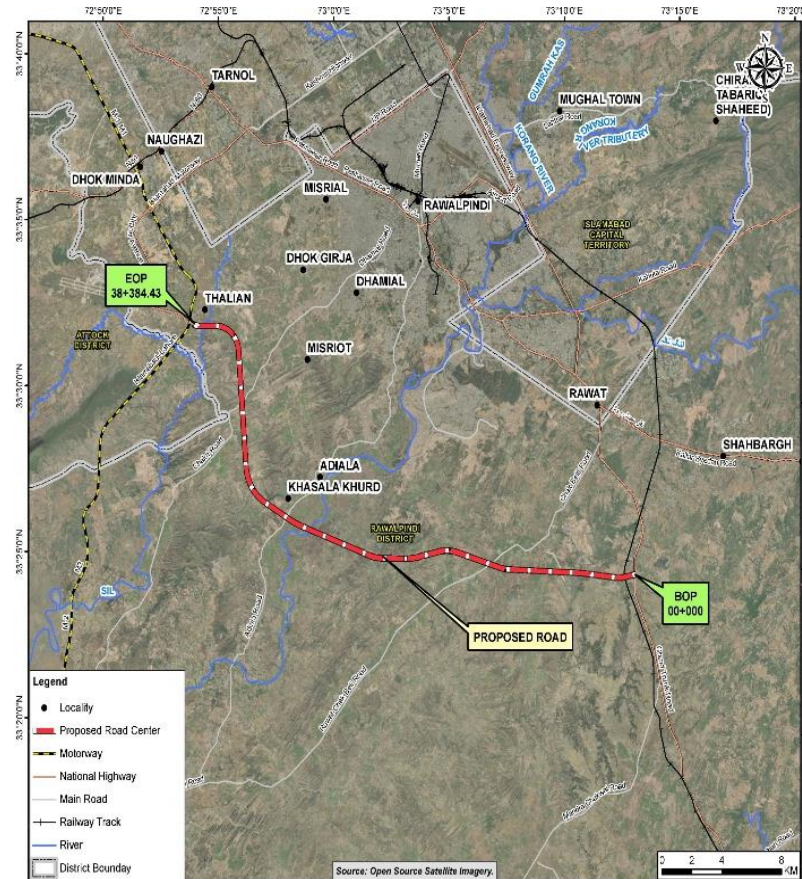




RAWALPINDI DEVELOPMENT AUTHORITY

DETAILED DESIGN FOR CONSTRUCTION OF RAWALPINDI RING ROAD (BAANTH N-5 TO THALLIAN M-2 38.3 KM)



ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

JANUARY, 2022



National Engineering Services Pakistan (Pvt) Limited
Geotechnical & Geoenvironmental Engineering Division
1C, Block N, Model Town Ext, Lahore 54700, Pakistan
Phone: +92-42-99231917, 99090396 Fax: +92-42-99231950
Email: geotech@nespak.com.pk Website: <http://www.nespak.com.pk>

Clearance Code		Doc. No.	3888-01	Rev. No.	00
----------------	--	----------	---------	----------	----



**Detailed Design for Construction of Rawalpindi Ring Road
(Baanth N-5 to Thallian M-2 38.3 Km)**

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

TABLE OF CONTENTS

	<u>Page No.</u>
TABLE OF CONTENTS	i
LIST OF TABLES	i
LIST OF FIGURES	iii
LIST OF ABBREVIATIONS	iv
GLOSSARY	vi
 EXECUTIVE SUMMARY	 ES-1
 1 INTRODUCTION.....	 1-1
1.1 PROJECT BACKGROUND.....	1-1
1.2 REQUIREMENT TO CONDUCT EIA.....	1-4
1.3 OBJECTIVE OF EIA	1-4
1.4 NATURE, SIZE, MAGNITUDE AND LOCATION OF THE PROJECT	1-5
1.5 PROJECT PROPONENT	1-5
1.6 CONSULTANT EIA TEAM	1-5
1.7 APPROACH AND METHODOLOGY	1-6
1.7.1 Literature Review	1-6
1.7.2 Review of Environmental Laws and Institutional Requirements	1-6
1.7.3 Delineation of Corridor of Impact (Col)	1-6
1.7.4 Survey of Col.....	1-8
1.7.5 Analysis of Alternatives	1-8
1.7.6 Environmental Baseline Survey of the Project.....	1-8
1.7.7 Stakeholder Consultations	1-9
1.7.8 Impact Assessment and Mitigation Measures	1-10
1.7.9 Environmental Management Plan (EMP).....	1-10
1.7.10 Conclusions and Recommendations	1-10
1.8 ORGANIZATION OF REPORT	1-10
 2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORKS	 2-1
2.1 GENERAL	2-1
2.2 GUIDELINES FOR CRITICAL AND SENSITIVE AREAS, 1997	2-17
2.2.1 Protected Areas Clearance Procedure	2-17
2.3 CHECKLIST OF PROCEDURE FOR ENVIRONMENTAL ASSESSMENT	2-18
2.4 COMPLIANCE PROCEDURE FOR OBTAINING NOC FROM PEPA	2-19
2.5 INTERNATIONAL PROTOCOL/CONVENTIONS.....	2-21
2.6 ADMINISTRATIVE FRAMEWORK	2-24
2.6.1 Rawalpindi Development Authority (RDA)	2-24
2.6.2 Environmental Protection Department, Punjab	2-24



3	PROJECT DESCRIPTION.....	3-1
3.1	OBJECTIVES OF THE PROJECT	3-1
3.2	PROJECT BENEFITS	3-1
3.3	PROJECT ADMINISTRATIVE JURISDICTION	3-2
3.4	PROJECT LOCATION	3-2
3.5	COMPONENTS OF THE PROJECT	3-2
3.6	ACCESSIBILITY OF THE PROJECT AREA	3-2
3.7	TRAFFIC STUDY	3-4
3.8	DESIGN ASPECT	3-5
3.8.1	Design Criteria.....	3-5
3.9	INTERCHANGE	3-6
3.10	DRAINAGE.....	3-6
3.10.1	Structural Design.....	3-11
3.11	CONSTRUCTION ASPECTS	3-13
3.11.1	Construction Materials	3-13
3.11.2	Course Aggregate	3-13
3.11.3	Fine Aggregates	3-13
3.11.4	Ordinary Portland Cement	3-14
3.11.5	Bridge Bearing pads and Expansion Joints	3-14
3.11.6	Bricks and Other Construction Materials	3-14
3.11.7	Borrow Areas.....	3-14
3.11.8	Work Force.....	3-15
3.11.9	Construction Activities and Required Machinery	3-15
3.11.10	Construction Camps.....	3-16
3.11.11	Water Requirement	3-16
3.11.12	Wastewater Generation	3-16
3.11.13	Solid Waste Estimation	3-16
3.11.14	Power Requirement/ Power Source.....	3-17
3.12	LAND ACQUISITION	3-17
3.13	PROJECT IMPLEMENTATION SCHEDULE.....	3-17
3.14	COST OF THE PROJECT	3-17
3.15	ALTERNATIVE ASSESSMENT	3-17
3.15.1	No Project Option	3-17
4	DESCRIPTION OF THE ENVIRONMENT.....	4-1
4.1	GENERAL	4-1
4.2	FIELD VISITS FOR BASELINE STUDY	4-3
4.3	PHYSICAL ENVIRONMENT.....	4-3
4.3.1	Topography	4-3
4.3.2	Regional Geology and Soil.....	4-3
4.3.3	Seismology	4-7
4.3.4	Climate	4-9
4.3.5	Temperature.....	4-9
4.3.6	Rainfall	4-10
4.3.7	Relative Humidity	4-11
4.3.8	Wind Speed.....	4-12
4.3.9	Climate Change Impacts and Vulnerability	4-13
4.3.10	Water Resources	4-14
4.3.11	Hydrology and Drainage	4-14
4.3.12	Solid Waste and Wastewater Situation	4-16
4.3.13	Environmental Monitoring, Sampling and Testing for Proposed Project	4-16



4.3.14	Landuse of the Proposed Project.....	4-19
4.3.15	Environmental Sensitive Receptor of the Proposed Project	4-19
4.4	ECOLOGICAL ENVIRONMENT	4-22
4.4.1	Methodology.....	4-22
4.4.2	Ecosystem.....	4-22
4.5	SOCIAL ENVIRONMENT	4-28
4.5.1	Political and Administrative Setup.....	4-28
4.5.2	Demographic Characteristics of the Project Area	4-28
4.5.2.1	Rural and Urban Distributions	4-29
4.5.2.2	Religion	4-29
4.5.2.3	Ethnic Structure.....	4-29
4.5.2.4	Mother Tongue	4-29
4.5.2.5	Sex Ratio.....	4-29
4.5.2.6	Migration.....	4-30
4.6	ECONOMIC CONDITIONS.....	4-30
4.6.1	Economical Active Population.....	4-30
4.6.2	Unemployment	4-30
4.6.3	Occupations	4-30
4.6.4	Industry.....	4-31
4.6.5	Roads	4-31
4.6.6	Railways	4-31
4.6.7	Educational Facilities	4-31
4.6.8	Health Facilities	4-31
4.6.9	Archeological and Cultural Property/ Places of Interest	4-32
4.7	IMPACT ASSESSMENT SURVEY OF THE PROJECT AREA	4-32
4.7.1	Survey Findings	4-33
5	STAKEHOLDER CONSULTATION	5-1
5.1	GENERAL	5-1
5.2	OBJECTIVES	5-1
5.3	CONSULTATION AND PARTICIPATION PROCESS.....	5-2
5.4	METHODS OF PUBLIC CONSULTATION.....	5-2
5.5	IDENTIFICATION OF STAKEHOLDERS	5-2
5.6	LOCATIONS OF THE PUBLIC CONSULTATIONS	5-3
5.7	CATEGORIES OF STAKEHOLDERS CONTACTED.....	5-3
5.8	STAKEHOLDERS AND THEIR APPREHENSIONS	5-4
5.9	CONSULTATION MEETINGS AND FORMAL & INFORMAL GROUP DISCUSSIONS	5-4
5.10	CONCERNS / SUGGESTIONS OF THE STAKEHOLDERS	5-5
5.11	MITIGATION MEASURES PROPOSED FOR ADDRESSING THE STAKEHOLDER'S CONCERNS.....	5-6
5.12	DEPARTMENTAL CONSULTATIONS	5-8
5.13	FUTURE CONSULTATIONS	5-16
5.14	FUTURE INFORMATION DISCLOSURE PLAN	5-18
5.15	GRIEVANCE REDRESS MECHANISM (GRM).....	5-18
5.15.1	Type of Grievance	5-19
5.15.1.1	1 st (I) Tier	5-19
5.15.1.2	2 nd II Tier	5-19
5.15.1.3	3 rd (III) Tier.....	5-20
5.15.2	Responsibilities of GRC	5-21
5.15.3	Procedures of Filing Complaints and Resolution	5-21



6	ANTICIPATED IMPACTS AND MITIGATION MEASURES	6-1
6.1	GENERAL	6-1
6.2	NOTION OF SIGNIFICANCE.....	6-1
6.3	METHODOLOGY FOR IMPACT EVALUATION.....	6-2
6.4	DELINEATION OF PROJECT CORRIDOR OF IMPACT (COI)	6-4
6.4.1	Corridor of Impact (Col)/ Area of Influence	6-4
6.4.2	Right of Way (RoW) / Project Area	6-4
6.5	POTENTIAL POSITIVE IMPACTS.....	6-5
6.6	POTENTIAL ADVERSE IMPACTS	6-5
6.7	ADVERSE IMPACTS DURING PLANNING AND DESIGN PHASE	6-6
6.7.1	Technical Design and Layout Planning.....	6-6
6.7.2	Topography	6-6
6.7.3	Drainage	6-7
6.7.4	Seismicity	6-7
6.7.5	Route (Alignment) Optimization	6-8
6.7.6	Change in Hydrologic Regime	6-8
6.7.7	Flora	6-9
6.7.8	Fauna	6-9
6.7.9	Land Acquisition and Resettlement	6-10
6.7.10	Renting / Leasing Land	6-11
6.7.11	Public Utilities	6-12
6.7.11.1	Physical, Religious and Cultural Resources	6-12
6.8	ADVERSE IMPACTS DURING CONSTRUCTION STAGE	6-13
6.8.1	Site Accessibility During Construction	6-13
6.8.2	Traffic Issues.....	6-14
6.8.3	Resource Conservation.....	6-15
6.8.4	Community Health and Safety	6-16
6.8.5	Occupational Health and Safety.....	6-17
6.8.6	Soil Erosion	6-22
6.8.7	Soil Contamination	6-23
6.8.8	Borrow/ Open Pits	6-24
6.8.9	Construction Camps/Camp Sites	6-24
6.8.10	Wastewater Generation at Construction Camps.....	6-26
6.8.11	Solid Waste Generation at Construction Camps	6-29
6.8.12	Waste Generation at Construction Site.....	6-29
6.8.13	Impact on Water Resources (Surface and Groundwater Contamination)	6-30
6.8.14	Waste Management from Asphalt and Batching Plants	6-31
6.8.15	Disposal of Mucking Material	6-32
6.8.16	Blockage of Water Channels and Natural Drainage	6-32
6.8.17	Green House Gas (GHG) Abatement	6-32
6.8.18	Discovery of Heritage Sites and Structures during Excavation	6-33
6.8.19	Emergency Response	6-33
6.8.20	Natural and Man-Made Disasters	6-33
6.8.21	Accidental Risks	6-34
6.8.22	Air Quality.....	6-34
6.8.23	Noise/Vibration	6-36
6.8.24	Flora	6-40
6.8.25	Fauna	6-42
6.8.26	Agriculture	6-42
6.8.27	Social and Cultural Conflicts	6-43
6.8.28	Community Disturbance, Health and Safety	6-44



6.8.29	Communicable Diseases	6-45
6.8.30	Gender Issues	6-45
6.8.31	Impacts on Livelihood	6-47
6.8.32	Influx of Labor.....	6-48
6.9	ANTICIPATED IMPACTS DURING OPERATIONAL PHASE	6-49
6.9.1	Landscape.....	6-49
6.9.2	Air Quality.....	6-50
6.9.3	Noise and Vibration	6-50
6.9.4	Road Safety.....	6-51
6.9.5	Drainage	6-51
6.9.6	Road Maintenance Works and Heavy Traffic	6-52
6.9.7	Flora	6-53
6.9.8	Fauna	6-54
6.9.9	Increase in Land Value	6-54
6.9.10	Decrease in Operating Cost of Vehicles	6-54
6.9.11	Economic Boost	6-54
6.9.12	Community Development.....	6-54
7	ENVIRONMENTAL MANAGEMENT PLAN.....	7-1
7.1	GENERAL	7-1
7.2	EMP COMPONENTS.....	7-1
7.3	EMP OBJECTIVES	7-1
7.4	SCOPE OF THE EMP.....	7-2
7.5	ENVIRONMENTAL POLICY, LEGISLATION AND FRAMEWORK.....	7-2
7.6	INSTITUTIONAL REQUIREMENTS	7-2
7.6.1	Institutional Arrangements for Implementation of EMP during Construction Phase	7-2
7.6.2	Overall Oversight Arrangements.....	7-3
7.6.3	Roles and Responsibilities	7-3
7.6.4	Monitoring and Evaluation Consultant	7-5
7.6.5	Institutional Arrangement for Implementation of EMP during O&M Phase.....	7-5
7.7	ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX.....	7-6
7.8	ENVIRONMENTAL MONITORING PLAN	7-32
7.8.1	Checklists for Environmental Monitoring.....	7-32
7.8.2	Monitoring Strategy	7-32
7.9	PLANNING FOR EMP IMPLEMENTATION	7-37
7.9.1	NOC and Other Approvals	7-37
7.9.2	Stakeholder Coordination.....	7-37
7.10	TRAINING AND CAPACITY BUILDING	7-38
7.11	COMMUNICATION AND DOCUMENTATION	7-38
7.11.1	Data Recording and Maintenance	7-38
7.11.2	Database	7-39
7.11.3	Meetings and Reporting	7-39
7.11.4	Social Complaint Register	7-39
7.11.5	Photographic Records.....	7-39
7.11.6	Non-Compliance of the EMP.....	7-40
7.11.7	Review of Recorded Data	7-40
7.12	MANAGEMENT PLANS.....	7-40
7.12.1	Tree Plantation / Reforestation Plan	7-40
7.12.2	HSE Management Plan.....	7-41
7.12.3	Emergency Preparedness and Response Plan	7-42
7.12.4	Restoration and Rehabilitation Plan.....	7-42



7.12.5	Waste Management Plan.....	7-43
7.12.6	Disaster Management Plan.....	7-44
7.12.7	Drinking Water Supply and Sanitation Plan	7-44
7.12.8	Traffic Management Plan	7-44
7.13	CHANCE FIND PROCEDURE.....	7-45
7.14	QUARRY MANAGEMENT PLAN.....	7-45
7.15	RESOURCE CONSERVATION PLAN	7-45
7.16	CODES OF PRACTICE	7-45
7.16.1	General.....	7-46
7.16.2	Good Engineering Practices	7-46
7.16.3	Cultural Norms	7-46
7.17	PUBLIC DISCLOSURE.....	7-47
7.18	EMP COST.....	7-47
8	CONCLUSION AND RECOMMENDATIONS	8-1
8.1	CONCLUSIONS.....	8-1
8.2	RECOMMENDATIONS.....	8-3

ANNEXES

Annex-I:	Environmental Monitoring Report
Annex-II:	Land use Map in the Col and Row
Annex-III:	Sensitive Receptor Stretch Wise Maps
Annex-IV:	List of Participants of Focus Group Discussions
Annex-V:	Guideline for Contractor's TMP
Annex-VI:	Contractor's Occupational Health and Safety Plan
Annex-VII:	Quarry Management Plan
Annex-VIII:	Sanitation Plan
Annex-IX:	Chance Find Procedure
Annex-X:	Emergency Response Plan
Annex-XI:	Guidelines to Combat with Covid-19
Annex-XII:	Tree Plantation Plan
Annex-XIII:	Resource Conservation Plan



LIST OF TABLES

Table 1-1 : Team Composition for the EIA Study	1-6
Table 2-1: Main Strategies/Policies Related to Environment and Relevance to the Project	2-1
Table 2-2: Main Legislation/Acts Related to Environment and Their Relevance to the Project	2-5
Table 2-3: International Agreements/Conventions Relevant to the Project	2-21
Table 3-1: Average Daily Traffic	3-4
Table 3-2: List of Proposed Culverts	3-11
Table 3-3: Machinery and Equipment Requirement	3-15
Table 4-1: Values of Seismic Zones of Pakistan	4-7
Table 4-2: Monthly Temperature Recorded at Airport Meteorological Gauging Station	4-9
Table 4-3: Mean Monthly Rainfall Recorded at Airport Station	4-10
Table 4-4: Relative Humidity Recorded at Airport Meteorological Gauging Station	4-12
Table 4-5: Wind Speed Recorded at Airport Stations	4-13
Table 4-6: Environmental Monitoring, Sampling and Testing Points	4-16
Table 4-7: Summary of Landuse in the Col and RoW	4-19
Table 4-8: Names of Trees/shrubs & Herbs of the Region	4-24
Table 4-9: List of indigenous Mammals	4-25
Table 4-10: Amphibians of the Study Area	4-26
Table 4-11: Reptiles of the Study Area	4-26
Table 4-12: Birds Found in Study Area	4-27
Table 4-13: Forests Located Near the Project Area	4-28
Table 4-14: Age Composition of the Respondents	4-33
Table 4-15: Educational Level of the Respondents	4-34
Table 4-16: Marital Status of the Respondents	4-35
Table 4-17: Occupation of the Respondents	4-36
Table 4-18: Ethnic Structure of the Respondents	4-37
Table 4-19: Mother Tongue of the Respondents	4-37
Table 4-20: Family Structure	4-38
Table 4-21: Average Monthly Income of the Respondents	4-39
Table 4-22: Average Monthly Expenditures of the Respondents	4-40
Table 4-23: Ownership Status of Houses	4-41
Table 4-24: Nature of Construction of Houses	4-41
Table 4-25: Acquisition of Private Land	4-42
Table 4-26: Implementation of the Proposed Project	4-43
Table 4-27: Perceived Impacts	4-43
Table 4-28: Perceived Impacts during Operation Phase	4-44
Table 5-1: Tasks and Purposes of Consultations	5-1
Table 5-2: List of Villages Consulted	5-3
Table 5-3: Stakeholders Contacted in the Project Area	5-3
Table 5-4: Major Stakeholders and their Apprehensions in the Project Area	5-4
Table 5-5: Summary Findings of the Consultations	5-7
Table 5-6: Summary of Consultation Meeting at Department Level	5-10
Table 5-7: Future Consultations Framework	5-18
Table 6-1: Project Impact Evaluation Matrix	6-3
Table 6-2: Major Approach Roads for the Proposed Project	6-13
Table 6-3: Summary of Workers Camp Impacts & Mitigation Measures	6-24
Table 6-4: Estimated Wastewater Generated by Workers in Construction Camps	6-26
Table 6-5: Noise Produced by Construction Equipment	6-37



Table 7-1: Environmental Mitigation and Management Matrix	7-7
Table 7-2: Environmental Monitoring Plan.....	7-33
Table 7-3: Periodic Reporting Mechanism	7-39
Table 7-4: Break-up for Personal Protective Equipment cost.....	7-48
Table 7-5: Environmental Management and Monitoring Cost Estimate	7-48



LIST OF FIGURES

Figure 1.1: Project Location Map	1-3
Figure 1.2 : RoW and Col of the Proposed Project	1-7
Figure 2.1: Procedure for Submitting the EA Report	2-20
Figure 3.1: Project Area Accessibility Map	3-3
Figure 3.2: Typical Cross-section of the Proposed Project.....	3-7
Figure 4.1: Index Map of RoW and Col Proposed Project.....	4-2
Figure 4.2: Topography of the Project Area	4-4
Figure 4.3: Regional Geological Map.....	4-6
Figure 4.4: Seismic Zoning Map	4-8
Figure 4.5: Mean Monthly Temperature at Airport Meteorological Gauging Station	4-10
Figure 4.6: Mean Monthly Rainfall of Airport Meteorological Gauging Station	4-11
Figure 4.7: Relative Humidity of Airport Meteorological Gauging Station	4-12
Figure 4.8: Wind Speed of Airport Meteorological Gauging Station	4-13
Figure 4.9: Surface Hydrological Map.....	4-15
Figure 4.10: Environmental Monitoring & Sampling Points Location Map.....	4-18
Figure 4.11: Index Landuse Map	4-20
Figure 4.12: Environmental Sensitive Receptors Map.....	4-21
Figure 4.13: Age Composition of the Respondents	4-34
Figure 4.14: Educational Level of the Respondents	4-35
Figure 4.15: Marital Status of the Respondents	4-35
Figure 4.16: Occupation of the Respondents	4-36
Figure 4.17: Ethnic structure of the Respondents	4-37
Figure 4.18: Mother Tongue of the Respondents	4-38
Figure 4.19: Family structure of the Respondents	4-39
Figure 4.20: Average Monthly Income of the Respondents.....	4-40
Figure 4.21: Average monthly expenditure of the Respondents	4-40
Figure 4.22: Ownership Status of the Respondents	4-41
Figure 4.23: Nature of Construction of Houses.....	4-42
Figure 4.24: Acquisition of Private Land	4-42
Figure 4.25: Implementation of the Proposed Project	4-43
Figure 4.26: Perceived Impacts by Respondents	4-44
Figure 4.27: Perceived Impacts during Operation Phase	4-44
Figure 5.1: Grievance Redress Mechanism (GRM).....	5-20
Figure 6.1: General Drawing of Septic Tank.....	6-28
Figure 7.1: Organizational Setup for Implementation of EMP at Construction Phase.....	7-3



LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
APs	Affected Persons
BCP	Buildig Code of Pakistan
CBD	Convention on the Biological Diversity
CC	Construction Contractor
CCI	Council of Common Interest
CCMP	Construction Camp Management Plan
CDA	Canal and Drainage Act
CDM	Clean Development Mechanisms
Col	Corridor of Impact
COVID-19	Coronavirus disease
DCR	District Census Report
DFO	Divisional Forest Officer
EIA	Environmental Impact Assessments
EMMM	Environmental Mitigation and Management Matrix
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
FGDs	Focused Group Discussions
GHG	Global Greenhouse Gas
GoP	Government of Pakistan
GoPb	Government of Punjab
GRC	Grievances Redressal Committee
GRM	Grievance Redress Mechanism
GT	Grand Trunk
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IGF	Inspector General Forestry
ILO	International Labour Organization
LAA	Land Acquisition Act
MBS	Metro Bus System
MCC	Manual Classified Traffic Counts
MSDS	Material Safety Data Sheets
NCS	National Conservation Strategy
NCS	Pakistan National Conservation Strategy
NESPAK	National Engineering Services Pakistan
NGO's	Non-Governmental Organizations
NOC	No Objection Certificate
NPO	No Project Option
NPZ	Noise Perimeter Zones
O&M	Operation and Maintenance
OD	Origin-Destination
OHSAS	Occupation Health and Safety Assessment Series
OIC	Organization of the Islamic Conference
PCC	Project Complaint Cell
PD	Project Director



PDMAs	Provincial Disaster Management Authorities
PEGO	Project Environmental Grievance Officer
PEPA	Punjab Environmental Protection Agency
PEQS	Punjab Environmental Quality Standards
PEQs	Punjab Environmental Quality Standards
PGA	Peak Ground Acceleration
PI	Public Involvement
PMD	Pakistan meteorological department
PMU	Project Management Unit
POPs	Persistent Organic Pollutants
PPE	Personnel Protective Equipment
PPE	Personal Protective Equipment
PSHA	Probabilistic Seismic Hazard Assessment
R & D	Research and Development
RDA	Rawalpindi Development Authority
ROW	Right of Way
SAARC	South Asian Association for Regional Cooperation
SC	Supervisory Consultant
SOP	Standard Operating Procedures
SSEMP	Site Specific EMP
STDs	Sexually-Transmitted Disease
TMP	Traffic Management Plan
ToR	Terms of Reference
UBC	Uniform Building Code
UNCCD	Convention to Combat Desertification
UNO	United Nations Organization
WAPDA	Water and Power Debelopment Authority



GLOSSARY

Air Quality Sensitive Receptors	People, property, species or designated sites for nature conservation that may be at risk from exposure to air pollutants potentially arising as a result of a proposed development.
Air Quality Standard	Air quality limiting values and objectives.
Annual Average Rainfall	Average amount of precipitation falling at a specified site recorded by the Meteorological Office. It gives a measure of the overall wetness of the local climate.
Baseline	Existing environmental conditions present on, or near a site, against which future changes can be measured or predicted.
Biodiversity	The variety of life in the world or in a particular habitat or ecosystem.
Climate	The climate can be described simply as the 'average weather', typically looked at over a period of 30 years. It can include temperature, rainfall, snow cover, or any other weather characteristic.
Climate Change	A change in the state of the climate, which can be identified by changes in average climate characteristics that persist for an extended period -typically decades or longer.
Cutting	A linear excavation of soil or rock to make way for a new railway or road. Cuttings help reduce the noise and/or visual impact of passing trains or road vehicles.
Decibel(S)	A unit used to express relative differences in sound power or intensity. There is a million to one ratio in sound pressure (measured in Pascal (Pa)) between the quietest audible sound and the loudest tolerable sound. The decibel (dB) scale, based on a logarithmic ratio, is used in sound measurement because of this wide range. Audibility of sound covers a range of approximately 0-140dB.
Dust	All airborne particulate matter.
Earthworks	The removal or placement of soils and rocks such as in cuttings, embankments and environmental mitigation, including the in-situ improvement of soils/rocks to achieve desired properties.
Ecosystem	A biological community of interacting organisms (e.g. plants and animals) and their environment.
Effect	Used throughout this environmental impact assessment report to refer to the consequence of an impact to the receiving environment (see also: 'impact').
Effluent	Liquid waste or sewage.
Embankment	Artificially raised ground, commonly made of rock or compacted soil, on which a new railway or road is constructed.



Environment Agency	Government agency established to protect and improve the environment and contribute to sustainable development. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental Impact Assessment	A process of systematically assessing the likely environmental effects of proposed development projects. EIA is a legal requirement for certain public and private projects under Punjab Environmental Protection (Amendment) Act, 2017.
Environmental Impact Assessment Report	A suite of documents, previously referred to as an environmental statement, produced as part of an environmental impact assessment. It must include all information that is reasonably required to assess the likely significant environmental effects of a proposed development.
Excavated Material	Soil, rock and other material that has been removed from the ground during construction.
Greenhouse Gas	A gas such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapor that contributes to the greenhouse effect by absorbing infrared radiation.
Groundwater	All water that is below the surface of the ground and within the permanently saturated zone.
Groundwater Body	A distinct volume of groundwater within an aquifer.
Heavy Metals	A loosely defined term which refers to a group of metal and metalloids, many of which are toxic to some degree.
Impact	Used throughout this EIA Report to refer to changes to the environment that have the potential to occur as a result of the construction and/or operation of the Proposed Scheme. (See also: 'effect'.)
Mitigation	The measures put forward to prevent, reduce and where possible, offset any adverse effects on the environment.
Risk Assessment	An assessment of the probability of a hazard occurring that could result in an impact.
Sand	Soil particles from 0.06mm-2.0mm in equivalent diameter. Fine sand particles are from 0.06mm-0.2mm; medium sand from 0.2mm-0.6mm; and coarse sand from 0.6mm-2.0mm.
Scoping	An initial stage in the environmental impact assessment process to determine the nature and potential scale of environmental effects arising as a result of a proposed development, and an assessment of what further studies are required to establish their potential environmental impacts and effects.
Screening	The first stage in an environmental impact assessment. It is used to determine if further assessment is necessary and to categorize the project.
Soil Erosion	The detachment and movement of soil by the action of water and/or wind.
Soil Profile	A vertical cross-section through a soil.



Surface Water	Waters including rivers, lakes, reservoirs, canals, streams, ditches, coastal waters and estuaries.
Threshold	A level of effect above which an assessment will be taken of whether any changes to procedures need to be made.
Topography	The natural or artificial features, level and surface form of the ground surface.
Topsoil	Upper layer of a soil profile, usually darker in color (because of its higher content of organic matter) and more fertile than subsoil, and which is a product of natural biological and environmental processes.



EXECUTIVE SUMMARY

ES-1 INTRODUCTION

Pakistan was previously facing inadequate transportation system few years ago. Currently, it has developed lot of Motorways as well as improved the network of National/Provincial Highways and many are under progress. Motorways are a network of multiple-lane, high-speed, controlled-access highways in Pakistan, which are owned, maintained, and operated federally by Pakistan's National Highway Authority (NHA).

Rawalpindi Development Authority (RDA) intends to construct Rawalpindi Ring Road (38.3 km) with reference to expansion of Rawalpindi City towards south-western site/Motorway which is spreading without any control with respect to accessibility network. Rawalpindi is the fourth largest city in Pakistan by population. The economy of Rawalpindi is interlinked with Islamabad, and the two are jointly known as the "Twin Cities". Both Cities are also connected with Metro Bus System (MBS). The proposed Ring Road/ Bypass will facilitate movement on (GT) road and also facilitate the growth of city towards south-western site/ Motorway side

RDA Punjab has engaged National Engineering Services Pakistan (NESPAK) Limited to provide Consultancy Services of the proposed Project. In light of the consultant's scope preparation of Environmental Impact Assessment (EIA) study is one of the key tasks. This EIA report has been prepared for the proposed Rawalpindi Ring Road to fulfil the requirements of the Punjab Environmental Protection Agency (PEPA).

Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the Category 'D' of "Transport" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval. Thus, to fulfill the requirements, an EIA Study has been prepared for the proposed Project.

The prime objective of the EIA study is to fully meet the statutory requirements set forth by the Punjab Environmental Protection Act, 1997 (Amended) Act, 2017.

ES-2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORKS

Following are the major relevant strategies, policies, acts and legislation, from environmental perspective, considered in the proposed project: National Conservation Strategy, 1992, National Environmental Policy, 2005, National Forest Policy, 2001, National Climate Change Policy, 2012, National Water Policy 2018, National Drinking Water Policy, 2009, National Sustainable Development Strategy, 2012, National Action Plan for COVID-19 Pakistan, Punjab Environmental Protection Act, 1997 (Amended, 2017), Pakistan Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2000, Punjab Environmental Quality Standards (PEQS), 2016, Guidelines for the Preparation and Review of Environmental Reports, 1997, Guidelines for Environmental Assessment, Punjab Wildlife Act, 1974, Punjab Plantation and Maintenance of Trees Act, 1974, Explosives Act, 1884, Explosives Act, 1884,



Pakistan Penal Code, 1860, Labour Laws as part of Constitution of Pakistan 1973, Cutting of Trees (Prohibition) Act, 1975, Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act, 2012, Pakistan Climate Change Act, 2017, Land Acquisition Act (LLA), 1894 Including Later Amendments, Punjab Environmental Protection (Motor Vehicles) Rules, 2013, The Punjab Occupational Safety and Health Act, 2019, Building Code of Pakistan, 2007 and International Conventions.

ES-3 PROJECT DESCRIPTION

Development of Rawalpindi Ring Road is inevitable to complete the city network according to Traffic & Transportation Plan of Twin Cities. Government of Punjab through RDA decided to initiate Rawalpindi Ring Road Project. The total length of the proposed Project is 38.3 km. The proposed Project is designed to provide a sustainable urban transport system in the project area and the roader region with the main focus on accessibility and mobility. The proposed RRR starts near Baanth Bridge on G.T road (N-5), 10 km towards Lahore from Rawat city. It crosses Rawat Chakbeli road between village Maira Mohra and village Jhatta Hathial, Adiyala road near village Bhattian Nur Din, Chakri Road and finally terminates at Thallian Interchange on Motorway M-2.

The major components of project include construction of six lanes dual carriageway and five (05) interchanges along the alignment to provide local access. In addition, Project will have 31 subway, 55 culverts, 13 River and nullah bridges and 5 overpassss. The bridges are planned at Soan River and Sill River. The total width of one lane is 3.65m with the design speed of 120 km/hr.

The total area of land to be acquired for various components of the project is approximately 8,992.32 Kanals (8,161.03 Kanals in Tehsil Rawalpindi and 831.29 Kanals in Tehsil Gujar Khan). The proposed Project is expected to be completed within Two (02) years. The estimated cost of the construction works of proposed Project is Rs. 30,330.94 Million

ES-4 DESCRIPTION OF THE ENVIRONMENT

Considering the potential impacts of the proposed Project, existing baseline environmental conditions of the proposed project's Corridor of Impact (CoI) has to be used as a benchmark for comparison of the physical, ecological and socio-economic conditions before and after construction phases of the Project. This baseline will also provide the datum for assessing the impacts and suggesting the mitigation measures, which will be implemented effectively at various phases of the project activities.

The data presented in the forthcoming sections has been collected from the primary and secondary sources.



PHYSICAL ENVIRONMENT

The data presented in the forthcoming sections has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted the field visit during the months of November and December, 2021.

The Project is located in Rawalpindi division which falls in the Salt Range and Potohar Plateau. The terrain mainly consists of plains and mountains (reaching an elevation of over 1,175 m) traversed by ravines and nullahs originating from the mountains. The northern part of the metropolitan area lies in the mountainous terrain of the Margala Hills, a part of the lower and outer Himalayas, which also includes the Hazara and Kala Chitta Ranges.

The area in and around Rawalpindi has a complex geological history of mountain formation, alluvial-loessic deposition and erosion cycles. In the west of the Potohar Uplands, the main depositions of loess are from the Pleistocene period. Streams and ravines cut the loess plain, affected by gully erosion and steep slopes. This type of land is unsuitable for cultivation. The areas are composed of sandstone and limestone. There is an extensive area with exposed bedrock and fragmentary, thin soil formations.

The Proposed Project as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone-2B (Moderate Hazard) category with PGA 0.16 to 0.24g. The Project area is classified as humid subtropical climate. The humid subtropical climates are characterized by typically mild, dry and short winters. Summers in Project area are long with higher temperatures starting from mid-April and reaching peak temperatures in June/July. The temperatures often exceed 40 °C in summers. The project area receives rains in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the month of July and September.

There is no proper sewerage and sanitation system available in the COI. A few villages of the COI were observed to be connected with the proper sewerage system. Four (04) surface water/ wastewater and four (04) drinking water/groundwater have been collected. Similarly, four (04) points have been selected for ambient air and background noise monitoring at site. All the parameters of ambient air quality and noise levels are well within the PEQS applicable limiting values except PM_{2.5}. All parameters are within prescribed limits of PEQS, 2016 except Phenolic Compound (As Phenol) for drinking water and BO_{D5} for surface water / wastewater. The sensitive receptors identified for the proposed project within or near the COI are religious and cultural places etc.

ECOLOGICAL ENVIRONMENT

Flora: As the project area is part of the Potohar plateau, the vegetation is characteristic of that tract. Kau (*Olea cuspidata*) is the climax species. However, in the project and the study area, Phulahi (*Acacia modesta*) and Kikar (*Acacia nilotica*) dominate. Shisham (*Dalbergia sissoo*), Mesquit (*Prosopis juliflora*) and Paper Mulberry (*Broussonetia papyrifera*) have also grown as secondary species with Phulahi. Dominant tree species include Phulai (*Acacia modesta*), Wild olive (*Olea ferruginea*), Sanatha (*Dodonea viscosa*), Black berries (*Monothea buxifolia*),



Reptonia buxifolia, *Beri* (*Zizyphus numularia*), *Gymnosporia royleana*, *Baikarh* (*Adhatoda vasica*), *Pistacia integerrima*, *Tecoma undulate*, and *Capparis decidua* on drier slopes. As undergrowth, underneath or between the small trees there are a number of common shrubs such as *Dodonaea viscosa* (*sanatha*), *Adhatoda vasica* (*bhekar*), *Otostegia limbata* (*awani booti*) and *Carissa opaca* (*granda*). *Dalbergia sissoo* (*shisham* or *tali*) is the most valuable tree for furniture and is common both in wild and cultivated form.

Fauna: The project area is to be considered highly degraded in terms of wild fauna. Jackals are quite common. Foxes are also common, and the piercing bark of the fox is usually heard in the hills. Wild boars are quite common. Hares are to be found on all the low hills and in most of the ravines. The most common reptile that is worth mentioning and is occasionally witnessed by the hikers is Monitor Lizard. Most common birds are House Sparrow, House Crow and Mynah. Birds like Cuckoo, Bulbul, Hoopoe, Parrots, Blue Birds, and Little Egrets etc were frequently sighted. River Soan is one of the important aquatic systems of the Punjab province in Pakistan and flows into Indus River near Kalla Bagh (District Mianwali). There are several kinds of fish found in these rivers. Rahu, Mari, Thaila, Gulfam and Daulafish can be found in the upper reaches of the Soan River. There are no designated wetlands in falling in the project area. There is no Game Reserve, Reserve Forests and wild sanctuaries reported in the project alignment.

SOCIO-ECONOMIC ENVIRONMENT

The proposed project area falls in the administrative jurisdiction of Tehsil Rawalpindi of the Rawalpindi District. According to Census of 2017 the population of Rawalpindi District is 5,405,633 with an average annual growth rate of 2.52 percent from 1998 to 2017. The population of the Rawalpindi District of which the Project Area is an integral part is predominantly Muslim i.e. 97.72 percent. One of the important races and tribes living in the Rawalpindi District are the Rajputs, amongst whom the important sub-divisions are Bhatti, Rawal, Janjua, and Chohans. During the baseline survey, 96 respondents were interviewed, comprising 100% males due to some traditional restrictions in the project area, only 10% of the respondents were illiterate. About 64% of the respondents were married and 36% were unmarried. A vast majority i.e. 50% was involved in agriculture which is the main source of income. Significant number of the respondents i.e. 100% were reported their religion Islam. Majority of the respondents 30% fall in the income group of 30,001 to 45,000 rupees, 23% of the respondents were earning their monthly income between the ranges of 20,001 to 30,000 rupees per month. The residents in the project area are facing problems of clean drinking water, sewerage. Facility of sui gas is also not available for the majority.

ES-5 STAKEHOLDER CONSULTATION

A series of public consultations were required to get the feedback/concerns of the different category of stakeholders including, district level departments, potential PAPs, local community and other general public residing in the Study Area. Consultation process includes focus group discussion, village/Town meetings and semi-structured interviews.



ES-6 ANTICIPATED PROJECT IMPACTS AND MITIGATION MEASURES

Significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed project. The positive impacts due to the proposed project are: The proposed Project shall provide an efficient / intelligent transport corridor. Main objective of this road is to provide a safe, congestion free and high speed facility to the commuters of project area and heavy traffic, the corridor will largely contribute to the economic and social development of the region. Development of businesses during the construction stage will cause socio-economic uplift of the locals along the project corridor. The socio-economic impacts like employment, education, living standards and cultural uplift during the interaction with locals are the indirect benefits due to the Project implementation. Raising of new trees on either side of the proposed road shall render a positive impact on the flora of the area and will also cause a positive impact on the landscape of the area, which shall be of permanent in nature.

The adverse impacts and their mitigations during the construction and operation phases are briefly discussed below:

- The proposed Rawalpindi Ring Road Project will be constructed on a new alignment for which approximately 8,992.32 Kanals (8,161.03 Kanals in Tehsil Rawalpindi and 831.29 Kanals in Tehsil Gujar Khan) private and government land will be acquired on permanent basis. The major issue in the proposed project will be land acquisition and resettlement. This will result in loss of land, crops, orchards, infrastructure, livelihood, commercial activities, disturbance to people and loss of income sources. Mosques, graveyards and shrines are falling in the RoW of the proposed Project. Shifting and demolishing of these structures may cause serious social issues. The LAA of 1894 is the main law regulating land acquisition for public purpose. This impact can be mitigated by ensuring compliance of LAA, 1894, addressing community grievances on priority basis and timely compensation to affectees. The effort will be made by making changes in design to avoid the sensitive and religious structures and to minimize the issues at possible extend. If needs demolishing and shifting of graveyards, a mechanism will be developed with the community consultation.
- Excessive water consumption by the construction staff may stress water resources in the project area and in certain cases may disturb the existing water supplies in the project area. Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purpose. Plan for the provision/purchase of adequate insulation to reduce heat loss through batching plants. Reduction of wastage of water through training of workers involved in water use.
- Construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities. Proposed project will also have potential of air (dust pollution), noise and vibrational impacts on nearby community. There will be proper control on construction activities and oil spillage leakage of vehicles; The labourers with different transmittable diseases will be restricted within the construction site; Ensure that the site is restricted for the entry of irrelevant people particularly children; Efforts will be made to create awareness about road safety among the drivers operating construction vehicles.
- Wastewater will be generated at the construction camps and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc.



The wastewater generation is estimated to be 9,600 liters/day for 300 construction workers for the proposed Project. Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks. Proper monitoring to check the compliance of PEQS will be carried out; and Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit.

- Considering the labourers (about 300 in numbers) residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.5 kg/capita/day¹ is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 135 kg of solid waste will be generated from construction camps on daily basis. All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste.
- Surface water might get contaminated due to the disposal of construction waste generated due to the Project activity and also result in jeopardizing the health of natives that use this water for meeting domestic requirement. Construction camps will be established in areas with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS, 2016 are met; the surface and groundwater reserves will be adequately protected by installing screens and barriers to protect the source of contamination such as construction and oily waste that will degrade its potable quality.
- Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. Diesel operated equipment should be equipped with well-maintained fuel filter and may be replaced timely (if required). In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators. Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS, 2016 for carbon emissions and noise; Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s).
- The project will involve destruction of vegetation cover on construction areas particularly along proposed road construction. It is initially examined that approximately 3,700 mature, sub-mature, pole crop and saplings of different tree/plants species may be removed during the construction phase of the project. A tree plantation program shall be formulated with the recommendations and technical support of concerned Forest Department. Plan for compensatory planting for ten (10) trees against each fallen tree of similar floral function at the available spaces in/around the project area.
- Mostly the alignment of the proposed project fall in the very rich agricultural area and damages of crops are expected during construction activities. The clearance of RoW may affect about 480 acres of agriculture land which may cause loss of income to affectees. The compensation value shall be calculated based on market value of the crops and average yields in the project area; In order to reduce the loss of agricultural land during the construction stage, existing haul routes will be preferred by the

Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day.



- contractor, and the width of any new haul route shall be limited to the bare minimum required and approved by the Engineer.
- During construction phase the existing population of mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. Care shall be taken during construction activities for avoiding purposely or chance killing of animals. If found any wild species and habitat during constructing that must dealt carefully and local wildlife department officials should be called. Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard.
 - During construction there will be a number of activities which, if not mitigated, are likely to cause disturbance to communities in the project area; these are: Increased traffic on public routes; Health and safety risk will also be posed to the community due to the existence of a construction site(s) and the storage and use of hazardous chemicals; and Movement of plant and vehicles throughout the project area, especially along haulage routes passing alongside private land during disrupting local movement and posing traffic safety issues. Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities; Maintaining a grievance procedure to facilitate stakeholders in expressing concerns; Proper traffic diversion plans before the start of the construction; Proposal of pedestrian bridge for the locals; Appropriate budget for traffic/safety sign boards; and Timely completion of the project.
 - Increased traffic levels may lead to higher values of emissions. PMU-RDA with the help of PEPA may set up system to monitor air quality along project area in accordance with PEQS, 2016 for a specific period to record the quality of air during the operation phase; Setting up to system to monitor air quality along the project area in accordance with acceptable International Standards; Monitoring emissions of vehicle as per PEQS, 2016.

ES-7 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The EMP of the proposed project mainly comprises Institutional Requirements; Environmental Mitigation and Management Matrix; Environmental Monitoring Plan; Planning for EMP Implementation; Training and Capacity Building; Communication & Documentation; Management Plans and EMP Cost. PMU-RDA will be responsible for overall project implementation and implementation of EMP of the proposed project during construction and operational phase. The total cost required to effectively implement the mitigation measures is approximately Rs. 107.3 /- million which includes cost of training, environmental monitoring, tree plantation and Health and Safety etc. during construction and operational phase. The EMP will be part of the contract document with the Contractor.

ES-8 CONCLUSION AND RECOMMENDATIONS

This report has been prepared in accordance with the requirements of the Punjab Environmental Protection (Amendment) Act, 2017 Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, Pakistan EIA procedures and sectoral guidelines for environmental reports: Major Roads. Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the Category 'D' of "Transport" of



the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval. Thus, to fulfill the EPA, Punjab requirements, an EIA Study has been prepared for the proposed Project.

Project is socio-economically viable and environment friendly if EMP is implemented in true letter and spirit. Results of the EIA Study have shown that the impacts of the project activity on the physical environment will be negligible. However, there will be significant impacts on the ecological and social environment. These impacts could be reduced by proper and judicious compensation to the affectees and well planned meticulous design of the facility and by implementing an appropriate tree plantation plan. An Environmental Management Plan (EMP) for both the phases (construction and operation) has been developed as part of the report which provides a detailed mitigation matrix that covers impacts, mitigation measures roles and responsibilities and timings to avoid, minimize or mitigate the adverse impacts of the project.

The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. The Bidding documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SSEMP which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

The EMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Pakistan was previously facing inadequate transportation system few years ago. Currently, it has developed lot of Motorways as well as improved the network of National/Provincial Highways and many are under progress. Motorways are a network of multiple-lane, high-speed, controlled-access highways in Pakistan, which are owned, maintained, and operated federally by Pakistan's National Highway Authority.

An efficient transportation framework is the foundation of any Nation's economy. Better transportation system leads not only to the development of a country but also helps in boosting countries economy. A huge number of population travel by means of roads in our nation. Better transportation system is inevitable for the prosperity of the country.

Rawalpindi Development Authority (RDA) intends to construct Rawalpindi Ring Road (38.3 km) with reference to expansion of Rawalpindi City towards south-western site/Motorway which is spreading without any control with respect to accessibility network. The is an initiative of the Punjab Government to provide an integral service forming a transport network linking twin cities and Punjab province through the existing national highways.

Rawalpindi is the fourth largest city in Pakistan by population. The economy of Rawalpindi is interlinked with Islamabad, and the two are jointly known as the "Twin Cities". Both Cities are also connected with Metro Bus System (MBS). The main industries of the city include oil refineries, gas processing, steel manufacturing, iron mills, railroad yards, a brewery, saw mills, tent factories, textiles, hosiery, pottery, leather goods production and tourism.

The proposed Ring Road/ Bypass will facilitate movement on (GT) road and also facilitate the growth of city towards south-western site/ Motorway side. It will also attract commuters due to its uninterrupted flow of traffic. This will also reduce traffic load on main arterial roads within city, traffic jams and noise & air pollution. In order to boost up the industrial development potential, it will ensure efficient movement of freight and passengers within the metropolis by removing traffic constraints. Apart from an urban free way it will also link to other industrial cities like Peshawar, Wah Cantt etc. which will help in the development of their local resources. The corridor will largely contribute to the economic and social development of the project area and its vicinity.

Industries and manufacturing units initially located at the peripheries of the twin cities have resulted in unplanned settlements creating expanding population centers. These centers have attracted economic activity such as grain, fruit and vegetable markets. The situation is compounded by a mix of heavily loaded slow-moving goods traffic with cars, motor cycles and commercial vehicles using the urban road network which in turn increases traffic congestion on these roads, causing excessive delays, safety hazards due to heavy duty vehicles and damage to the road infrastructure. Therefore, a solution becomes necessary to address the demands of growing usage and pressures on the existing road infrastructure.

One of the major issues from a long time is the blending of bypassing traffic of Islamabad and Rawalpindi with local traffic on internal urban roads. The traffic coming on N-5 (G.T. Road) has to enter Islamabad and Rawalpindi and use local roads to pass through the cities. The roads used by the bypass traffic are already congested because of daily commute of local residents of Islamabad and Rawalpindi cities. The trucks coming on N-5 have to use IJP and Islamabad Expressway to bypass the twin cities. These bypassing trucks cause congestion and create safety issues on urban road network. The proposed Project will facilitate the bypass traffic and provide alternative road to the local daily commuters in future. The proposed Project will also help to ease out the traffic congestion on the internal roads of Islamabad and Rawalpindi. It will also provide access to airport, motorway, and other land use. The overall objective of planning the proposed Project is to provide congestion free, safe and high speed multi-lane access controlled highway to commuters of the Project Area as well as general public. The Project will improve communication network locally (within and around the twin cities) and regionally (between provinces).

RDA Punjab has engaged National Engineering Services Pakistan (NESPAK) Limited to provide Consultancy Services of the proposed Project. In light of the consultant's scope preparation of Environmental Impact Assessment (EIA) study is one of the key tasks. This EIA report has been prepared for the proposed Rawalpindi Ring Road to fulfil the requirements of the Punjab Environmental Protection Agency (PEPA).

The proposed project will pass through Rawalpindi district (Tehsil Gujar Khan and Rawalpindi) of Punjab Province. The map showing the location of the Proposed Project is shown in Figure 1.1.

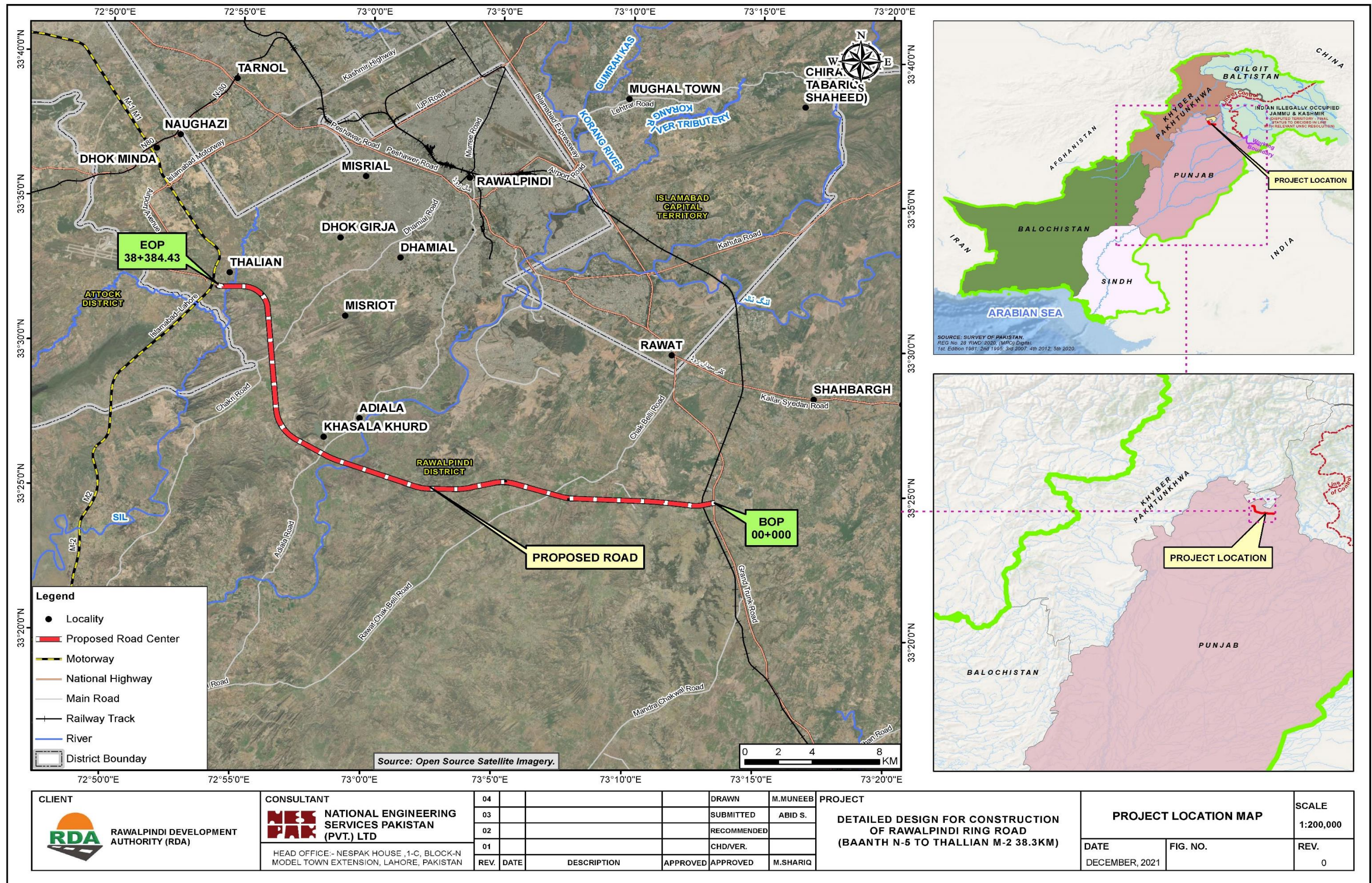


Figure 1-1: Project Location Map

1.2 REQUIREMENT TO CONDUCT EIA

The Proposed Project is located in Punjab Province, therefore the Punjab Environmental Protection Act, 1997 (Amended) Act, 2017 is the core environmental law for the Proposed Project. Under Section 12 (1) of the Act, it is mandatory for the proponents of the project² to execute the Initial Environmental Examination (IEE) and/ or EIA, where warranted, and get the approval from PEPA. Hence for the Proposed Project, the PEPA is the concerned authority with respect to environmental approvals.

Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the Category 'D' of "Transport" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval. Thus, to fulfill the requirements, an EIA Study has been prepared for the proposed Project.

1.3 OBJECTIVE OF EIA

The prime objective of the EIA study is to fully meet the statutory requirements set forth by the Punjab Environmental Protection Act, 1997 (Amended) Act, 2017.

The overall objective of this EIA is to elucidate the anticipated aspects of the proposed intervention and to propose necessary mitigation measures to prevent/minimize adverse impacts on surrounding environment and community. To achieve this objective, an assessment of the existing environmental conditions of the project corridor is a prerequisite and therefore, included after collecting the baseline data of major environmental attributes acquired from secondary sources. This EIA has been prepared to ensure adequate environmental and social management during pre-construction, construction and implementation stages of the proposed project. It provides mechanisms to ensure that potentially significant environmental and social impacts of the proposed project are identified, assessed and mitigated as appropriate. More specific objectives of this EIA report are to:

- Facilitate proponents of the project in ensuring environmental and social sustainability of the project;
- Establish a baseline of existing social and environmental conditions prior to project initiation by collecting secondary data/information on physical, biological and socio-economic environment of the project area;
- Identify potentially significant environmental and social impacts (both positive and negative) during all stages of the Project;
- Avoid, minimize, and suggest mitigation measures for significant adverse impacts;
- Conduct, record and report and ensure e-consultations with major stakeholders; and
- Provide Environmental Management Plan (EMP) for all stages of the project as a tool for the implementation of the suggested measure along with monitoring and

² "No proponent of a project of public and private sector shall commence construction or operation unless he has filed with the Punjab Environmental Protection Agency an Initial Environmental Examination / Environmental Impact Assessment or where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment, and has obtained from the Punjab Environmental Protection Agency approval in respect thereof".



evaluation mechanism with adequate resources including implementing agencies capacity building.

1.4 NATURE, SIZE, MAGNITUDE AND LOCATION OF THE PROJECT

The Proposed Project involves the construction of Rawalpindi Ring Road (38.3 km) Project having six (06) lane dual carriageway to reduce the traffic congestion issues in the project area.

The proposed Project starts near Baanth Bridge on G.T road (N-5), 10 km towards Lahore from Rawat city. It crosses Rawat Chakbeli road between village Maira Mohra and village Jhatta Hattial, Adiyala road near village Bhattian Nur Din, Chakri Road and finally terminates at Thalial Interchange on Motorway M-2. Main Mouzas through which proposed Project passes include Baanth (Start Point on N-5), Jalhari Bahi Khan, Chamba Papai, Kalam Awan, Hardeo Jagi, Mohra Mehar Bakhsh, Qutab Ferozwala, Bhagwal Dargai in tehsil Gujar Khan and Kalyam Teli, Lohsar, Tamar, Ratyal, Basali, Nothia Bania, Dhakki Kalan, Jhatta Hattial, Maira Mohra, Mandhal, Gai Mir Baaz Main, Khingar Kalan, Bhattian Nur Din, Hoshial, Gai Mir Baaz Kharji, Lilla Kamal Pur, Chappar, Tarahia, Dhapai, Mian Ahmada, Khasala Kalan, Khasala Khurd, Mara Kallan, Kolian Parr, Kohala Muaffi, Pilo, Thallian, Ghareeba in tehsil Rawalpindi (refer Figure 1.1).

1.5 PROJECT PROPONENT

RDA is the project proponent. The details of the relevant section are given below:

**RAWALPINDI DEVELOPMENT AUTHORITY (RDA)
PROJECT MANAGEMENT UNIT (PMU)**

The Government of the Punjab, RDA Headquarters,
Murree Road near Liaqat Bagh, Rawalpindi.
Telephone Number: +92 515555490-92

1.6 CONSULTANT EIA TEAM

The NESPAK's EIA team has been involved in the preparation of this EIA report for the proposed project. The details of consultant are provided as below:

NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LIMITED (NESPAK)

NESPAK House: 1-C, Block-N, Model Town Extension, Lahore, 54700,
(P.O. Box 1351), Pakistan
Telephone Number: 92-42-99090000
Fax Number: 92-42-99231950
Company E-mail Address: info@nespak.com.pk
Company Website: www.nespak.com.pk

Based on the requirements of ToR and objectives of the study, NESPAK formed a team of experts comprising a team leader (Environmental Specialist) with professional support from

the Environmental Engineer, Environmental Scientist, Sociologist and Ecologist. The professional staff was involved in analyzing the data, impact assessment and mitigation measures and report compilation. In addition, the EIA team worked in close coordination with the design team and several inputs were provided by the design specialists to the EIA team. Detail of EIA team is given in Table 1.1 below:

Table 1-1 : Team Composition for the EIA Study

Sr. No.	Name of Expert	Designation
1.	Muhammad Shariq Ahmed	Chief Engineer/Head ERSD
2.	Mr. Faiz Fayyaz	Project Manager
3.	Ms. Uzma Rafiuge	Sr. Engineer / Quality Assurance Expert
4.	Mr. Hafiz Muhammad Abid Saleem	Sr. Environmental Engineer
5.	Mr. Hashim Farooq	Sr. Sociologist
6.	Mr. Ibadullah Khan	Sr. Ecologist
7.	Mr. Muneeb Yousuf	GIS Expert

1.7 APPROACH AND METHODOLOGY

The detailed approach and methodology used for the EIA study is provided below.

1.7.1 Literature Review

The Consultants conducted a desktop study through collection and review of guidelines, data and reports related to the Project, that included (a) review of National Environmental Legislations; (b) Google Earth Satellite Imagery; (c) Relevant District Census Reports (DCR) and any other relevant documents/drawings; and (d) Reference similar project EIA documents.

1.7.2 Review of Environmental Laws and Institutional Requirements

The Project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of the Government of Pakistan and Punjab.

1.7.3 Delineation of Corridor of Impact (Col)

As per the national regulations, impacts and risks have been analyzed within the project Corridor of Impact (Col). The Col of the project encompasses primary project site(s) and related facilities that the Client and Contractor develops or controls, such as proposed road and access roads, borrow pits, disposal areas and construction camps. Environmental impacts and risks will also be analyzed for all relevant stages of the project cycle, including pre-construction, construction and operation phases of the project.

The Col includes the actual Right of Way (RoW) of Project as well as the surrounding areas where positive and adverse impacts may be foreseen due to the implementation of the Proposed Project. RoW of the Proposed Project is 90 m. Col is taken as 15 m beyond RoW on both sides. Figure 1.2 represents the RoW and Col of the proposed road.

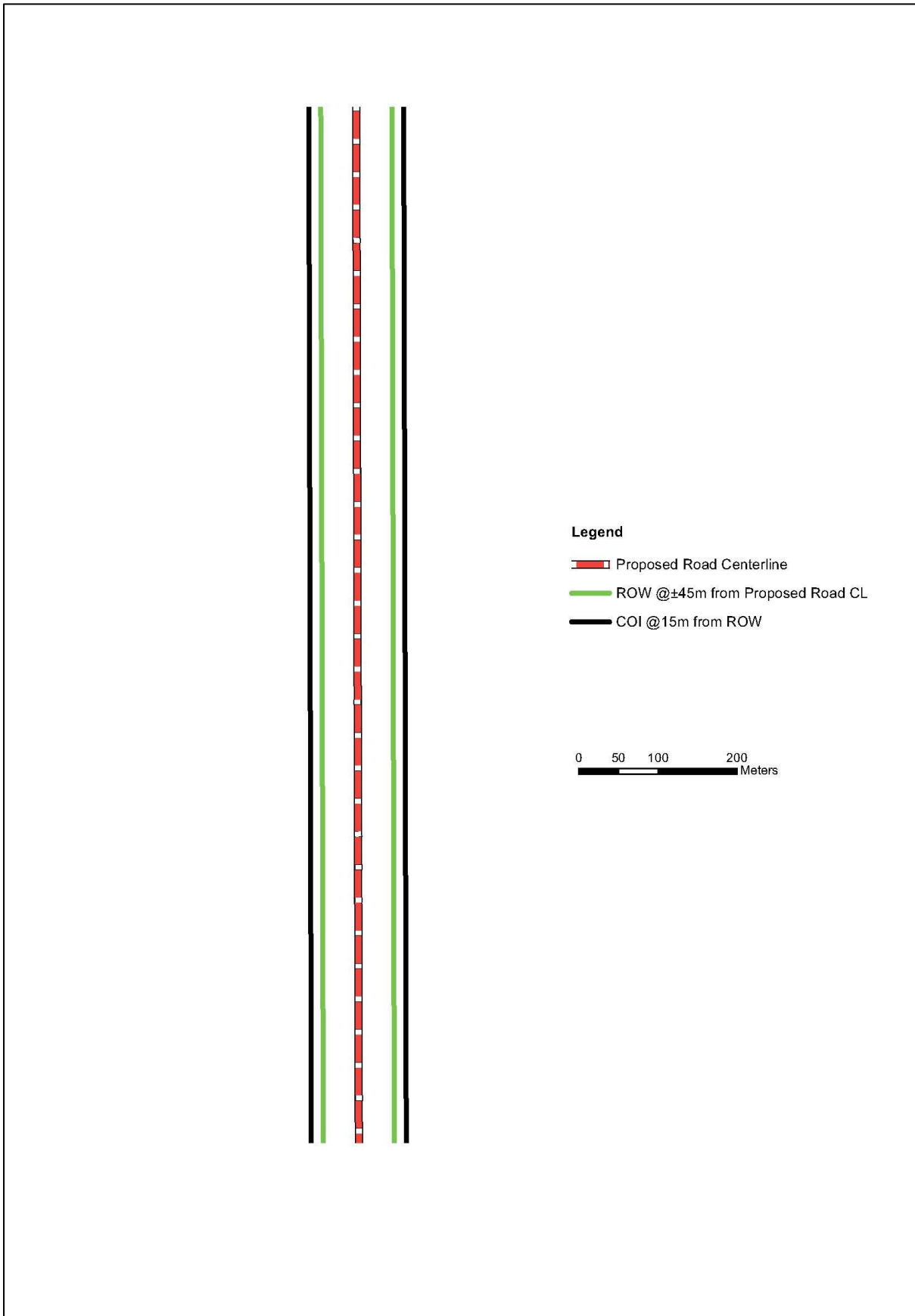


Figure 1-2 : RoW and Col of the Proposed Project



1.7.4 Survey of Col

A team of environmental and social experts, including environmental engineer, ecologist and sociologist carried out the environmental and social survey of the Col to familiarize themselves with the local conditions and the environmental settings. During the survey, the information regarding the topography, soils, surface water, groundwater, flora and fauna, forested areas, social settings and villages/towns along the Col was observed.

1.7.5 Analysis of Alternatives

It is a mandatory requirement for EIA study to analyze each potential alternative available that could have been developed to meet the objectives and recommend the most environmentally and economically feasible option.

The analysis of different alternatives was carried out for the selection of the most feasible options of the study keeping in view the environmental, economic and social constraints. Moreover, the No Project Option (NPO) was also considered with reference to the increased traffic volume and time delay due to existing infrastructure. This exercise confirmed the justification for the need of the proposed Project.

1.7.6 Environmental Baseline Survey of the Project

After the selection of the most feasible route for the proposed project based on satellite images and the delineation of Col, detailed environmental survey was carried out within the Col. Detailed investigations/surveys were carried out for environmental parameters on which any adverse or positive impacts were envisaged by the implementation of the proposed project. The data presented in the forthcoming sections has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted the field visit during the months of November, 2021. Prior to the start of field activities, comprehensive checklists, proformas and maps were developed covering the following main parameters:

a) Physical Environment

The information acquired for the establishment of physical environment baseline included the following main parameters:

1. Land resources (including landuse pattern, soil composition, contamination of soil and soil erosion etc.);
2. Water resources (including available surface and groundwater resources and natural streams, hydrology, water supply, water contamination etc.);
3. Climate data (including temperature, rainfall, humidity, wind speed and direction etc.);
4. Ambient air quality and noise level monitoring data;
5. Existing solid waste management and effluents disposal practices and storm water drainage;



6. Buildings and infrastructure details, including residential, commercial and animal shed for complete/partial relocation;
7. Religious, cultural and heritage information (mosques, shrines, graveyards);
8. Archaeological monuments; and
9. Other private/public infrastructures such as roads, telephone poles, transmission lines, irrigation channels, hand pumps, tube wells etc.

b) Ecological Environment

- Flora (trees, herbs, shrubs, grasses and overall vegetation including valuable or rare trees and their loss due to implementation of the Project etc.);
- Fauna/ Wildlife (Mammals, reptiles, amphibians and avifauna.);
- Agriculture and livestock;
- Reserved forests, Guzara forests, Community forests/ Private forests and wildlife sensitive or notified areas in Col/RoW, if any;
- Migratory birds' corridors; and
- Endangered species (both flora and fauna, if any).

c) Socio-Economic Environment

This section presents the information on socio-economic and cultural environment of the study area that falls in district i.e. Rawalpindi. Socio-economic information has been gathered through secondary data and telephonic consultations with stakeholders and consulting various documents such as District Census Reports (DCRs) and other secondary data available from the concerned districts from the web.

This section deals with the existing social conditions of the proposed project area. During the desk/ office study, available reports / documents were comprehensively reviewed. To achieve the project objectives, it is imperative to study the prevailing socio-economic and socio cultural aspects of their livelihoods.

1.7.7 Stakeholder Consultations

The Consultants identified project stakeholders and held meetings with them during the surveys to receive feedback on the expected environmental issues related to the project impacts and suggested mitigation measures. Meetings were carried out with the project affectees, relevant departments including Forest, Wildlife, Agriculture, Environment, Fisheries, Irrigation etc. to discuss the issues/constraints and get their views and feedback to mitigate the potential environmental impacts associated with the implementation and operation of the project. Consultations/group discussions were carried out with the locals residing along the Col.

The proceedings of the consultations/meetings along with the photographs and list of participants are documented in Chapter 6.



1.7.8 Impact Assessment and Mitigation Measures

A logical and systematic approach was adopted for impact identification and assessment. The process began during the screening and continued through scoping which identified the key issues and classified them into different categories. The tools, which were used for impact assessment, are:

- Checklists (Physical & Ecological);
- Matrices; and
- Overlays.

Identification of potential environmental and social impacts in terms of their nature, magnitude, extent, location, timing and duration were carried out. The impacts were correlated to the Project location, design stage, construction as well as operation stage. Based on the impacts prediction methods and as a result of public/stakeholder consultations, NESPAK screened the adverse environmental impacts for inclusion in the mitigation measures and Environmental Management Plan. The same process was followed for the identification of social impacts. Public consultations (which provided feedback of the impacts from the stakeholder's viewpoint) were used to screen out the insignificant impacts. Matrices and overlays were used for the evaluation of temporal and spatial impacts respectively.

1.7.9 Environmental Management Plan (EMP)

An EMP has been prepared to ensure the adequacy and effectiveness of the proposed protocol by clearly identifying the roles and responsibilities of the agencies responsible for implementation, monitoring and auditing of EMP activities, existing and suggested framework, necessary approvals, training needs and the required further studies. The EMP also includes organizational setup, a monitoring mechanism, monitoring plan, environmental and social parameters to be monitored with their frequency. Similarly, costs for environmental monitoring, ecological and social component/social mitigation measures were also included as part of the EMP. Environmental monitoring, evaluation, auditing and reporting mechanism were also proposed in the EMP.

1.7.10 Conclusions and Recommendations

Based on the baseline conditions, identified impacts and suggested mitigation measures and proposed environmental cost, conclusions have been developed along with recommendations regarding the future plan of action and outcome of the EIA report.

1.8 ORGANIZATION OF REPORT

This report contains ten chapters. The contents of chapters are described as under:

- **Chapter 1**– “Introduction” describes introduction, location of project, objective and purpose of the EIA report;
- **Chapter 2** – “Environment Legislative Requirements and Framework” elucidates the current legal framework including national and funding agency's guidelines which is



applicable to the proposed project in the context of environment and sustainable development;

- **Chapter 3** – “Project Description” furnishes an overall description of the project, including its background, features and key components, timeframe and cost, Alternatives;
- **Chapter 4** – “Description of the Environment” comprises a detailed narrative of the existing (baseline) conditions of the project area, with respect to its physical, biological and socio-economic environment;
- **Chapter 5** – “Stakeholder Consultations, Consultation and Participation” provides summary of consultative sessions with the local community as well as with other stakeholders including local politicians, local government officials, policy makers and NGOs for their opinions and suggestions on the project;
- **Chapter 6** – “Anticipated Environmental Impacts & Mitigation Measures” elaborates the likely impacts of the project on the physical, biological and socio-economic environment during the construction and operation stages and lays down the proposed measures to mitigate the adverse impacts of the project;
- **Chapter 7** – “Environmental Management Plan” provides the mechanism to be adopted for the implementation of measures and monitoring the environment during all stages; and
- **Chapter 8** – “Conclusion and Recommendations” gives the conclusion of the impact assessment study and recommendations for the construction and operational stages.

2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORKS

2.1 GENERAL

This chapter provides an overview of the policy framework and legislation that applies to control the environmental consequences as a result of project implementation and operation. The project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of Government of Pakistan and the provincial government.

The summary of major relevant strategies, policies, acts and legislation from environmental perspective are briefly described in Tables 2.1 & 2.2 below:

Table 2-1: Main Strategies/Policies Related to Environment and Relevance to the Project

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
1.	National Conservation Strategy, 1992	Pakistan National Conservation Strategy (NCS), which was approved by the federal cabinet in March 1992, is the principal policy document on environmental issues in the Country. The NCS outlines the Country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment.	The core areas that are relevant in the context of the proposed project are pollution prevention during construction and conserving biodiversity and forestry.
2.	National Environmental Policy, 2005	In March 2005, Government of Pakistan (GoP) launched its National Environmental Policy, which provides a framework for addressing the 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 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.	Clause (b) of sub-section 5.1 states that Environmental Protection Act, 1997, will be diligently enforced for all developmental projects.

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
3.	National Forest Policy, 2001	The goal of this policy is to foster the sustainable development of Renewable Natural Resources (RNR) in Pakistan, through maintenance and rehabilitation of these essential resources and enhancement of sustainable livelihoods of rural masses, particularly women, children and other deserving groups. The various components of the policy include: • Reducing poverty, powerlessness and unemployment; • Population planning in critical ecosystems; • Reducing the impact of socio-economic factors; • Providing substitutes to firewood in the mountain-woods; • Reducing political interferences in Forestry and Wildlife Departments; • Renovating and invigorating the institutions of RNR; • Supporting Local Governments in the sustainable development of their RNR; • Policies for fragile ecosystems; • Riverside forests; • Irrigated plantations; • Preservation of sensitive and unique forests; • Wildlife conservation; • Rangelands and desert ecosystems; and • Planting trees and fodder on farmlands.	The proposed project does not pass through a Reserve Forest or other notified areas. However, other relevant components like wildlife conservation, planting trees will be applicable. The Proposed Project involves the tree cutting along the route so the relevant clauses of preservation of the policy will be applicable.
4.	Pakistan Labour Policy, 2010	The main objective of the Labour Policy, 2010 is the social and economic well-being of the labour of Pakistan. The Labour Policy, 2010 has following 4 parts: • Legal Framework; • Advocacy: rights of workers and employers; • Skill development and employment; and • Manpower export.	The labour will be employed for construction of the proposed project. The provision of policy will apply to all the labour employed.
5.	National Climate Change Policy, 2012	The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. In	This policy document is a 'living' document and will be reviewed and updated regularly to address emerging concepts

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
		view of Pakistan's high vulnerability to the adverse impacts of climate change, in particular extreme events, adaptation effort is the focus of this policy document. The vulnerabilities of various sectors to climate change have been highlighted and appropriate adaptation measures spelled out. The policy cover measures to address issues in various sectors such as water, agriculture, forestry, coastal areas, biodiversity and other vulnerable ecosystems. Notwithstanding the fact that Pakistan's contribution to global Greenhouse Gas (GHG) emissions is very small, its role as a responsible member of the global community in combating climate change has been highlighted by giving due importance to mitigation efforts in sectors such as energy, forestry, agriculture and livestock. Furthermore, appropriate measures relating to disaster preparedness, capacity building, institutional strengthening; technology transfer; introduction of the climate change issue in higher education curricula; ensuring environmental compliance through Initial Environmental Examinations (IEE) and Environmental Impact Assessments (EIA) in the development process; addressing the issue of deforestation and illegal trade in timber; promoting Clean Development Mechanisms (CDM); and raising Pakistan's stance regarding climate change at various international forums, have also been incorporated as important components of the policy. The policy thus provides a comprehensive framework for the development of Action Plans for national efforts on adaptation and mitigation.	and issues in the ever-evolving science of climate change. This policy will accelerate due to the emissions from the construction machinery.
6.	National Water Policy 2018	This first ever water policy was unanimously approved in April 2018 by Council of Common Interest (CCI). The Policy aims at efficient management and	This policy will be applicable as the proposed Project alignment traverses through one (01) Irrigation Channel i.e. Khasala

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
		conservation of existing water resources, optimal development of potential water resources, steps to minimize time and cost overruns in completion of water sector projects, equitable water distribution in various areas and canal commands, measures to reverse rapidly declining groundwater levels in low-recharge areas, increased groundwater exploitation in high-recharge areas, effective drainage interventions to maximize crop production, improved flood control and protective measures, steps to ensure acceptable and safe quality of water, minimization of salt build-up and other environmental hazards in irrigated areas, institutional reforms to make the managing organizations more dynamic and responsive. The policy covered all water related issues, including water uses, allocation of priorities, integrated planning for development, use of water resources, environmental integrity of the basin, impact of climate change, trans boundary water sharing, irrigated and rain fed agriculture, drinking water and sanitation, hydropower and industry, groundwater, water rights & sustainable water infrastructure, water related hazards, quality management, awareness, conservation, legal and capacity building of infrastructure.	Khurd, Rivers (Soan and Sill) and Nullahs through which water is being utilized for local level irrigation and livestock purposes.
	National Drinking Water Policy, 2009	The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. Drinking water is the constitutional responsibility of the provincial governments and the specific provision function has been devolved to specially created agencies in cities and Town and Tehsil Municipal Administrations under the Local Government Ordinance 2001.	This policy is applicable for the proposed project during construction phase in terms of regular water quality monitoring.
7.	National Sustainable	The National Sustainable Development Strategy is an attempt to define	This strategy is applicable as the project involves the

Sr. No.	Policy/Strategy	Brief Coverage	Relevance to Project
	Development Strategy, 2012	sustainable development and the pathway to a “green economy” in Pakistan’s context. It lays out an adaptive system and approach that can be continuously improved, through regular updates, to respond to evolving challenges. The focus has been on integrating not only across the three overall dimensions of economic, social and environment but also integrating the goals with the existing development paradigm with the aim of shifting it on to a more sustainable pathway.	construction of roads and bridges to improve the traffic situation with least environmental burden and sustainable operation of transportation in the city.
9.	National Action Plan for COVID-19 Pakistan	Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf . The Government of Pakistan has launched the real-time data portal for COVID-19 http://covid.gov.pk/ . These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf .	This Action Plan for COVID-19 is applicable to the proposed project as it is being launched during this pandemic.

Table 2-2: Main Legislation/Acts Related to Environment and Their Relevance to the Project

Sr. No.	Act	Brief Coverage	Relevance to Project
1.	Punjab Environmental Protection 1997 (Amended) Act, 2017	The Punjab Environmental Protection Act, 1997 (Amended, 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The ‘environment’ has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the	The provision of the act is applicable to proposed Project for conducting an IEE/EIA according to section 12 and to obtain environmental approval from the EPA. The section 11 of the act is applicable in term of compliance with Punjab Environmental Quality Standards (PEQS). Similarly,

Sr. No.	Act	Brief Coverage	Relevance to Project
		interrelationships between any of the factors specified in sub-clauses 'a' to 'f'. The notable points of the law are: - No proponent of a project shall commence construction or operation unless he has filed an EIA / IEE with the Provincial Agency designated by the Provincial EPAs an EIA / IEE, and has obtained an approval; - Establishment and formation of the Punjab Environmental Protection Council (PEPC); - Prohibition of certain discharges or emissions; - Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and - Provincial Government can issue notices and enforce them to protect the environment. In the amendment of 2012, legislatures powers related to environment and ecology are given to provincial governments from the Federal government. The provinces are required to enact their own legislation for environmental protection. Other amendments include increasing the penalties for violations. For the proposed Project, Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.	section 13 of the act prohibits the import of hazardous waste. The provisions of section 16 are also applicable to comply with the discharge or emission of any effluent, waste, air pollutant or noise or disposal of waste or handling of hazardous substance. Under section 17, penalties will apply if anyone fails to comply with the provisions of section 11, 12, 13 and 16.
2.	Pakistan Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2000	These regulations set out: - Key policy and procedural requirements for filing an EIA / IEE; - The purpose of environmental assessment; - The goals of sustainable development;	The proposed project falls under the Category 'D' of "Transport" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval.

Sr. No.	Act	Brief Coverage	Relevance to Project
		- The requirement that environmental assessment be integrated with feasibility studies; - The jurisdiction of the Federal and Provincial EPA's and Planning & Development (P&D) Departments; - The responsibilities of proponents; - Duties of responsible authorities; - Provides schedules of proposals that the project requires either IEE or an EIA; - The environmental screening process of the projects under schedule I, II and III; and - The procedure for the environmental approval for filing the case with the concerned EPA for the granting of the NOC.	
3.	Punjab Environmental Quality Standards (PEQS), 2016	PEQS promulgated recently in 2016. Specified standards under PEQS are for: - Drinking Water; - Ambient Air; - Noise; - Industrial Gaseous Emissions; - Municipal and Liquid Industrial Effluents; - Motor vehicle exhaust and noise; and - Treatment of Liquid and Bio-Medical Waste.	All projects to be implemented in Punjab must conform to PEQS during all the phases i.e. construction and operation.
4.	Guidelines for the Preparation and Review of Environmental Reports, 1997	These guidelines describe the format and content of IEE/EIA reports to be submitted to PEPA for obtaining NOC/approval. The guidelines present: - The environmental assessment report format; - Assessing impacts; - Mitigation and impact management and preparing an environmental management plan; - Reporting; - Review and decision making; - Monitoring and auditing; and - Project Management.	The guidelines are applicable for the preparation of the EIA.
5.	Guidelines for Environmental Assessment	Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different	The guidelines are applicable for the preparation of the EIA.

Sr. No.	Act	Brief Coverage	Relevance to Project
		types of development Projects. The guidelines that are relevant to the proposed Project are listed below. - Guidelines for the Preparation and Review of Environmental Reports, Pakistan Environmental Protection Agency, 1997; - Guidelines for Public Consultation, Pakistan Environmental Protection Agency, May, 1997; and - Sectoral Guidelines: Pakistan Environmental Assessment Procedures, Pakistan Environmental Protection Agency, October 1997.	
6.	Punjab Wildlife Act, 1974	The Punjab Wildlife Act (1974) is developed for the regulation of activities relating to protection, conservation and management of wildlife in Punjab.	The proposed project involves the cutting of trees which may result in loss of habitat, therefore, the provisions of this law are applicable.
7.	Punjab Plantation and Maintenance of Trees Act, 1974	The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection.	The requirements of this act are applicable in terms of planting new trees and their maintenance by the occupier of the existing land who would have the physical possession.
8.	Explosives Act, 1884	It provides regulations for handling, transportation and use of explosives.	The proposed project will not involve the blasting activity, therefore, this act will not be applicable.
9.	Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act 2012	The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: “Ancient” is any object that is at least 75 years old; - All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology; - The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; - All new construction within a distance of 200 feet from protected antiquities is forbidden; - No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and	The law will be applicable to the project mainly due to its two provisions: According to the law, any construction activity within 61 m or 200 ft. of protected antiquities, are prohibited. The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed Project.

Sr. No.	Act	Brief Coverage	Relevance to Project
		The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	
10.	The Punjab Special Premises (Preservation), Ordinance, 1985	The Punjab Special Premises (Preservation), Ordinance (1985) provides the legal framework for preservation of premises of historical, cultural, archaeological, and architectural value in the Punjab province. This legislation empowers the provincial government to notify heritage sites and sites of cultural and archaeological importance and to prohibit implementation of developmental schemes or new constructions within the notified areas around the special premises. So far 246 sites stand notified under the Punjab Ordinance.	The provision of the ordinance is applicable for protection and conservation of special premises declared by department of Youth Affairs, Sports, Archeology & Tourism, Punjab. The ordinance is applicable in terms of land acquisition, entrance, exploitation and destruction of special premises near site.
11.	Pakistan Penal Code, 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
12.	The Protection against Harassment of Women at the Workplace Act, 2010	The Protection Against Harassment of Women at the Workplace Act (2010) refers to sexual harassment at the workplace.	This Act will be applicable to the project if women are employed for the construction of the proposed Project.
13.	Labour Laws as part of Constitution of Pakistan 1973,	The Constitution of Pakistan contains a range of provisions with regards to labour rights, in particular: - Article 11 of the Constitution prohibits all forms of slavery, forced labour and child labour; - Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions; - Article 25 lays down the right to equality before the law and	The labour laws will be relevant as it would deal with employment of labour for the construction of propose project. Following are the major labour laws which are applicable to the project: - Bonded Labour System (Abolition) Act, 1992 - Employment of Child Act, 1991 - Minimum Wages Ordinance, 1961

Sr. No.	Act	Brief Coverage	Relevance to Project
		prohibition of discrimination on the grounds of sex alone; and - Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment. Labour law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labour laws. The labour laws are a comprehensive set of laws in Pakistan dealing with the following aspects: - Contract of Employment; - Termination of Contract; - Working Time and Rest Time; - Working hours; - Paid Leave; - Maternity Leave and Maternity Protection; - Other Leave Entitlements; - Minimum Age and Protection of Young Workers; - Equality - Pay Issues; - Workers' Representation in the Enterprise; - Trade Union and Employers Association Regulation; and - Other Laws.	- Industrial Relations Act, 2010 - West Pakistan Minimum Wages for Unskilled Workers' Ordinance, 1969
14.	Punjab Protection of Women Against Violence Act, 2016	This act counters gender-based discrimination, violence against women, and economic and social empowerment of women.	This act will be entail if gender based violence observed in the Project Area during construction phase.
15.	Employment of Children Act, 1991	Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any construction, or any other hazardous employment. In accordance with this Article, the Employment of Child Act 1991 prohibits child labour (a child is under 14 years old).	The relevance of this act to the project will be to prohibit child employment for construction of the proposed project.
16.	Labour Laws as part of Constitution of Pakistan 1973,	The Constitution of Pakistan contains a range of provisions with regards to labour rights, in particular:	The labour laws will be relevant as it would deal with employment of labour for the

Sr. No.	Act	Brief Coverage	Relevance to Project
		- Article 11 of the Constitution prohibits all forms of slavery, forced labour and child labour; - Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions; - Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and - Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment. Labour law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labour laws. The labour laws are a comprehensive set of laws in Pakistan dealing with the following aspects: - Contract of Employment; - Termination of Contract; - Working Time and Rest Time; - Working hours; - Paid Leave; - Maternity Leave and Maternity Protection; - Other Leave Entitlements; - Minimum Age and Protection of Young Workers; - Equality - Pay Issues; - Workers' Representation in the Enterprise; - Trade Union and Employers Association Regulation; and - Other Laws.	construction of proposed project. Following are the major labour laws which are applicable to the project: - Bonded Labour System (Abolition) Act, 1992 - Employment of Child Act, 1991 - Minimum Wages Ordinance, 1961 - Industrial Relations Act, 2010
17.	Punjab Forest Act (Amended), 2010	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in	Therefore, this Act will not be triggered as there is no protected forest situated in the Project area.

Sr. No.	Act	Brief Coverage	Relevance to Project
		reserved and protected forests. There is no protected forest situated in and around the Project area.	
18.	Pakistan Climate Change Act, 2017	This Act aims to meet obligations under international conventions relating to climate change and to provide for adoption of comprehensive adaptation and mitigation policies, plans, programmes, projects and other measures required to address the effects of climate change and for matters connected herewith and ancillary thereto.	This Act will accelerate due to the emissions from the construction machinery.
19.	National Clean Air Act, 2000	The Act aims to control vehicular emissions, pollution from industry, and indoor air pollution in rural and urban areas.	This Act will trigger if vehicles and machinery used for construction activities emanate air pollutants above the permissible limit.
20.	Seismic Building Code of Pakistan 2007	This code stipulates the minimum requirements for seismic safety of building and structures and the provisions of the Building Code of Pakistan (Seismic Provisions-2007) shall apply for engineering design of buildings, like structures and related components. Construction of buildings shall be considered as violation of professional engineering work specified under clause (XXV) of section 2 of the Act.	This Code is applicable to the proposed project as it includes the formation of structures.
21.	The Parks and Horticulture Authority Act, 2012	This act entails regulation, development, and maintenance of public parks, green belts and green areas in the Punjab; regulation of billboards, sky signs and outdoor advertisements; to promote open and unrestricted views of the Punjab.	This act will be triggered if green belts along the proposed project route are affected during construction phase.
22.	Land Acquisition Act (LLA), 1894 Including Later Amendments	The Land Acquisition Act, 1894, is a “law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition”. The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate	This Act will be applicable as proposed Project will involve the permanent acquisition of land in the Project area.

Sr. No.	Act	Brief Coverage	Relevance to Project
		those who have been deprived of property, adequately. The land needed for the construction of development projects will be acquired under normal conditions based on prevailing market prices or negotiated prices between client and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.	
23.	Punjab Municipal Water Act, 2014	The basic aim of the Act is to recognize, regulate and manage present and future municipal water supply and sanitation services and to establish rights of access to basic water supply and basic sanitation, and to ensure conservation of water resources in the Province. This Act is in draft stage.	This Act will elicit if there is misappropriation of water supply during construction activities.
24.	Fisheries Act, 1897	This Act aims at the protection of fish in water bodies by rules of State Government.	This Act will be applicable due to presence of species of fish in water bodies (Soan and Sill Rivers) of the proposed Project area.
25.	The Punjab Polythene Bag Rules, 2004	This rule prohibits the manufacturing, sale, use and import of polythene bags that is below 15-micron thickness.	This rule will be applicable if polythene bags with more than 15-micron thickness used during construction activities.
26.	Punjab Environmental Protection (Motor Vehicles) Rules, 2013	Subject to the provisions of this act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants and noise are being emitted in an amount, concentration or level which is in excess of the Punjab Environmental Quality Standards, or where applicable the standards established under clause (g) of subsection (1) of section 6 of the act.	This act will be elicited during construction and operational phase due to use of motor vehicles that produces air pollutants and noise.
27.	ISO 18001 Occupation Health and Safety Assessment Series (OHSAS)	OHSAS 18001 is an Occupation Health and Safety Assessment Series for health and safety management systems to help organizations to control occupational health and safety risks. The OHSAS specifications are applicable to any	This series will be eliciting during construction and operational phase to ensure health and safety of workers associated with the project activities.

Sr. No.	Act	Brief Coverage	Relevance to Project
		institute that desires to establish an OH&S management system to eradicate or reduce risk to employees and other interested parties who may be exposed to the risks allied with the project activities. The construction of the proposed project may involve various health and safety issues to construction labour, therefore these ISO 18001 guidelines will be applicable and pertinent.	
28.	The Punjab Occupational Safety and Health Act, 2019	This Act entails provision of occupational safety and health of the workers at workplace and to protect them against risks arising out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.	The Act will trigger during construction and operational phase to ensure health and safety of workers at workplace associated with the project activities.
29.	Punjab Restriction on Employment of Children Act, 2016	According to the sub-section 11(a) of this Act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees.	This Act will trigger if Contractor hire skilled and unskilled labour under age 15.
30.	Electricity Act, 1910	The Act provides a legal basis for distribution of Power. It enables a licensee to conduct operations for supply of electricity and binds the license to payment of compensation in respect of any damages caused during the construction, Operation and Maintenance (O&M) of Power distribution facilities.	This act will be applicable if any damages occur during construction of the power facilities.
31.	Cutting of Trees (Prohibition) Act, 1975	The Act was enforced in 1975 to place restrictions on cutting of trees in order to restrain unchecked trend of tree felling without replacement plantations.	This act will be applicable to the subject project where the cutting of tree will be involved.
32.	The Punjab Irrigation and Drainage Authority Act, 1997,	It empowers the Punjab Irrigation and Drainage Authority to implement the strategy of the Government of Punjab for streamlining the Irrigation and Drainage System in the province, to achieve economical and effective operation and	This act will be applicable as the proposed alignment traverses through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs through which

Sr. No.	Act	Brief Coverage	Relevance to Project
		maintenance of the irrigation, drainage and flood control system; to make the irrigation and drainage network sustainable on a long-term basis and introduce participation of beneficiaries in the operation and management. It also enforces to undertake anti-erosion operations including conservation of forests and reforestation, to restrict or prohibit the clearing or breaking up of land in the catchment areas of any rivers, hill torrents and other streams and to conduct studies with a view to regularly analyze and evaluate the impact of the operations and policies of the Authority on the ecology and environment within the Province with a view to establish the various available options for the minimization of the adverse impact of such operations and policies, if any, and to adopt the optimal options for further action.	water is being utilized at local level.
33.	The Canal and Drainage Act 1873	The Canal and Drainage Act 1873 (CDA) focuses on construction and maintenance of drainage channels and defines powers to prohibit obstruction or order their removal. It also covers issues related to canal navigation. It briefly addresses issues relating to environmental pollution. Section 70(5) of the CDA clearly states that no one is allowed to “corrupt or foul the water of any canal so as to render it less fit for the purposes for which it is ordinarily used.” In addition, Section 73 of the CDA gives power to arrest without warrant or to be taken before the magistrate a person who has wilfully damaged or obstructed the canal or “rendered it less useful.”	This act will be applicable as the proposed alignment traverses through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs through which water is being utilized at local level.
34.	The Punjab Emergency Service Act, 2006	It deals with the establishment of emergency service for a purpose of maintaining a state of preparedness to deal with emergencies, to provide timely response, rescue and emergency medical treatment to the affected persons and recommending measures to be taken by related organizations to avoid any emergency situation. It	This act is applicable to the proposed project to provide timely response, rescue and emergency medical treatment to the affected persons during construction and operation phase of project.

Sr. No.	Act	Brief Coverage	Relevance to Project
		describes procedures to establish emergency service, emergency board, emergency fund, emergency ambulance and rescue vehicles, offence and punishment, etc.	
35.	National Disaster Management Act, 2010	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.	This act is applicable to the proposed project. The proposed project will require special consideration to disasters and risk management strategies as per the Act.
36.	Hazardous Substance Rule, 2003	The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. Inter alia, general safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are described in these rules. Requirements for project waste management plans are also defined. These include a requirement for updating the plan every three years, the need to provide for management of hazardous waste in a manner that will prevent adverse environmental impacts and to ensure that hazardous and non-hazardous waste are not mixed.	This rule is applicable to the proposed project due to involvement of hazardous waste handling, use and disposal during the construction stage.
37.	Building Code of Pakistan, 2007	The provision of Building Code of Pakistan shall apply for engineering design of building like structure and related components. The construction in violation of the Building code shall be deemed as violation of professional engineering work. Moreover, a certificate for the proposed action will be obtained from Provincial Building Control Authority.	These codes shall be used in structural design of building area components constructed under this proposed project.
38.	The Punjab Highway Authority Act, 1989	To meet growing needs of traffic, a unified system of motorways, super highways and highways in the province needs to be established. This act deals with the establishment of an authority for construction, development, improvement and maintenance of highways and other projects. It defines the procedures about	This act will be applicable as the proposed Project involves the construction of six (06) carriageway having length of 38.3 km.

Sr. No.	Act	Brief Coverage	Relevance to Project
		constitution of authority, its powers, members, responsibilities, etc.	

2.2 GUIDELINES FOR CRITICAL AND SENSITIVE AREAS, 1997

Protected areas are of crucial and growing importance. Properly managed protected areas are based on the establishment of a system, which aims to:

- Safeguard the earth's precious biodiversity;
- Protect outstanding areas of natural beauty; and
- Conserve areas of cultural significance.

In Pakistan, there exists a system of protected areas for the protection of endangered species, habitats, ecosystems, archaeological sites, monuments, buildings and other cultural heritage. The threats to protected areas in Pakistan are commercial-industrial pressures including mining, logging, overgrazing, cutting wood for fuel, development Projects and mismanaged tourism. Protected areas in Pakistan can be broadly categorized into two groups; i.e.

- Ecosystems; and
- Archaeological and cultural sites.

There is no central or federal level legislation for wildlife conservation in Pakistan. However, each province has its own laws covering protected areas. There are separate wildlife departments in the provinces that administer protected areas.

It should be noted that the above legislation consists of complicated, lengthy and legal documentation. Logically, only the relevant conservation authorities are in a position to provide the proponent or consultant with the most appropriate technical, scientific, administrative and regulatory assistance relating to the different legislations.

The GoP in the past years has taken some concrete steps to preserve, conserve and manage our national heritage, fauna and vegetation through the establishment of protected areas. This is being done through legislation, scientific research and education. In all the four (04) provinces, there are statutes that provide for creation and management of national parks, wildlife sanctuaries and game reserves.

The official classification of notified protected ecosystems in Pakistan consists of wildlife sanctuaries, national parks and game reserves. However, there is no Critical and Sensitive Areas along the proposed project.

2.2.1 Protected Areas Clearance Procedure

Protected areas help maintain the integrity and diversity of eco-systems, protect flora and fauna and facilitate ecological processes such as water flows, soil regeneration, nutrient cycling and so on, which is vital for all life.

The Guidelines for Sensitive and Critical Areas have described the procedure for the clearance of the Forestry and Wildlife departments in case of the Project lies into the protected areas.

The Secretary Forestry and Wildlife department at the provincial level will be involved in the comment and recommendation for EIA that are related to ecosystems. The Proponent or consultant for a proposed development in a protected area will be required to contact the Secretary Forestry and Wildlife departments in Punjab, Sindh, KPK, Baluchistan, Azad Jammu and Kashmir (AJK), or Northern Areas.

At the federal level, the office of the Inspector General Forestry (IGF) will be the central and national coordinator for the Provincial Wildlife department in the EIA report review. The IGF office has on-going responsibilities for policy formulation, implementation, embedding process, monitoring, technical assistance and Research and Development (R&D) assistance if required. Finally, the IGF will need to be involved to assist in any dispute between the provincial Wildlife departments and the Proponent/consultant which they cannot resolve themselves.

The EIA report should not be finalized and submitted to the responsible authority (i.e. provincial EPA's) until there is consultation with the provincial Wildlife departments and their comments and recommendations are taken into consideration as part of the mitigation and control measures.

These guidelines are expected to be included by the Federal IGF Office in the refinement of their current Forestry Master Plan for upto year 2017. The involvement of the provincial Wildlife departments and Federal IGF in the EIA report review will become a critical part of the process for Project review and approval, for development in or vicinity of protected ecosystems.

While the provincial Wildlife Conservation Departments and the Federal IGF will provide this technical and specialized expertise in the review process, the review of the environmental reports and the provision of any Environmental approval will be undertaken by the responsible authority, as provided for in the Act and elsewhere in the package.

2.3 CHECKLIST OF PROCEDURE FOR ENVIRONMENTAL ASSESSMENT

Prior to any Environmental approval being granted by the responsible authority, the following steps should be undertaken:

- First of all, the proponent should identify whether the site for the proposed development is within the precincts of a protected ecosystem, cultural and archaeological sites. For this, RDA Punjab should refer to the list of notified ecosystem, archaeological and historical sites. This list was last updated in April 1997. If the proposed site is not located in a notified area and there are no apparent ecological or cultural values associated with the site, take no further action;
- If RDA Punjab or NESPAK identifies an ecological site that appears to be of importance, but the site is not listed, they should discuss the site with the relevant conservation authority;

- If the site falls within the boundaries of a protected ecosystem, the relevant conservation authority in each province should be contacted for advice about the extent to which the development may be allowed and with what conditions. Certain protected areas may have total prohibition of development while others may allow controlled development;
- The relevant conservation authority should inform the responsible authority of their assessment of the significance of the likely impacts of the proposed development early in the process in order for the responsible authority to determine the level of documentation required. The Provincial EPA (Punjab EPA) will then be in a position to review the level of reporting required in the light of the advice from the conservation authorities; and
- During the review of the environmental report, the responsible authority will liaise with the Conservation Authority to ensure that the impacts and mitigation measures detailed in the environmental report are well based to frame environmental approval conditions, which protect the values of the listed area.

2.4 COMPLIANCE PROCEDURE FOR OBTAINING NOC FROM PEPA

Review of IEE and EIA Regulations, 2000 provide the necessary details on the preparation, submission, and review of the IEE and the EIA reports. Categorization of projects for IEE and EIA is one of the main components of these regulations. Projects have been classified on the basis of expected degree of adverse environmental impact.

Based on Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the Category 'D' of "Transport" of the Schedule II. This category requires an EIA study to be conducted for obtaining NOC from respective EPA, Punjab.

The regulations stipulate that within ten (10) working days of the IEE or EIA study having been submitted, the concerned provincial agency will confirm that the document submitted is complete for the purpose of review. During this time, should the agency require the proponent to submit additional information, it will return the IEE or EIA to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the concerned Provincial EPA would make every effort to complete an IEE review within forty-five (45) days and an EIA review within ninety (90) days of filing.

The prescribed procedure for review of EIA by the EPAs is described in Review of IEE and EIA Regulations, 2000 and is depicted in Figure 2.1.

Article 12(4) of Punjab EPA 1997 (Amended) Act, 2017 binds the concerned EPA to communicate its approval or otherwise within a period of four months from the date the IEE or EIA study is filed, complete in all respects in accordance with the prescribed procedure, failing which the IEE study or, as the case may be, the EIA study shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations made thereunder.

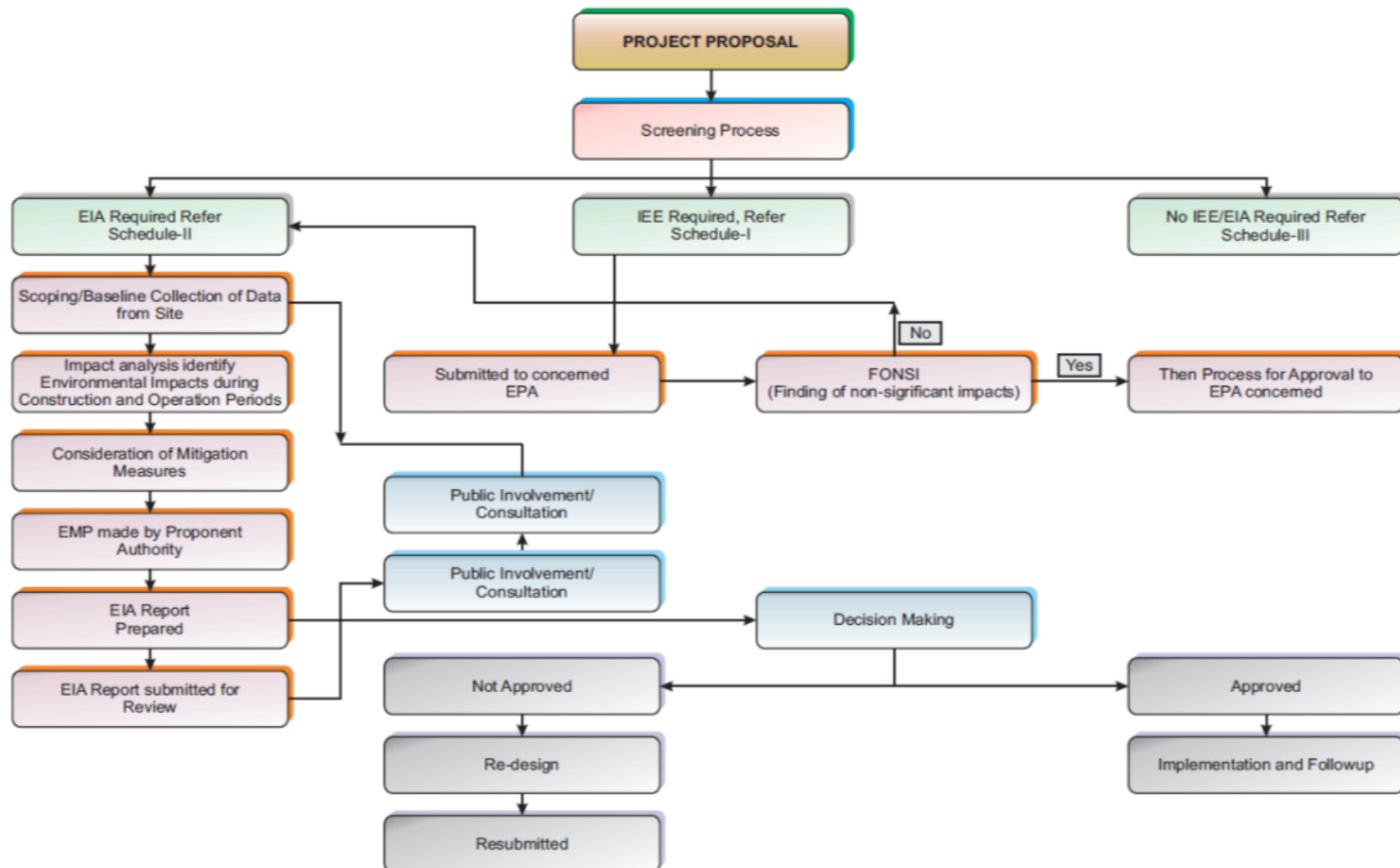


Figure 2-1: Procedure for Submitting the EA Report



2.5 INTERNATIONAL PROTOCOL/CONVENTIONS

As Pakistan is a member of a number of international organizations such as United Nations Organization (UNO), Organization of the Islamic Conference (OIC), South Asian Association for Regional Cooperation (SAARC), Economic Cooperation Organization (ECO) etc., so it has to follow the international protocols and obligations related to the environment. The major protocols, ratification dates by Pakistan and obligations related to the proposed project are provided in the Table 2.3 below.

Table 2-3: International Agreements/Conventions Relevant to the Project

Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
1.	UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972	Pakistan ratified this convention on 23 July 1976.	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection. The proposed project design and EIA team paid due attention to archaeological sites and local norms. Both of these factors will also be considered during project implementation.
2.	Convention on the International Trade of Endangered Species (CITES), 1975	Pakistan signed the Convention in 1973 and ratified it in April 1976.	The convention entered in to force on 1 July 1975. The principal obligations of contracting parties to the CITES are to safeguard the trade in rare or endangered species and it established a permit system to control imports and exports of wild fauna and flora. According to this convention, species threatened with extinction whose movement between countries is prohibited except for conservation purposes such as captive breeding, species whose commercial trade is permitted but export permits are needed.
3.	Convention on Conservation of Migratory Species of Wild Animals, 1979	Pakistan signed this convention in 1981 and ratified it in December 1987.	Convention on the Conservation of Migratory Species deals with the conservation and protection of the migratory species. Species covered in



Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
			the Convention should be given special attention during EIA and monitoring and any impacts identified should be mitigated to acceptable levels. There are no endangered species of plant life or animal life in the vicinity of the Project Area.
4.	The Rio Declaration, 1992	Pakistan signed the treaty on 13 June 1992 and ratified on 1 June 1994	The Rio Declaration comprises 27 principles which address important issues such as; sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level, reduce and eliminate unsustainable patterns of production and consumption.
5.	Kyoto Protocol, 1992	Pakistan has ratified Kyoto Protocol in 2005	The Kyoto Protocol is a protocol to reduce Greenhouse gases that cause climate change. It was agreed on 11th December, 1997 at the 3rd Conference of the countries to the treaty when they met in Kyoto, and entered into force on 16th February, 2005. As of November 2007, 175 countries have ratified the protocol. One hundred and thirty-seven (137) developing countries have ratified the protocol, including Brazil, China, India and Pakistan but have no obligation beyond monitoring and reporting emissions.
6.	Convention on Biological Diversity, 1994	Pakistan signed this treaty in 1992 and it was ratified by cabinet in 1994.	The Convention on the Biological Diversity (CBD) has three main goals: Conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.
7.	Basel Convention, 1994	In 1994, Pakistan signed Basel Convention that restricts trans-boundary movements of "Hazardous Waste and	The proposed Project will not be necessitating the endowment of this convention.



Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
		their Disposal” with aim to protect human health and surrounding environment by minimizing the use of hazardous waste production.	
8.	UN Convention to Combat Desertification (UNCCD), 1994	Pakistan signed the Convention on 15th October 1994 and ratified it on 24 February, 1997	The UNCCD is a Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements.
9.	Stockholm Convention on Persistent Organic Pollutants (POPs), 2004	The Stockholm Convention on Persistent Organic Pollutants was signed on 22 May 2001 and entered in to force on 17 May, 2004. Pakistan signed the convention on December 6, 2001	Convention seeks to protect human health and the environment from POPs as set out in Article 1, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.
10.	Paris Agreement, 2015	The Paris Agreement’s central goal is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below two degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to one and half degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway.	The implementation of the proposed project will reduce the emission of greenhouse gases (GHG) due to the construction of the proposed project.



Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
11.	Sustainable Development Goals (SDGs)	Pakistan has displayed commendable commitment to the 2030 Agenda for Sustainable Development as it was one of the first countries to endorse it globally in 2015. On 16 th February 2016, the Parliament unanimously approved the Sustainable Development Goals (SDGs) as the national development agenda.	The SDGs that will prevail for the proposed project are as follows: • Promote Gender Equality and Empower Women: The contractor during construction phase will be responsible to hire women for construction activities to elude gender discrimination and to promote women empowerment. • Combat HIV/AIDS Malaria and Other Diseases: Contractor will be responsible to conduct medical surveillance of the workers before hiring to combat HIV/AIDS Malaria and other diseases. • Ensure Environmental Sustainability: Contractor will be responsible to ensure environmental sustainability of the proposed Project Areas by ensuring implementation of EMP to mitigate adverse environmental impacts from construction activities during construction phase.

2.6 ADMINISTRATIVE FRAMEWORK

2.6.1 Rawalpindi Development Authority (RDA)

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

2.6.2 Environmental Protection Department, Punjab

For the proposed Project, EPD Punjab will be responsible for reviewing the report, issuing NOC and overall/broad based monitoring of the proposed Project activities.

3 PROJECT DESCRIPTION

The traffic on G.T Road from Lahore to Rawalpindi/Islamabad & Peshawar and vice-versa passes through the heart of Rawalpindi city and this traffic combine with the local slow moving vehicles results in high traffic congestion. The integration of Capital Islamabad & Rawalpindi has further aggravated the traffic congestion.

Development of Rawalpindi Ring Road is inevitable to complete the city network according to Traffic & Transportation Plan of Twin Cities. Government of Punjab through RDA decided to initiate Rawalpindi Ring Road Project. The total length of the proposed Project is 38.3 km.

The details of the proposed Project, project components, design considerations, construction aspects, and operation and maintenance activities are discussed below.

3.1 OBJECTIVES OF THE PROJECT

The proposed Project is designed to provide a sustainable urban transport system in the project area and the roader region with the main focus on accessibility and mobility. The Project is planned keeping in view the urban growth and public space along the alignment through integration of land-use and transport planning. Therefore, organizing the city more pleasant to live in and providing a holistic solution for integrated urban mobility. Specific Project objectives are listed below:

- Improve the environment within the Project area;
- Contribute to the economic uplift and social development due to fast, safe and reliable journey after up-gradation;
- Provide a safe, congestion free and high speed facility to the commuters;
- Reduce journey time and vehicle operating cost;
- Provide a safe and efficient passage to M2 Motorway and M1 Motorway and reduce traffic load on GT Road;
- Alleviate the traffic congestion caused in the twin cities urban transportation system and curtail travel time and costs for the road users;
- Improve safety for both the road users and vehicles and limit vehicle's maintenance costs for the owners; and
- Facilitate speedy travel of goods traffic on the Ring Road by bypassing the twin cities and save time for access to the destinations.

3.2 PROJECT BENEFITS

Following benefits can be expected from the operation of proposed project:

- Reduced travelling time;
- Reduced the fuel consumption and transportation cost caused by traffic congestion;
- Create job opportunities for laborers and semi-skilled staff during construction phase;
- Reduced air emissions from vehicular exhaust especially in case of traffic congestion; and

- Reduced the noise pollution due to decrease in traffic jams.

3.3 PROJECT ADMINISTRATIVE JURISDICTION

The proposed project falls under administrative jurisdiction of the District Rawalpindi, Punjab province.

3.4 PROJECT LOCATION

The proposed RRR starts near Baanth Bridge on G.T road (N-5), 10 km towards Lahore from Rawat city. It crosses Rawat Chakbeli road between village Maira Mohra and village Jhatta Hathial, Adiyala road near village Bhattian Nur Din, Chakri Road and finally terminates at Thallian Interchange on Motorway M-2, refer Figure 1.1 for Project location map.

3.5 COMPONENTS OF THE PROJECT

The major components of project include construction of six (06) lanes dual carriageway and five (05) interchanges along the alignment to provide local access. In addition, Project will have 31 subway, 55 culverts, 13 River and nullah bridges and 5 overpass. The bridges are planned at Soan River and Sill River. The total width of one lane is 3.65m with the design speed of 120 km/hr.

3.6 ACCESSIBILITY OF THE PROJECT AREA

The alignment of proposed project is inter-connected with various existing roads that includes National Highway N-5 (Islamabad-Lahore Road), Rawat-Chakbeli Road, Adiyala Road, Chakri Road and Motorway M-2 (Thalian Interchange).

Near Baanth, National Highway N-5 (Islamabad-Lahore Road), the alignment crosses main railway line at 0+800 km. Project Area Accessibility Map is shown in Figure 3.1.

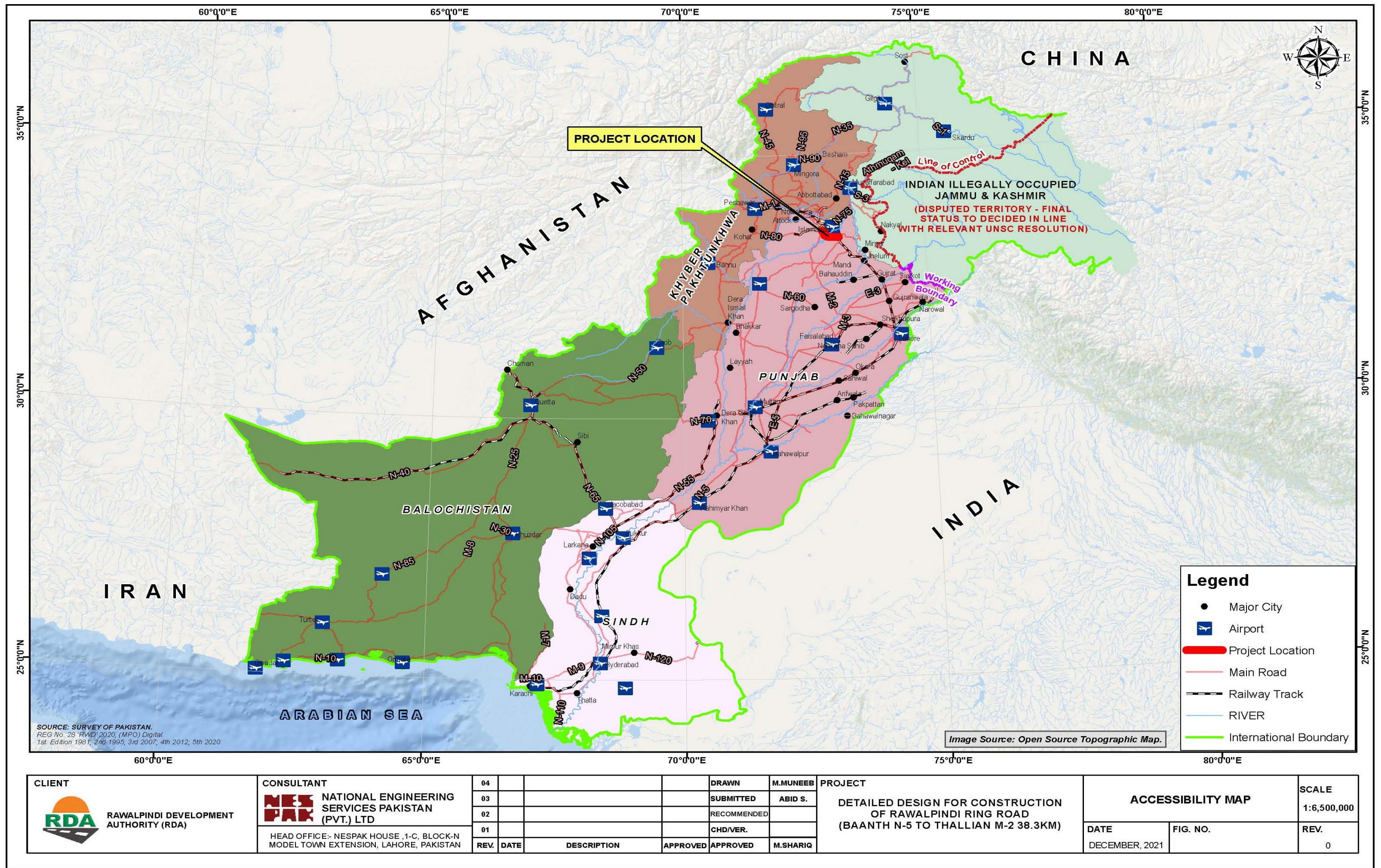


Figure 3-1: Project Area Accessibility Map

3.7 TRAFFIC STUDY

The main objective of Traffic Studies is to assess the volumes and composition of traffic load likely to use the proposed road immediately after the project implementation. The projected volumes of traffic for the future years will be used to judge the future load of vehicles on the proposed road. Capacity analysis of the road segments and major intersections along the alignment is also carried out and the improvements in geometry required are recommended on the basis of the analysis.

A comprehensive Traffic Survey for Feasibility Study/ traffic study was made, by M/s NESPAK in 2017. Manual Classified Traffic Counts (MCC) and Origin-Destination (OD) surveys were conducted at all the significant road sections/ segments which are crossing the proposed Ring Road. Table 3.1 presents the Average Daily Traffic and traffic direction.

Table 3-1: Average Daily Traffic

Sr. No.	Location name	Direction	ADT
1	Rawat (Near Channi Sher Alam Bridge)	Rawat to Mandra	23,207
		Mandra to Rawat	23,817
		Both Directions (Total)	47,024
2	Sawaan Check Post	Rawat to Rawalpindi	54,997
		Rawalpindi to Rawat	50,585
		Both Directions (Total)	105,582
3	Adiala Road	Adiala to Rawalpindi	3,312
		Rawalpindi to Adiala	3,198
		Both Directions (Total)	6,510
4	Dhamial Road	Dhamial to Misriot	1,450
		Misriot to Dhamial	1,461
		Both Directions (Total)	2,910
5	Chakri Road	Ranial to Chakri	9,868
		Chakri to Ranial	8,083
		Both Directions (Total)	17,950
6	Girja Road	Rawalpindi to Motorway	2,120
		Motorway to Rawalpindi	1,859
		Both Directions (Total)	3,980
7	Kashmir Highway	Golra Morr To 26 No. Chungi	49,674
		26 No. Chungiy to Golra Mor	41,717
		Both Directions (Total)	91,391
8	M1 Toll Plaza	Islamabad to Peshawar	14,225
		Peshawar to Islamabad	13,275
		Both Directions (Total)	27,500
9	G.T Road Near Sangjani Toll Plaza	Rawalpindi to Peshawar	29,718
		Peshawar to Rawalpindi	23,635
		Both Directions (Total)	53,352

3.8 DESIGN ASPECT

Following is the brief description of the design aspects of the proposed Project.

3.8.1 Design Criteria

The geometric design will be carried out as per American Association of State Highway and Transportation Officials (AASHTO) Criteria for Geometric Design of Highways based on the following main parameters.

a. Right of Way (RoW)

- RoW : 90 m

b. Design Speed:

1. Design Speed for the proposed project on main carriageway is 120 Kilometres per hour (KPH).

- c. Interchanges : 5 Nos.
(Baanth N-5, Chakbeli Road, Adiyala Road, Chakrii Road and Thalian M-2)

d. Road Cross Section

- Type of Project : Six Lane Dual Carriageway (Controlled Access)
- Type of Terrain : Plain/ Rolling
- No of Lanes : 3 lanes on each side
- Lane width : 3.65 m x 3 (10.95 m)
- Shoulder Width
 - Inner : 1.2 m
 - Outer : 3.0 m
- Median NJB : 0.6 m
- Max Super Elevation : 6%
- Max. Gradient : 5% (Main Carriageway)
- Median Barrier : New Jersey Barrier

- e. Design life of Pavement : 10 Years

f. Pavement Design Thickness

- Asphalt Wearing Course : 50 mm
- Asphalt Base Course : 200 mm
- Water Bound Macadam : 300 mm
- Granular Sub Base : 300 mm

Cross-section of the proposed project is attached as Figure 3.2 (a to d).

3.9 INTERCHANGE

An interchange is a system of interconnecting roadways in conjunction with one or more grade separations that provide for the movement of traffic between roadways on different levels. The following lists several general warrants for an interchange:

Design Designation: Once a controlled access facility has been designated on the major road an interchange may be warranted for a crossing road based on the anticipated demand for access to the minor road.

Traffic Volumes: An interchange may be warranted to accommodate the traffic volumes at the selected level of service and the traffic distribution pattern of an at-grade intersection.

Road-User Benefits: An interchange may be warranted where the road user costs (e.g., travel time, accidents) are significantly reduced when compared to at-grade intersections.

Site Topography: The topography at some locations may allow an interchange at less cost than an at-grade intersection. The interchanges in the proposed project are listed below:

- Baanth N-5 Interchange;
- Chakbeli Road Interchange;
- Adiyala Road Interchange;
- Chakrii Road Interchange; and
- Thalian M-2 Interchange.

3.10 DRAINAGE

A total of 55 culverts are proposed. All deck runoff is to be collected off the bridge. Removal of storm water runoff quickly and efficiently from bridge deck surfaces is an important safety issue. Therefore, a proper design has been made to control the spread of water into traffic lanes and prevent the accumulation of significant depth of water to reduce the risk of hydroplaning. List of proposed culverts is provided in Table 3.2.

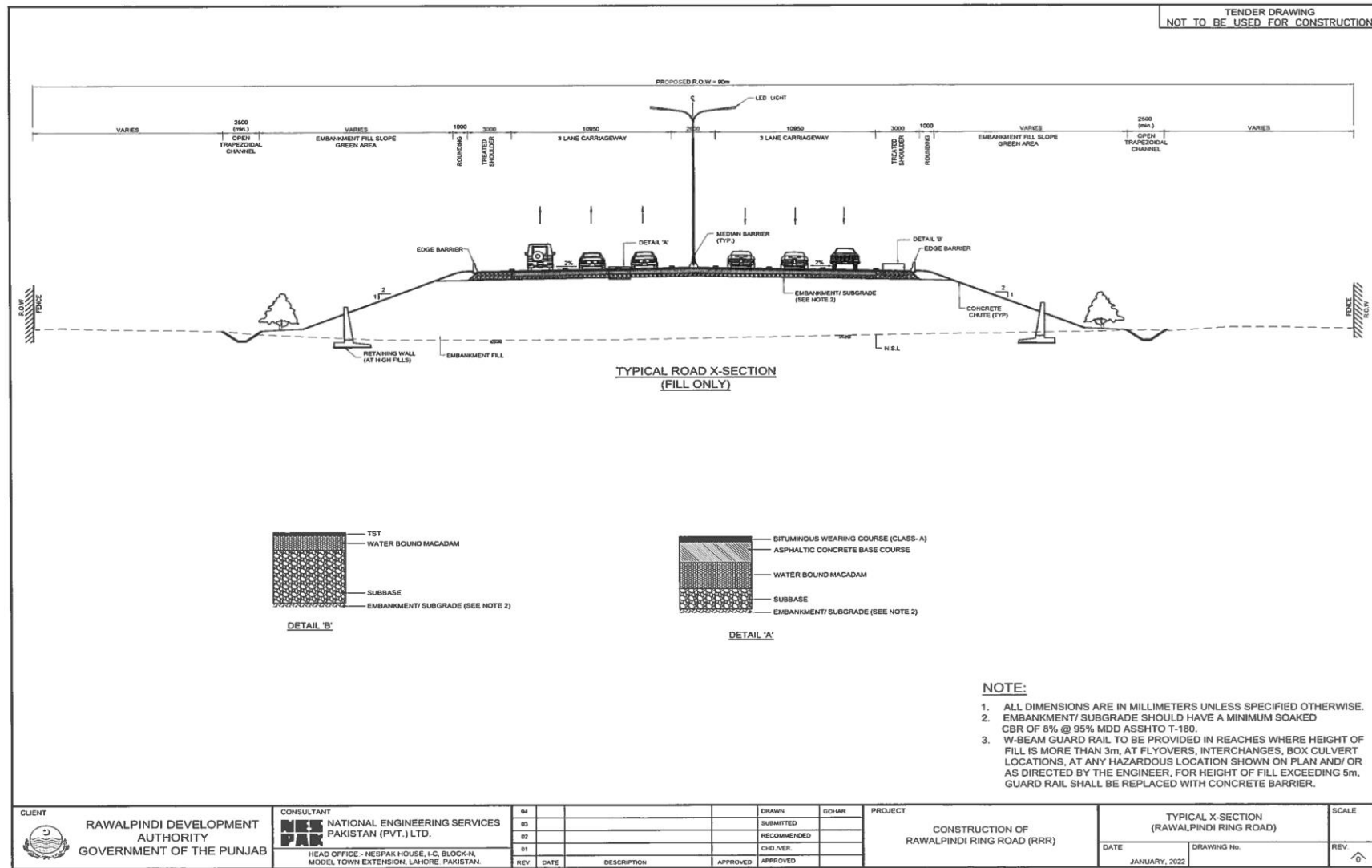


Figure 3-2 (a): Typical Cross-section of the Proposed Project

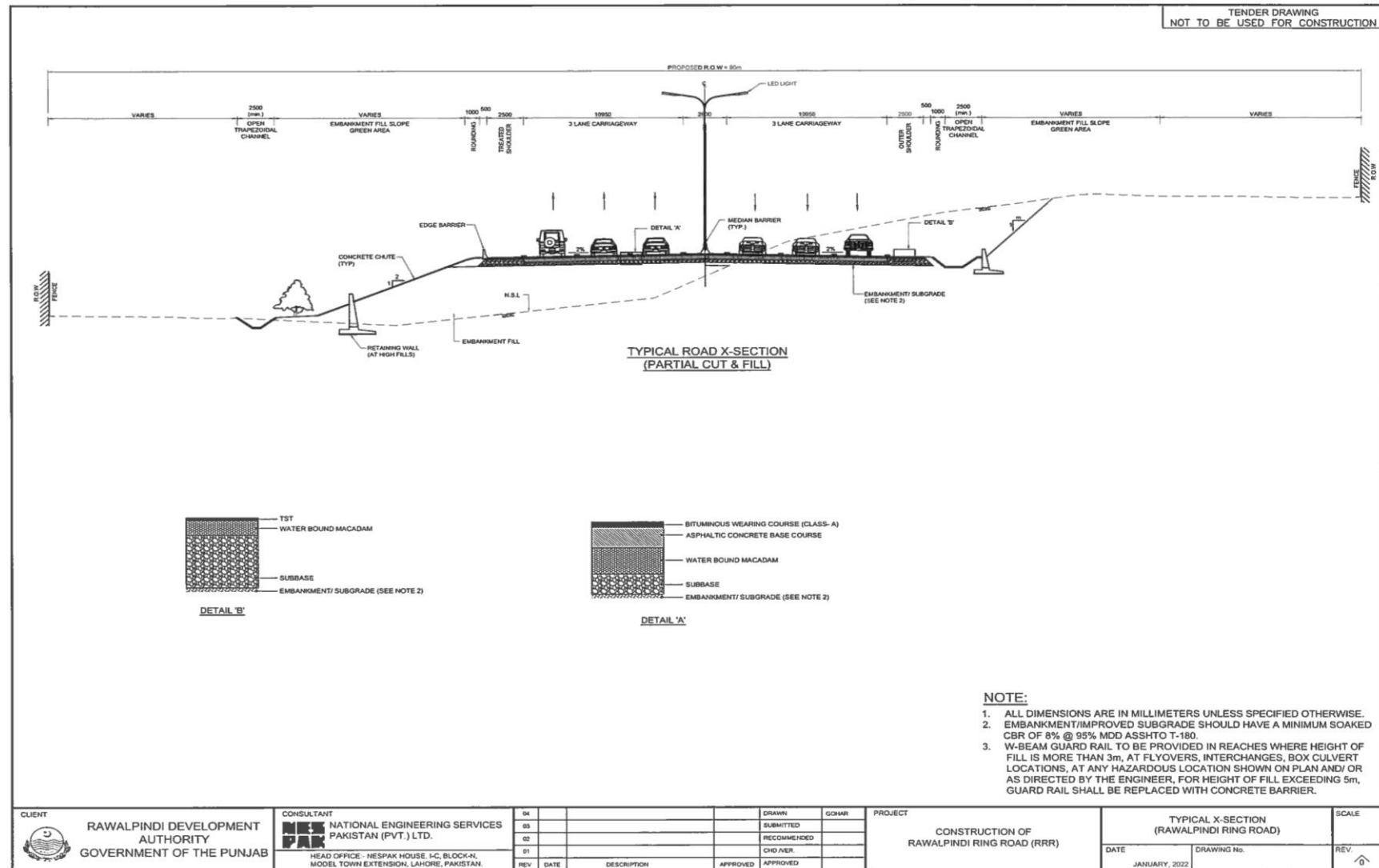


Figure 3-3 (b): Typical Cross-section of the Proposed Project



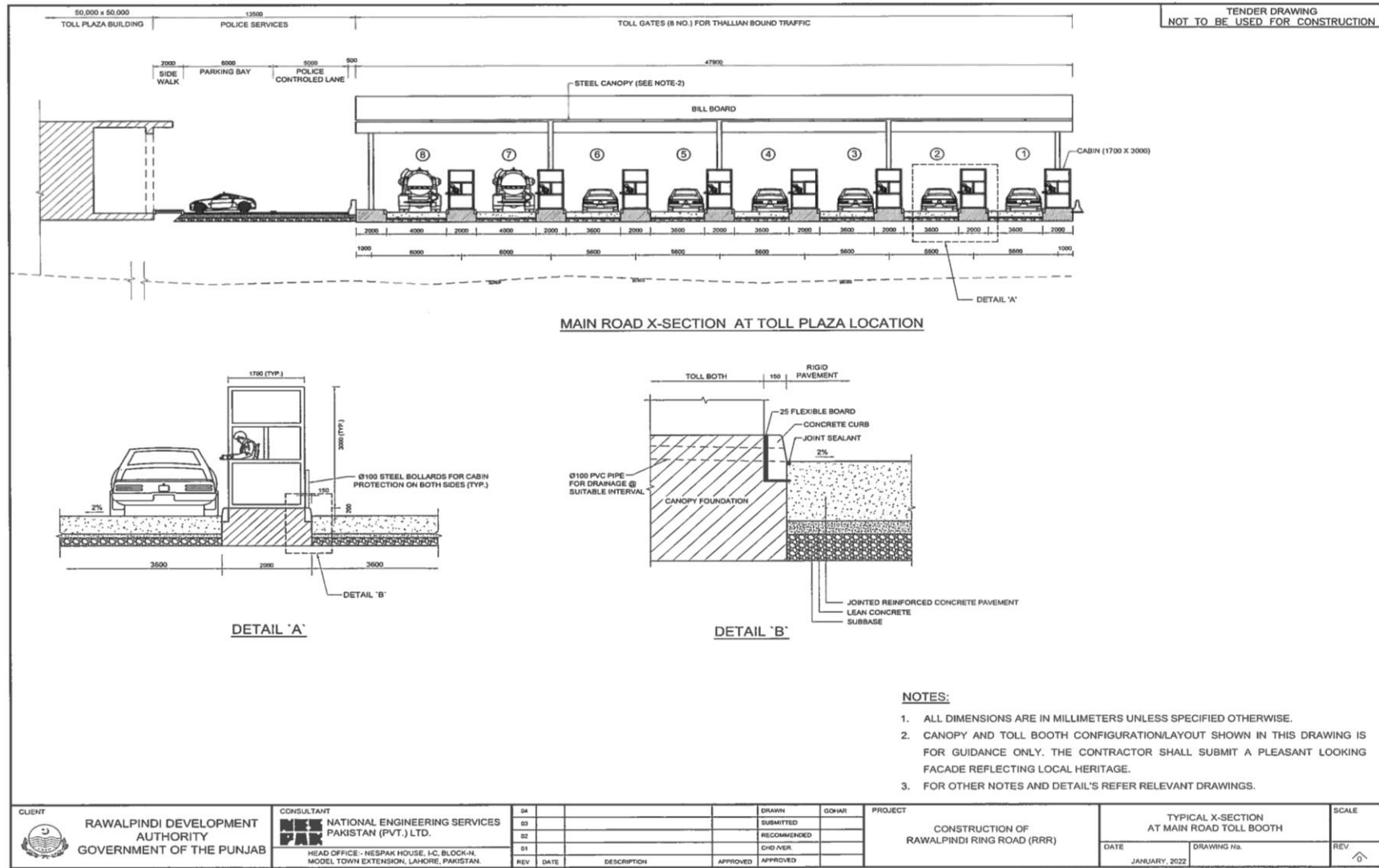


Figure 3-5 (d): Typical Cross-section of the Proposed Project

Table 3-2: List of Proposed Culverts

BOX CULVERTS							
Sr. No.	CHAINAGE	SIZE	SKEW	Sr. No.	CHAINAGE	SIZE	SKEW
1	0+111	2(3.0x2.0)	0	29	17+316	1(3.0x2.0)	41
2	0+483	1(3.0x2.0)	0	30	17+754	4(3.0x2.0)	0
3	0+640	1(3.0x2.0)	0	31	18+625	8(3.0x2.0)	0
4	0+780	2(3.0x2.0)	0	32	19+029	3(3.0x2.0)	52
5	0+786	1(3.0x2.0)	0	33	20+290	2(3.0x2.0)	16
6	1+570	2(3.0x2.0)	0	34	20+643	2(3.0x2.0)	0
7	1+839	2(3.0x2.0)	0	35	21+600	4(3.0x2.0)	0
8	2+900	2(3.0x2.0)	0	36	21+720	2(3.0x2.0)	0
9	4+417	3(3.0x2.0)	0	37	21+830	2(3.0x2.0)	0
10	5+216	5(3.0x2.0)	0	38	21+900	1(3.0x2.0)	15
11	5+558	4(3.0x2.0)	0	39	23+300	3(3.0x2.0)	0
12	7+202	5(3.0x2.0)	0	40	23+740	4(3.0x2.0)	0
13	7+644	4(3.0x2.0)	0	41	24+000	3(3.0x2.0)	0
14	8+267	2(3.0x2.0)	0	42	24+380	3(3.0x2.0)	0
15	9+444	4(3.0x2.0)	0	43	24+600	3(3.0x2.0)	0
16	10+198	2(3.0x2.0)	0	44	25+250	2(3.0x2.0)	0
17	10+752	2(3.0x2.0)	0	45	25+800	2(3.0x2.0)	0
18	11+301	7(3.0x2.0)	0	46	26+057	2(3.0x2.0)	0
19	11+655	3(3.0x2.0)	0	47	26+933	6(3.0x2.0)	0
20	12+058	8(3.0x2.0)	0	48	28+050	5(3.0x2.0)	0
21	12+412	2(3.0x2.0)	0	49	28+300	4(3.0x2.0)	0
22	12+686	4(3.0x2.0)	0	50	29+500	6(3.0x2.0)	0
23	14+121	3(3.0x2.0)	0	51	30+140	7(3.0x2.0)	0
24	14+172	3(3.0x2.0)	0	52	32+600	7(3.0x2.0)	0
25	14+853	2(3.0x2.0)	19	53	34+100	6(3.0x2.0)	0
26	17+004	7(3.0x2.0)	9	54	34+424	8(3.0x2.0)	0
27	17+157	1(3.0x2.0)	0	55	36+270	6(3.0x2.0)	0
28	17+200	1(3.0x2.0)	58				

3.10.1 Structural Design

a. Structural Design Criteria

The main purpose and the objective of the design criteria is to formulate and finalize technical data, design assumptions, codes of practice, methods and procedures to be adopted in the structural design of various structures of the project. The design assumptions and criteria mentioned herein will be used for the structural design of the, bridges, subways, culverts and related works.

b. Design Codes and Standards

Generally following codes and standards shall be followed:

- BCP (2007) - Building Code of Pakistan;
- WPCPHB (1967) - West Pakistan Code of Practice for Highway Bridges;
- AASHTO LRFD - AASHTO LRFD Bridges Design Specification;
- BRIDGES (2012) (For the design of all structural members);
- ASD combination for the calculating length of pile;
- ACI 318-08 - Building Code Requirements for Reinforced;
- ACI 301-95 - Specifications for Structural Concrete American Concrete Institute;
- ASTM A-615 - Specifications for Deformed and Plain Billet;
- Steel Bars for Concrete Reinforcement;
- ASTM C-150 - Specifications for Portland cement;
- ACI-350 R - Environmental Engineering Concrete Structures;
- ASTM C-33 - Specifications for Concrete Aggregate; and
- UBC 1997 - Uniform Building Code of USA.

c. Loads

Structures designed will be capable of resisting the following main loads and forces:

- Dead Load;
- Live Load;
- Impact/ Dynamic Allowance;
- Vehicle Collision Force;
- Wind Load;
- Longitudinal forces due to tractive/braking effort of vehicles;
- Earth Pressure; and
- Earthquake Forces.

Construction of bridge starts with the relevant geotechnical information of the ground so that the design values of foundation has been verified. After verification of foundations e.g. for pile type foundations and results of pile load tests, working piles will be started. As a parallel activity, prestressed girders have been constructed upon gaining required strengths, prestressing process will be started.

After completion of piles, pile cap, piers and girder seats will be constructed. After achieving required strength formworks will be removed and prestressed girder will be launched in a manner to avoid eccentric loading over piers. After launching of girders deck slabs are poured in a single pour between expansion joints. Bridge deck barriers are constructed afterwards. Parallel to this activity bridge approaches or in case of flyover, ramps are constructed and filled upto the deck level. The pavement work is carried out over the ramp and bridge deck. After completion of Wearing surface, expansion joints are installed at the designed location. Piling technique will be used in bridges.



3.11 CONSTRUCTION ASPECTS

3.11.1 Construction Materials

Coarse aggregate is obtained either by the naturally occurring weathered and abrasion aggregates or by artificially crushing a larger parent mass. Thus, many properties of aggregate depend on the properties of their parent rocks e.g. chemical and mineral composition, petrographic classification and their physical indices like specific gravity, hardness, strength, structure, color etc. along with their particle shape, size, surface texture and absorption. All these properties have a considerable influence on the quality of fresh and hardened concrete. According to the available studies and field works, the following main sources were identified for the construction of proposed Rawalpindi Ring Road.

3.11.2 Course Aggregate

a) Margalla Hill Limestone

Margalla Limestone is an approved source as a coarse aggregate, located near Taxila. The reserve of source is available in huge quantity. Many crush plants are installed at source. The petrography analysis of Margalla Lime Stone depicts that it is composed of 99% of Calcium Carbonate with 1% of other ingredients, it has Bulk SSD specific gravity ranges from 2.64 to 2.68, its Los Angeles Abrasion value ranges from 20% to 23%, whereas it has soundness values ranges from 0.8% to 1.2%. It can be safely used for Asphalt and Concrete works.

b) Gravel & Cobbles from the Lei Conglomerate

The Lei Conglomerate formation is exposed along & surrounding the proposed road corridor of Rawalpindi Ring. Formation comprises of rounded to sub rounded gravel & cobbles with silt & sand.

c) Nullah/River Bed Material

Nullah/river bed material is available in huge quantity along the Soan river, Sill river and other nullahs/streams along & surrounding the proposed road corridor. Nullah/river bed material comprises of rounded to sub rounded & sub rounded to sub angular gravel, cobbles & boulders with fine material (silt & sand). The material is commonly quite coarse and the clasts are well rounded, so crushing is needed to optimize size and increase angularity. Most of the crushers are scattered along the Soan River and its tributaries.

3.11.3 Fine Aggregates

It generally consists of natural sand or crushed stone with most particles smaller than 4.75 mm. It is generally considered to have a lower size limit of 0.075 mm or less. The material between 0.075 mm and 0.002 mm is classified as silt and particle smaller silt or termed clay. For this purpose, field work was conducted along the proposed road corridor. There is not any suitable source for fine aggregate available along or nearby the proposed road corridor. Only



“Lawrecepur sand” is available to be used in concrete and other structural works. “Lawrencepur sand” is an approved source for fine aggregates and it already in use. The source will utilize as fine aggregates for proposed project. Lawrence pur sand has been widely used for concrete purpose; this is the only source available in the vicinity of the project. When tested it is found that its bulk specific gravity (SSD) ranges from 2.68 to 2.71, absorption 0.8% to 1.2%, it also qualified in soundness test. It can be safely used for all type of concrete works.

3.11.4 Ordinary Portland Cement

Various renowned cement factories are located close to the project area especially in Hattar, Wah, Islamabad and Kalar Kahar. The potential cement sources closest to the project are listed below:

- Askari Cement, Wah;
- Bestway Cement, Hattar;
- Fauji Cement, Jang Bahtar;
- FECTO Cement, Islamabad;
- Pak Cement, Kalar Kahar; and
- DG Khan Cement, Kalar Kahar.

3.11.5 Bridge Bearing pads and Expansion Joints

There are local manufacturer of these items available in Karachi and Lahore but mostly imported bearing pads and expansion joints have been used in the permanent works.

3.11.6 Bricks and Other Construction Materials

The bricks are essential part of the Building construction, there are several manufacturer of bricks in the vicinity of Ring Road project, bricks of specified quality shall be used during the construction of buildings of service areas and other building works. Other construction materials such as Admixtures, Joint filers, water stoppers, Epoxies, Guard rails, road studs, chain link fence thermoplastic paints for civil works, for Electrical works such as low voltage cables, Transformers, Standby power generators, Switchgear and distribution board, Road Lighting, electric poles Interior lighting, Fire detection and alarm system, Data Networking System, HVAC, Firefighting fixtures, Optic Fibre, CCTV Cameras for ITS Systems of specified quality will be required for construction purpose. Some of these materials are available in Rawalpindi/Islamabad and some of them can be procured from other cities and some will be imported.

3.11.7 Borrow Areas

Materials for embankment should consist of suitable material from borrow road way excavation or structure excavations. Borrow material can be used only when material obtained from road way or structural excavation is not suitable or is different for embankment formation.

a) Borrow Soil for Embankment

Topography of the project area is plain and elevated which requires cutting and filling also. In this area, cutting material can be used for filling purposes where required. However, in agricultural areas, borrow soil is available for embankments.

b) Borrow Material for Sub Base

Suitable Materials for sub base are locally available and hence are economical. Available material may consist of pit run or bed run gravels, sand gravels mix or soil aggregates. The project is mostly in an agricultural, barren and elevated terrain. Similarly, crushed aggregate, fine aggregate will also be required for construction activities. Large quantity of sub-grade soil will be required in large quantity for the project. Moreover, borrow pits of suitable material at a reasonable reach will be selected. Asphalt, reinforcement and cement will be transported from different locations.

3.11.8 Work Force

Man power demand estimation is an essential component to facilitate deployment of manpower. Total man power required for the proposed project will be estimated by the contractor at construction stage, whereas as per consultant's previous experience the workforce for proposed project has been estimated as 300 workers comprising skilled and unskilled staff and labours.

3.11.9 Construction Activities and Required Machinery

Construction activities involve following:

- Earth work (clearing of vegetation/ trees and top soil);
- Roadwork (Levelling, preparation of sub grade, sub base, base and wearing course); and
- Structure works.

The list of the machinery and the equipment required for the proposed Project is provided in Table 3.3.

Table 3-3: Machinery and Equipment Requirement

Sr. No.	Type of Machinery/ Equipment	Sr. No.	Type of Machinery/ Equipment
1	Bulldozer	12	Rollers
2	Excavator	13	Tandem
3	Dump Trucks	14	Vibratory Combination Rubber Mounted Tandem Roller
4	Grader	15	Crane
5	Grader with Scarifier	16	Beam Launching Truss
6	BackHoe	17	Piling Equipment
7	Water Tanker	18	Vibrator for Concrete
8	Front End Loader	19	Road Marking Machine

Sr. No.	Type of Machinery/ Equipment	Sr. No.	Type of Machinery/ Equipment
9	Paver	20	Concrete Batching Plant
10	Power Broom	21	Asphalt Premix Plant
11	Bitumen Pressure Distributor	22	Laboratory with Equipment (1 permanent & 1 mobile)

3.11.10 Construction Camps

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Keeping in view the following criteria guidelines, the Contractor has to identify the construction camp sites before start of the construction activities:

- There should be no resettlement issue for the location of the camps;
- Camp site should be away from the residential areas and sensitive receptors;
- Selection of sites for construction camps shall be near the project area having proper access to the nearby main/link road;
- The camps must be located in a place where the drainage from and through the camps will not threaten any domestic or public water supply;
- Camp site must be adequate in size to prevent overcrowding of necessary structures;
- The camp site should consider avoiding any damage of property, vegetation, irrigation, and drinking water supply systems;
- The camp site must not be subject to periodic flooding; and
- There should not be any ecological sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near to the construction camp site.

3.11.11 Water Requirement

The source of water during the construction phase will be from water bowser tanks and groundwater (if available) from local sources will be used. The water consumption is estimated to be 12,000 liters /day³ for 300 construction workers comprising skilled and unskilled staff/labourers (approx.) for the proposed Project.

3.11.12 Wastewater Generation

The wastewater generation is estimated to be 9,600 liters/day for 300 construction workers comprising skilled and unskilled staff/labourers (approx.) for the proposed Project.

3.11.13 Solid Waste Estimation

Due to construction activities waste will be generated at construction site and contractors camp. The contractor will provide the estimated quantity of excavation material during the construction phase. These wastes will be generated due to the construction activities and the

³ Tentative Work Force Requirements Including Client and Contractor Staff"
= (300) x (40) = 10,000 liters/day
= (12,000) x (80%) =9,600 liters/day

up to the extent possible the excavated materials will be reused, where applicable, for construction purposes. Solid waste generated during construction and camp sites shall be safely disposed in demarcated waste disposal sites.

The solid waste generation is estimated to be 150 kg/day (as per 0.5 kg/capita/day waste generation)⁴ for 300 construction workers comprising skilled and unskilled staff/labours for the proposed Project.

3.11.14 Power Requirement/ Power Source

The main source of electricity/electric power during construction phase will be diesel generators for construction camps and construction machinery and during the operational phase it would be taken from main electric power grid, supplying power to the main city. The Contractor(s) will provide the details about capacity, type and number of generators to be utilized during construction phase.

3.12 LAND ACQUISITION

The total area of land to be acquired for various components of the project is approximately 8,992.32 Kanals (8,161.03 Kanals in Tehsil Rawalpindi and 831.29 Kanals in Tehsil Gujar Khan).

3.13 PROJECT IMPLEMENTATION SCHEDULE

The proposed Project is expected to be completed within Two (02) years.

3.14 COST OF THE PROJECT

The estimated cost of the construction works of proposed Project is Rs. 30,330.94 Million.

3.15 ALTERNATIVE ASSESSMENT

3.15.1 No Project Option

The No Project Option (NPO) alternative is defined as the scenario where the proposed Project is not constructed. The early stages of project planning involved an in-depth analysis of the “NPO” option (or “do-nothing scenario”). The analysis shows that most of the existing roads will have to operate beyond their traffic volume capacity therefore will not be able to deal with the following scenarios:

- Rise in population growth and economic development;
- Increase in the number of cars owned by people and businesses; and
- Urban area expansion.

⁴ Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day



Given the NPO scenario, conditions on the majority of roads would remain largely the same. For example, the demand will surpass capacity and road congestion leading to severe bottlenecks will remain a common occurrence throughout. As a result, air and noise pollution due to traffic jams and associated health risks will increase in addition to higher maintenance costs of vehicles, increased fuel consumption and higher probability of accidents. The ambient air quality may deteriorate in coming years, which may exceed the permissible limits of PEQS, 2016.

The NPO alternative will impede the chances of development and trade opportunities as the urban market access will remain very limited to the rural population in the Project area. In addition, the same can be deduced for access to basic services such as health and education. Villages having no road access at present may face delays in rescue services in case of emergencies.

The relatively minor, less than significant environmental impacts (such as noise and short-term air quality impacts due to maintenance activities) and inconveniences (such as traffic diversions) would be avoided in the short run. In the long run, however, the steadily declining state of the roadway would severely hamper economic development in the area.

If project is not initiated then it will continue to increase the negative impacts generated by increased traffic loads on insufficient capacity of the existing road (traffic congestion, noise, low speed, higher emissions, accidents, etc.). Continuous growth of residential infrastructure along GT road will further disturb the movement of local traffic and smooth access of the local population. Approach to the main city by nearby villages will remain difficult and access to better educational and health facilities will also remain limited. In case of emergencies, rescue services will also not reach easily to the affected areas or safe areas if needs evacuation.

Therefore, NPO conditions will result in further worsening of the present environmental and socio-economic conditions and increased disturbance to residents of the area and the road users.

4 DESCRIPTION OF THE ENVIRONMENT

4.1 GENERAL

This chapter provides the description of the baseline conditions along the proposed Project within the Col and RoW. Figure 4.1 shows the extent of the Col and RoW.

Considering the potential impacts of the Proposed Project, existing baseline environmental conditions of the proposed project's Col has to be used as a benchmark for comparison of the physical, ecological and socio-economic conditions before and after construction phases of the Project. This baseline will also provide the datum for assessing the impacts and suggesting the mitigation measures, which will be implemented effectively at various phases of the proposed Project activities.

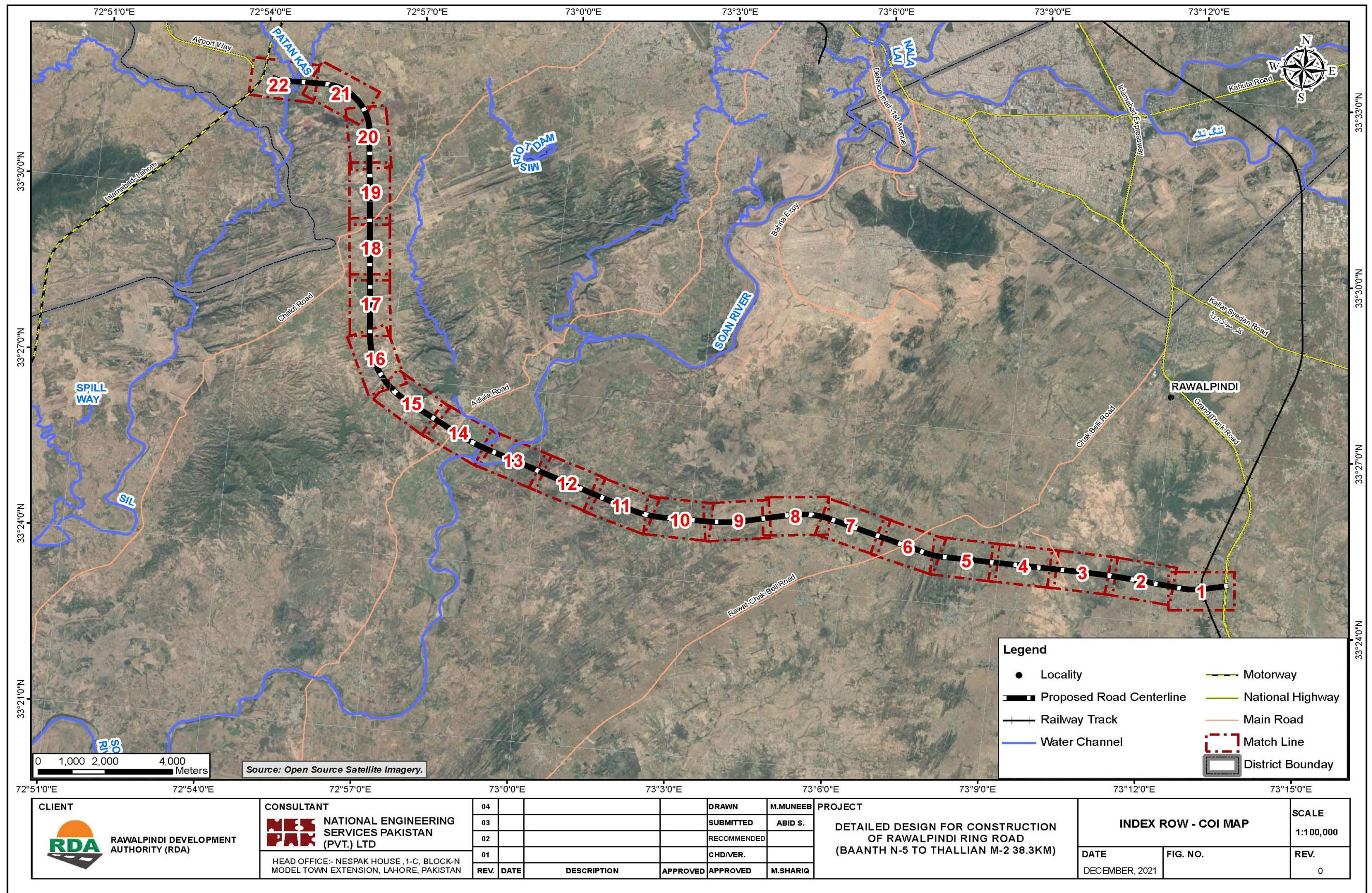


Figure 4-1: Index Map of RoW and Col Proposed Project

4.2 FIELD VISITS FOR BASELINE STUDY

The data presented in the forthcoming sections has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted the field visit during the months of November and December, 2021.

The major objective of the field visits was to collect the baseline data on physical, ecological and social aspects along with identification, assessment and categorization of the significant environmental and social impacts of the proposed Project. The secondary data was collected from published sources/reports and relevant departments, which were also verified through visual observations during detailed surveys.

4.3 PHYSICAL ENVIRONMENT

The following section provides an overview of the information on physical environment of the Col collected from primary as well as secondary sources. The major parameters covered include Topography, Geology, Seismicity, Soil, Climate, Water Resources, Ambient Air Quality & Noise, Solid Waste and Land-use along the Proposed Project.

4.3.1 Topography

The Project is located in Rawalpindi division which falls in the Salt Range and Potohar Plateau. The terrain mainly consists of plains and mountains (reaching an elevation of over 1,175 m) traversed by ravines and nullahs originating from the mountains. The northern part of the metropolitan area lies in the mountainous terrain of the Margala Hills, a part of the lower and outer Himalayas, which also includes the Hazara and Kala Chitta Ranges. The Margala Hills, which reach 1,600-m altitude near Islamabad, consist of many ridges of Jurassic through Eocene limestones and shales that are complexly thrust, folded, and generally overturned. Margalla Hills Range acts as a wall forming the boundary of the Nullah Lai basin. The foot of Margalla range stands at an elevation of about 620 m and the top of the mountain is about 1,200 m. The terrain of Rawalpindi gradually falls off towards Lai Nullah in the west and the Kurang River in the east. Lai Nullah enters the city from the southwest and joins the Soan River in the southern side. Occasionally it overflows during the rainy season, causing considerable damage. Four major tributaries, namely SaidpurKas, TenawaliKas, BedarawaliKas, and JohdKas, originate from Margalla Hills. After this ChaklalaBridge, the Nullah Lai becomes steeper with many downfalls eventually falling in the River Soan, which is a tributary of the River Indus. Figure 4.2 represents the topography of the area.

4.3.2 Regional Geology and Soil

The area in and around Rawalpindi has a complex geological history of mountain formation, alluvial-loessic deposition and erosion cycles. In the west of the Potohar Uplands, the main depositions of loess are from the Pleistocene period. Streams and ravines cut the loess plain, affected by gully erosion and steep slopes. This type of land is unsuitable for cultivation. The areas are composed of sandstone and limestone. There is an extensive area with exposed bedrock and fragmentary, thin soil formations.

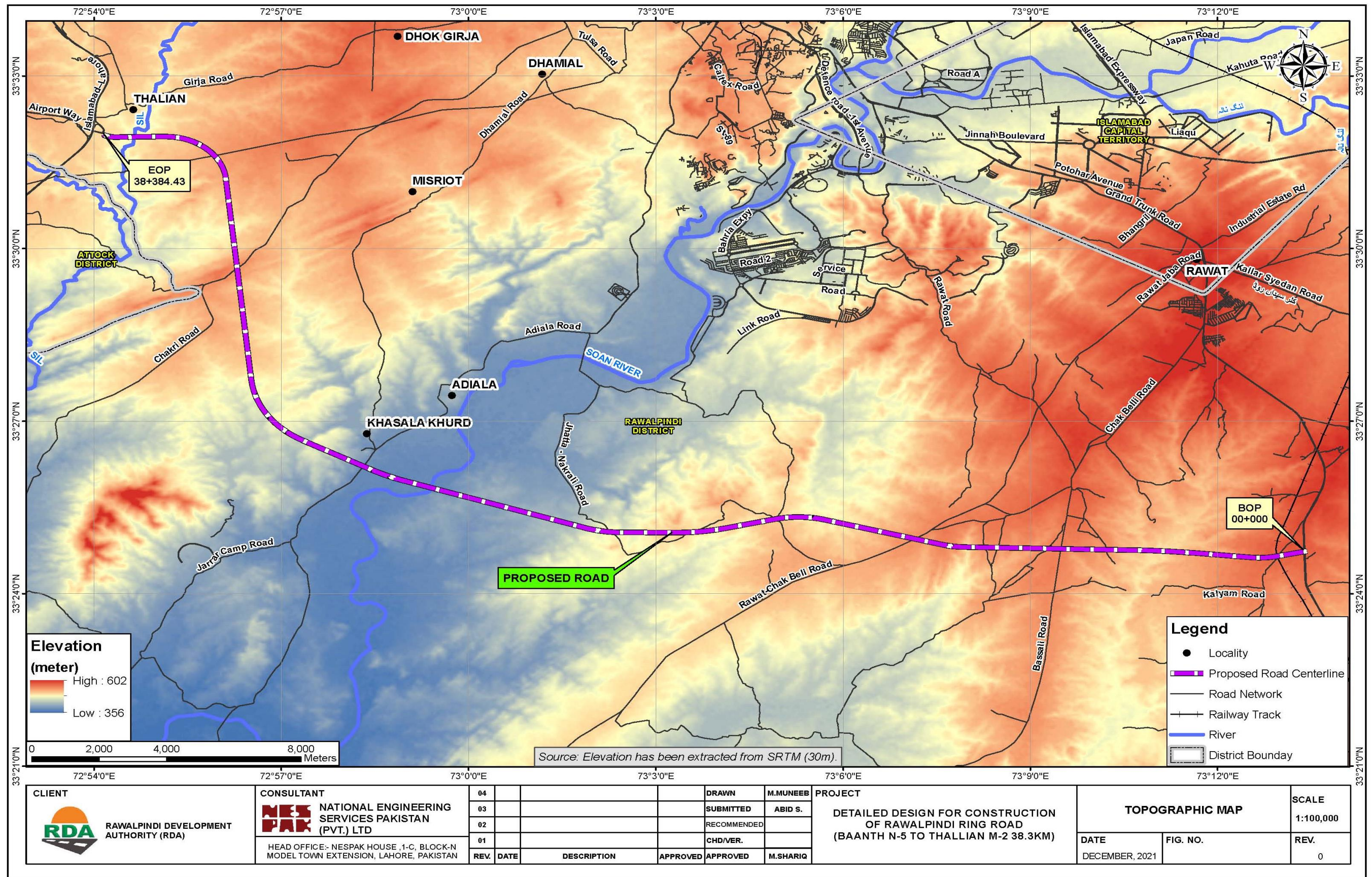


Figure 4-2: Topography of the Project Area

The gravel and loess are especially important to the environmental geology because they form most of the building foundations and because gravel is the primary ground-water aquifer. West of Rawalpindi, plains of thick, easily eroded loess is extensively dissected into shallow badland valleys. East of Rawalpindi, the folded ridges of Rawalpindi Group rocks rise above the alluvial cover to form prominent hills. Urban development is concentrated in the piedmont bench area, which is little dissected in its northern part, where Islamabad is located, but is more deeply dissected toward the south near the Soan River, where Rawalpindi is located.

In the southernmost part of the area, the Soan River valley extends generally along the axis of the Soan syncline at an altitude of about 425 m. The Soan is incised more than 40 m below the level of extensive silt-covered plains north and south of the river. Southeast of Rawalpindi, upstream from the Grand Trunk Road bridge, the Soan channel and flood plain extend 1.5 kilometers (km) across the valley floor. Elsewhere, the valley bottom is much narrower. Beds of fluvial sandstone, mudstone, and conglomerate of the Siwalik Group of Neogene to Pleistocene age underlie the southern area and crop out along the many steep-sided stream valleys that dissect the land.

Important minerals like limestone, marble, and fireclay are found in the area. Limestone is found abundantly in Margalla Hills and marble in the western section of Margalla range. Limestone is common in the lower hills in Rawalpindi Tehsil, and deposits can also be found in the Kankar Plains. Clay soils in the District exhibit five strata, from bottom to top: (i) coarse pebbles with sand or clay; (ii) an alluvial stratum deposited by an older river system in the Soan Basin, (iii) alluvial deposits of the present river system (iv) an airborne top layer of silt or clay (loess), and (v) conglomerate and loose gravel deposits.

Figure 4.3 indicates the properties (silty clay, clean clay and sand with silt) of soil in the Project Area. Out of these three, the silty clay is a predominant one.

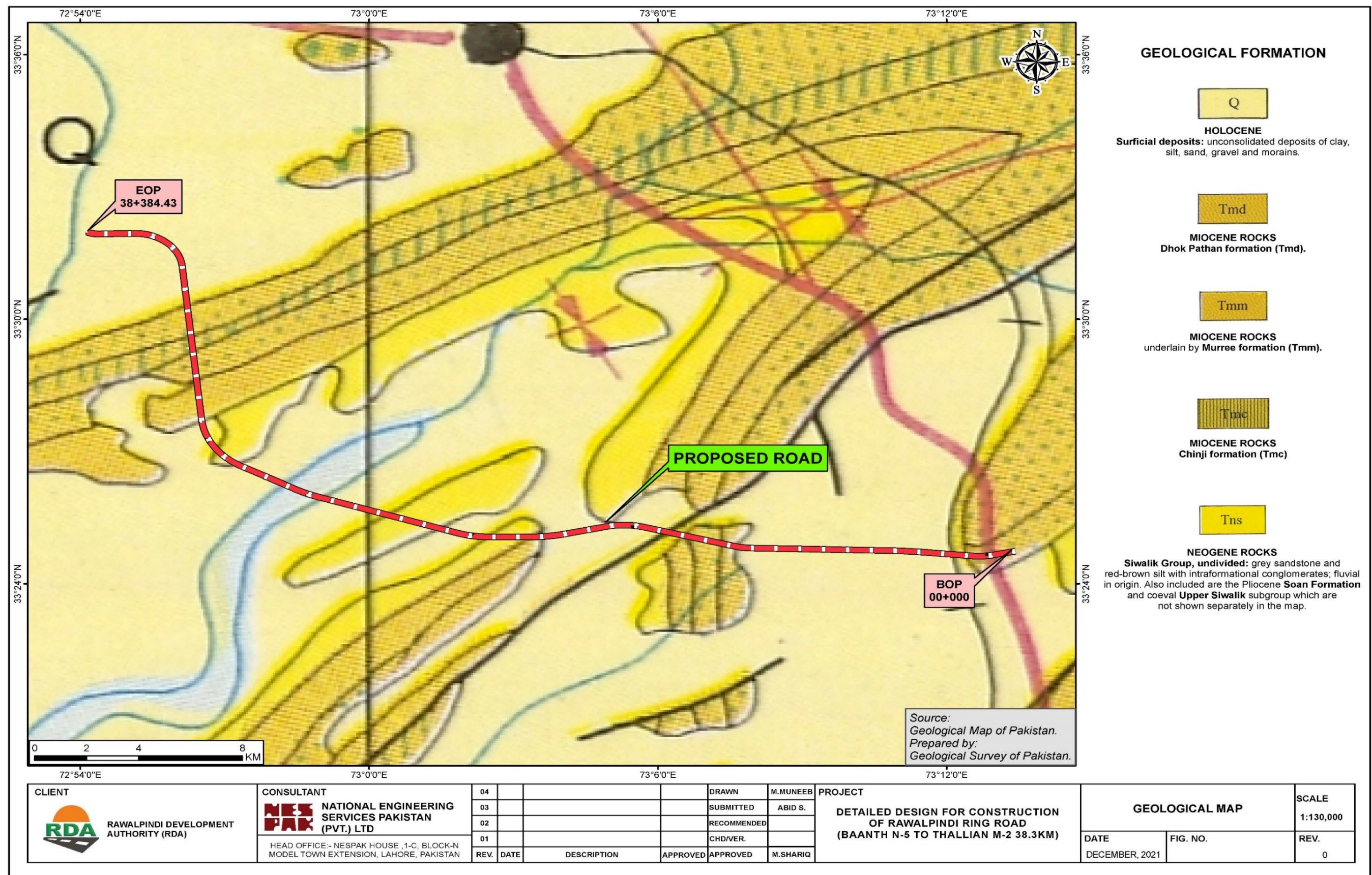


Figure 4-3: Regional Geological Map

4.3.3 Seismology

On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment (PSHA), Pakistan is divided into five (05) seismic zones in line with the Uniform Building Code (UBC), 1997 of the Pakistan. The boundaries of these zones are defined on the basis as shown in Table 4.1.

Table 4-1: Values of Seismic Zones of Pakistan

Sr. No.	Zone	PGA (g)
1	1	0.05 to 0.08
2	2A	0.08 to 0.16
3	2B	0.16 to 0.24
4	3	0.24 to 0.32
5	4	> 0.32 g

In general, the Proposed Project as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone-2B (Moderate Hazard) category with PGA 0.16 to 0.24g of the seismic zonation map as shown in Figure 4.4. Hence all the applicable provisions of BCP should be met during the design and construction⁵ for safety against seismic hazards.

⁵ Building Code of Pakistan (Seismic Provisions – 2007), Ministry of Housing and Works

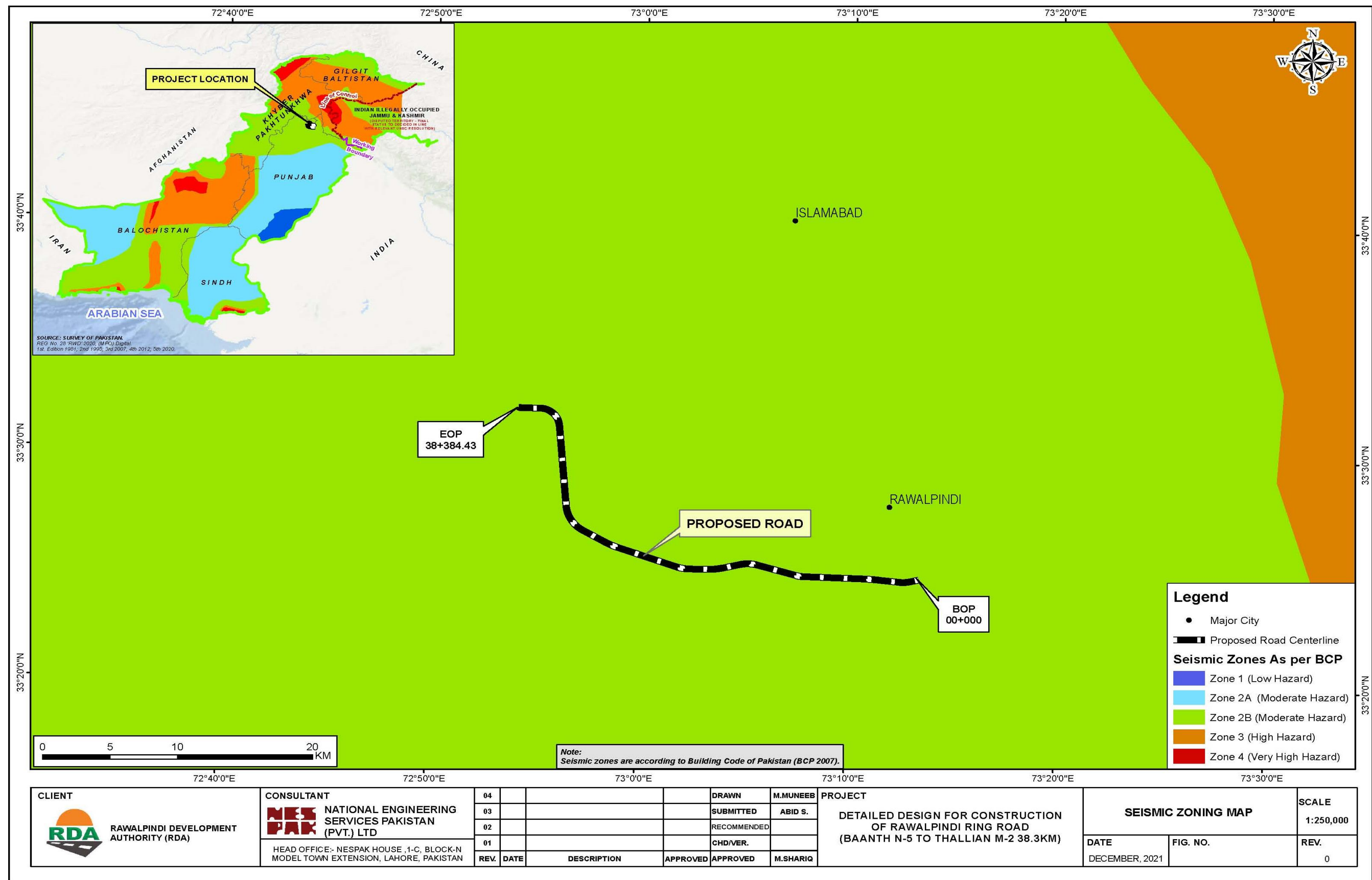


Figure 4-4: Seismic Zoning Map

4.3.4 Climate

The Project area is classified as humid subtropical climate. The humid subtropical climates are characterized by typically mild, dry and short winters. Summers in Project area are long with higher temperatures starting from mid-April and reaching peak temperatures in June/July. The temperatures often exceed 40 °C in summers. The summers are typically followed by monsoons where heavy rains are experienced. The project area receives rains in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the month of July and September. Average high temperatures decrease during the monsoon season, but humidity increases. This results in hot and humid conditions, similar to summers in other humid subtropical climates.

The following sections present the climate details of the meteorological gauging station situated near the proposed project. Airport, Islamabad meteorological station was identified near to the proposed project.

The monthly data for Temperature, Rainfall, Relative Humidity and Wind speed from year (1981-2010) for the above mentioned Weather Stations for the Project Area are presented in subsequent section.

4.3.5 Temperature

The proposed Project Area will be subjected to long periods of high temperature in summers and low temperature in winter. The mean monthly temperature (max & min) of Airport, Islamabad climatic station has been acquired from Pakistan Meteorological Department (PMD) for the 1981 to 2010 years and presented in Table 4.2.

Average monthly mean maximum and mean minimum temperatures of above mentioned station has been discussed in this section which represents the temperature conditions. It may be seen from the Figure 4.5 below that the temperature rises rapidly until June and the temperature drops with advent of monsoon in July. The temperature rises rapidly until June and the temperature drops with advent of monsoon in July. The months of December and January experience a severe drop in temperature and, the temperature falls below the freezing point in areas above 1800 masl. Summer is marked with monsoon rains, which occur usually in July/August.

Table 4-2: Monthly Temperature Recorded at Airport Meteorological Gauging Station

Sr. No.	Months	Mean Max. Temperature (°C)	Mean Min. Temperature (°C)	Mean Temperature (°C)
1.	Jan	17.9	3.2	10.6
2.	Feb	19.7	6.0	12.9
3.	Mar	24.5	10.7	17.6
4.	Apr	30.5	15.8	23.1
5.	May	36.0	20.7	28.3
6.	Jun	38.4	23.7	31.0

Sr. No.	Months	Mean Max. Temperature (°C)	Mean Min. Temperature (°C)	Mean Temperature (°C)
7.	Jul	35.3	24.4	29.8
8.	Aug	33.7	23.8	28.8
9.	Sep	33.7	21.1	27.4
10.	Oct	30.9	14.5	22.7
11.	Nov	25.9	8.3	17.1
12.	Dec	20.2	4.3	12.2

Source: Pakistan Meteorological Department

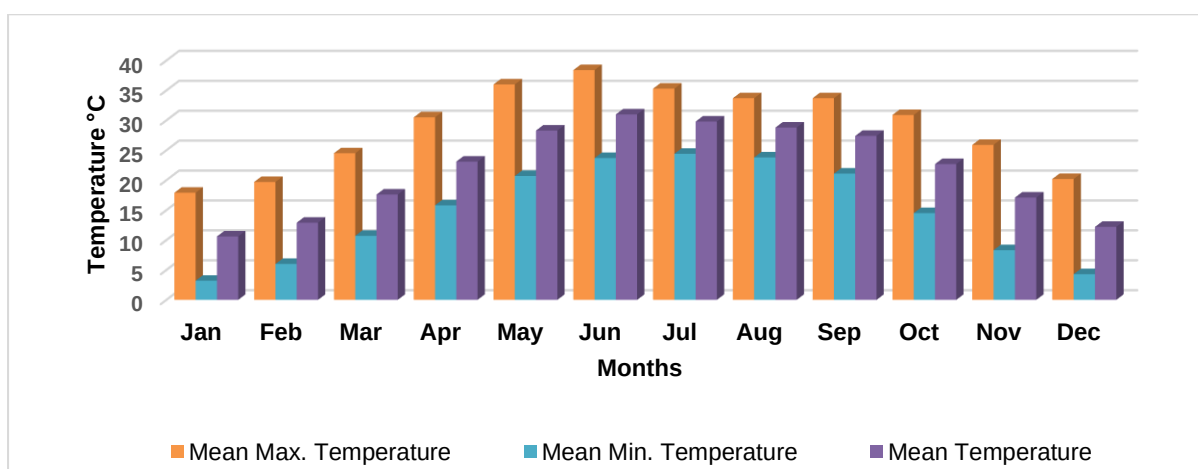


Figure 4-5: Mean Monthly Temperature at Airport Meteorological Gauging Station

According to the Metrological Gauging Station installed at Airport, the coldest month is January in which the mean minimum temperature is 3.2°C and the mean maximum temperature is 17.9°C. June is the hottest month with the mean minimum temperature of 23.7°C and the mean maximum temperature as 38.4°C.

4.3.6 Rainfall

Mean monthly rainfall data and the number of rainy days recorded at Airport, Islamabad, climatic stations in the vicinity of the Project Area are given in Table 4.3. The average annual rainfall of the project area is 1248 mm.

The maximum rainfall occurs during the months of July and August, which is about 50% of the annual rainfall. Winter rains generally occur during the months of January to March, whereas, November is normally the months with least precipitation.

Table 4-3: Mean Monthly Rainfall Recorded at Airport Station

Sr. No.	Months	Mean Monthly Rainfall (mm)
		Airport
1.	Jan	56.2
2.	Feb	84.1

Sr. No.	Months	Mean Monthly Rainfall (mm)
		Airport
3.	Mar	92.4
4.	Apr	63.2
5.	May	35.8
6.	Jun	75.3
7.	Jul	307.8
8.	Aug	340.3
9.	Sep	110.7
10.	Oct	31.7
11.	Nov	14.4
12.	Dec	36.3
Annual		1248.5

Source: Pakistan Meteorological Department

Graphical representations of month-wise precipitation of Airport meteorological gauging station are provided below in Figure 4.6. The maximum rainfall occurs during the monsoon season in the months of July and August.

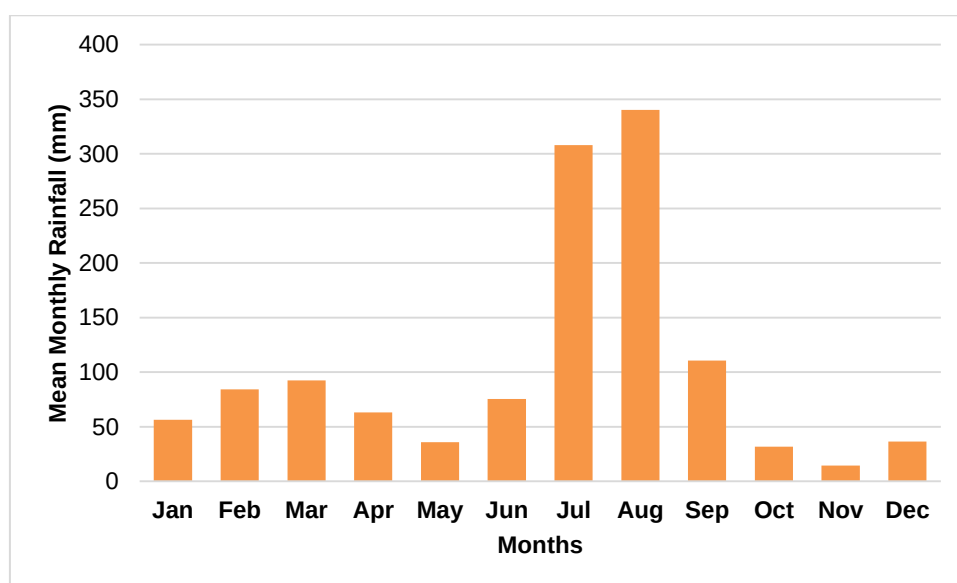


Figure 4-6: Mean Monthly Rainfall of Airport Meteorological Gauging Station

The maximum rainfall occurs during the monsoon season during the month of July.

4.3.7 Relative Humidity

The relative humidity data at Airport, Islamabad met stations around the proposed Project Area is given in Table 4.4. The data reveals that at 00:00 hours, the relative humidity levels are generally higher while lower relative humidity levels are recorded at 12:00 hours. Relative humidity levels are mostly high during the month of August, whereas, these are extremely lower during the highest temperature i.e., May and June.

Table 4-4: Relative Humidity Recorded at Airport Meteorological Gauging Station

Sr. No.	Months	Relative Humidity (%)		
		Airport		
		00 UTC	03 UTC	12 UTC
1.	January	87.4	86.8	46.6
2.	February	84.1	82.5	43.4
3.	March	80.2	74.0	39.3
4.	April	72.7	60.1	32.3
5.	May	62.0	47.6	26.5
6.	June	63.5	49.3	30.3
7.	July	81.7	73.5	52.8
8.	August	88.8	81.6	60.9
9.	September	85.3	76.0	50.5
10.	October	83.9	76.1	41.4
11.	November	86.2	82.7	44.0
12.	December	87.6	86.8	48.7

Source: Pakistan Meteorological Department

Graphical representations of month-wise Relative Humidity of Airport meteorological gauging stations are provided below in Figure 4.7.

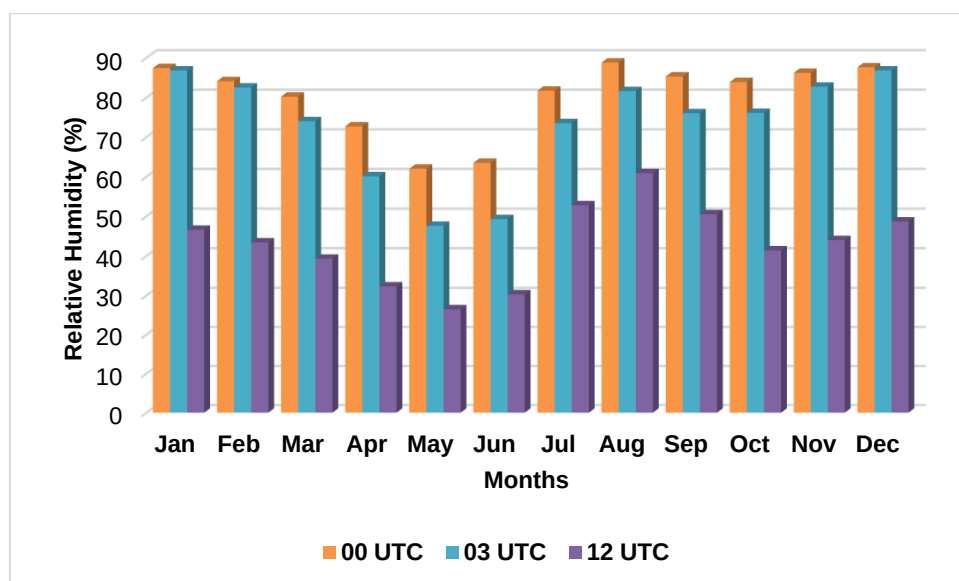


Figure 4-7: Relative Humidity of Airport Meteorological Gauging Station

The maximum humidity recorded at Airport weather station is in the month of December i.e. 87.6 % and the minimum humidity recorded is in the month of May i.e. 62.0 % at 00 UTC.

4.3.8 Wind Speed

The mean monthly wind speed at Airport, Islamabad met stations around proposed Project Area is given in Table 4.5. The data reveals that at 00 UTC, the wind speeds are generally lower while higher wind speeds are recorded at 12 UTC. During summers wind speeds are generally higher than wind speeds in winters.

Table 4-5: Wind Speed Recorded at Airport Stations

Sr. No.	Months	Wind Speed (knots)		
		Airport		
		00 UTC	03 UTC	12 UTC
1.	January	0.7	0.6	6.4
2.	February	1.2	1.1	8.8
3.	March	1.6	1.4	9.5
4.	April	2.4	2.2	10.0
5.	May	2.9	2.6	9.9
6.	June	2.8	3.5	9.4
7.	July	3.6	3.5	8.3
8.	August	3.1	2.4	6.7
9.	September	1.5	1.5	5.9
10.	October	0.8	0.7	4.9
11.	November	0.6	0.4	4.5
12.	December	0.4	0.4	5.0

Source: Pakistan Meteorological Department

Graphical representations of month-wise wind speed Airport meteorological gauging station is provided below in Figure 4.8.

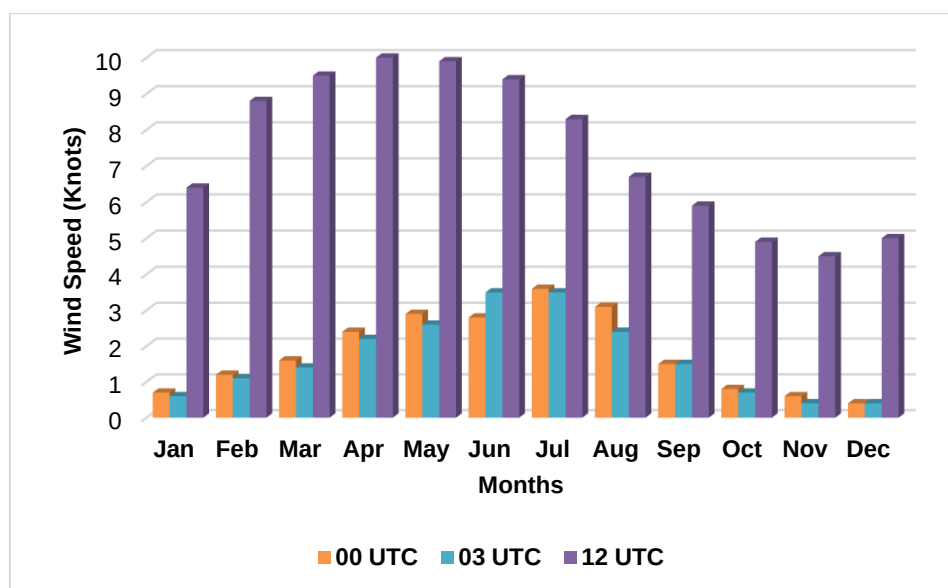


Figure 4-8: Wind Speed of Airport Meteorological Gauging Station

The maximum wind speed recorded at Airport weather station is 10.0 knots in the month of April and the minimum wind speed is 4.5 knots in the month of November at 12 UTC.

4.3.9 Climate Change Impacts and Vulnerability

The rainfall and temperature pattern of any particular area plays significant role in defining the design layout and parameters of road infrastructure. Based on long term regime analysis, any significant variation in the rainfall and/ or temperature may also be explored in terms of any possible climate change scenario. However, data accuracy or redundancy were analyzed

before undertaking any such regime analysis. The area falls in the climatic zone where mostly flows are emerging from upstream upland of Murree Hills, passing through Islamabad, Rawalpindi having high rainfalls and some part of Attock District with relatively mild rainfalls. The average monthly rainfall pattern shows that July to September (monsoon period) are the months having maximum rainfall during the year. Whereas the average monthly temperature shows the months of highest temperature as May to August (35 to 40°C) whereas the lowest temperatures (winter season) are December to February as 2 to 5°C.

4.3.10 Water Resources

In barani region of Rawalpindi district, small dams have been an important source for drinking water, fish farming and irrigation, built on perennial and non-perennial streams to capture seasonal runoff. Khalasa (at a distance of 1.3 km approx.), Chahan (at a distance of 5 km approx.) and Jawa (at a distance of 1.4 km approx.) dams are main dams near the proposed alignment. Moreover, Soan River and Sill River are crossing through the Project Area.

4.3.11 Hydrology and Drainage

The Study Area falls in humid subtropical region. The land use changes from mild slope eroded lands to mix cultural lands under arid conditions. The proposed alignment crosses the Soan River, a tributary of Indus River, carrying flood water from upland areas of Murree, Kahuta and Lei Nullah.

Nullah Lai has three major tributaries (Saidpur Kas, Tenawali Kas, and Bedarawali Kas) in the administrative jurisdiction of Islamabad. In the jurisdiction of Rawalpindi below Katarian Bridge, other three major tributaries (Nikki Lai, Pir Wadhai Kas, and Dhoke Ratta Nullah) fall into the Nullah Lai. In addition, there are six other drainage channels joining the Nullah after the Dhoke Ratta and finally the Nullah falls down in the Soan River.

Nullah Lai basin drains a total area of 235 km² south of Margalla Hills, with 70% of the watershed falling within the territory of Islamabad and the remaining 30% within the downstream Rawalpindi municipal and cantonment limits. Stretching from the Margalla hills in the federal capital Islamabad at north-western edge until the Soan River at south-eastern edge in the District Rawalpindi the maximum length of the Lai Nullah does not exceed 45 km.

The hydraulic analysis provided that all the major rivers are functioning as per design discharges with sufficient conveyance capacity. At most of the bridges no significant scour problem was observed and the canals crossings were noticed satisfactorily in operation. The guide banks and allied protective structures should be maintained regularly to avoid any unprecedented event due to high flood conditions.

The surface hydrological map of the proposed project area is shown in Figure 4.9.

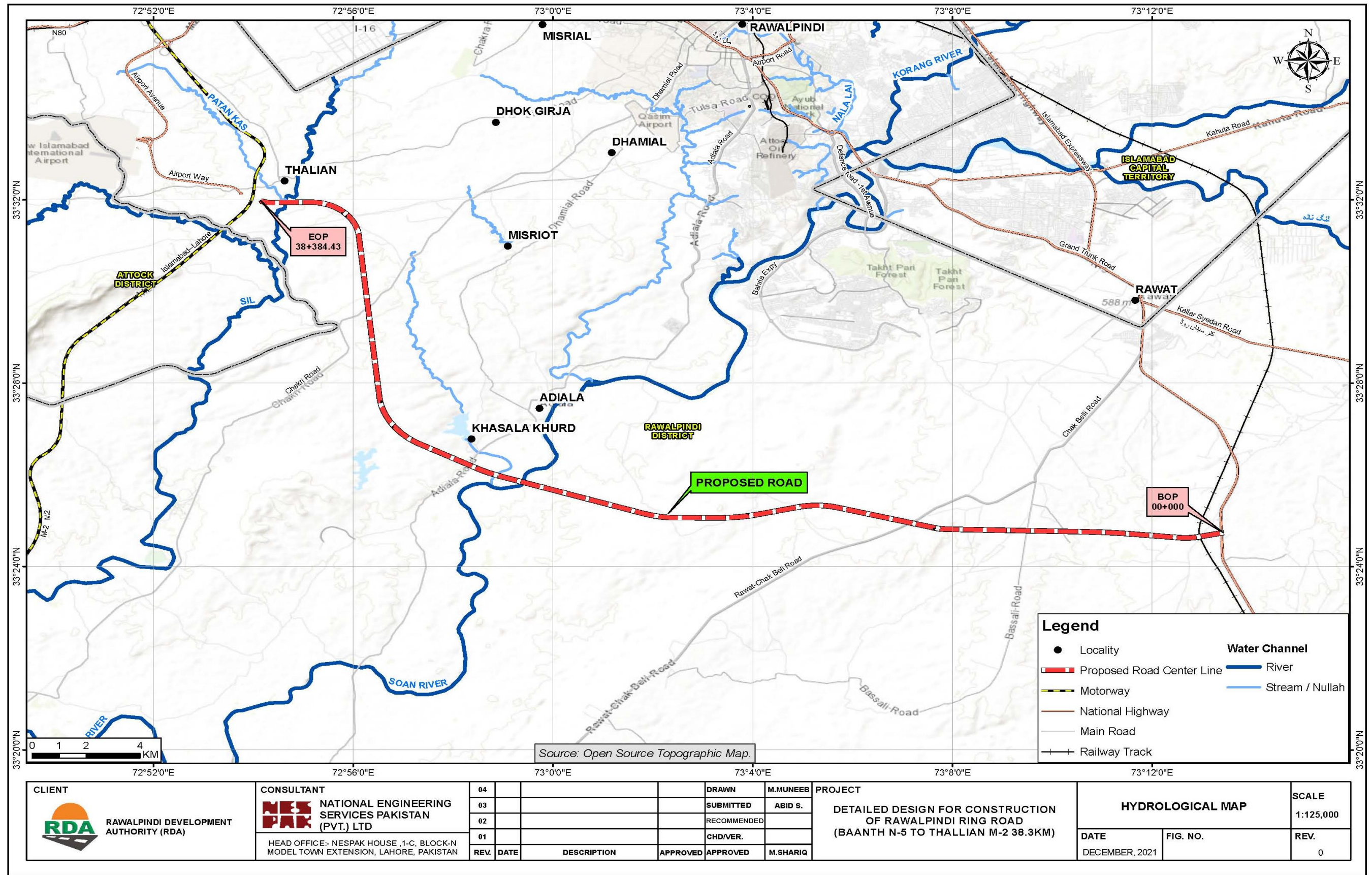


Figure 4-9: Surface Hydrological Map

4.3.12 Solid Waste and Wastewater Situation

In Rawalpindi city, proper solid waste management system and sewerage system exist. However, in rural areas, there is no proper sewerage and sanitation system available in the COI. A few villages of the COI were observed to be connected with the proper sewerage system. In a majority of the cases, village's wastewater is disposed of into open spaces or nearby ponds. Ultimately, wastewater is drained into a pond/nullah, thus it becomes a source of pollution. Same is the case with solid waste there is no proper arrangement for disposed of solid waste. Most of the solid waste is found to be stored in the form of heaps at various locations near the villages. The remaining organic and livestock waste is collected in the designated area which is used to prepare compost utilized by local farmers in their agriculture fields as a fertilizer. The major constituents of solid waste in the area are paper, plastic, and organic waste (food waste and animal waste) and waste from the existing nearby houses.

4.3.13 Environmental Monitoring, Sampling and Testing for Proposed Project

In order to determine the ambient air, background noise levels, water and surface water /wastewater quality of the study area different locations were selected in or near the RoW. The sampling locations for the environmental monitoring of ambient air, noise and water for proposed project is shown in Figure 4.10. Detailed environmental monitoring, sampling and testing report is attached as Annex-I.

Four (04) surface water/ wastewater and four (04) drinking water/groundwater have been collected. Similarly, four (04) points have been selected for ambient air and background noise monitoring at site. The work for external monitoring and testing was awarded to an EPA approved environmental laboratory i.e. M/S Pak Green Enviro-Engineering Pvt. Ltd. The details of monitoring points are provided in Table 4.6 below:

Table 4-6: Environmental Monitoring, Sampling and Testing Points

Sr. No.	Surface Water / Wastewater	Drinking Water / Ground Water	Ambient Air & Noise	Remarks
1.	SW/WW1 Wadala Kas Drain	----	----	All parameters are Within Prescribed Limits of PEQS, 2016.
2.	---	---	A&N -1 Baanth Near Railway Line	All parameters of ambient air and noise levels are within prescribed limits of PEQS, 2016 except PM _{2.5} .
3.	---	---	A&N-2 Near Mandhaal Mosque	All parameters of ambient air and noise levels are within prescribed limits of PEQS, 2016 except PM _{2.5} .
4.		DW/GW-1 Baanth	---	All parameters are Within Prescribed Limits of PEQS, 2016 except Phenolic Compound (As Phenol).
5.	---	---	A&N -3 Near PTCL Exchange Khasala Khurd	All parameters of ambient air and noise levels are within prescribed limits of PEQS, 2016 except PM _{2.5} .

Sr. No.	Surface Water / Wastewater	Drinking Water / Ground Water	Ambient Air & Noise	Remarks
6.	---	DW/GW-2 Mandhaal Mosque	---	All parameters are Within Prescribed Limits of PEQS, 2016 except Phenolic Compound (As Phenol).
7.	SW/WW-2 Chakri Kas Drain	---	---	All parameters are Within Prescribed Limits of PEQS, 2016.
8.			A&N -4 Near Thallian Motorway Toll Plaza	All parameters of ambient air and noise levels are within prescribed limits of PEQS, 2016 except PM _{2.5} .
9.	SW/WW-3 Soan River	---	---	All parameters are Within Prescribed Limits of PEQS, 2016..
10.	---	DW/GW-3 Near PTCL Exchange Khasala Khurd	---	All parameters are Within Prescribed Limits of PEQS, 2016 except Phenolic Compound (As Phenol).
11.	SW/WW-4 Sill River	---	---	All parameters are Within Prescribed Limits of PEQS, 2016 except BOD ₅ .
12.		DW/GW-4 Thallian Motorway Toll Plaza		All parameters are Within Prescribed Limits of PEQS, 2016 except Phenolic Compound (As Phenol).
Total	4	4	4	

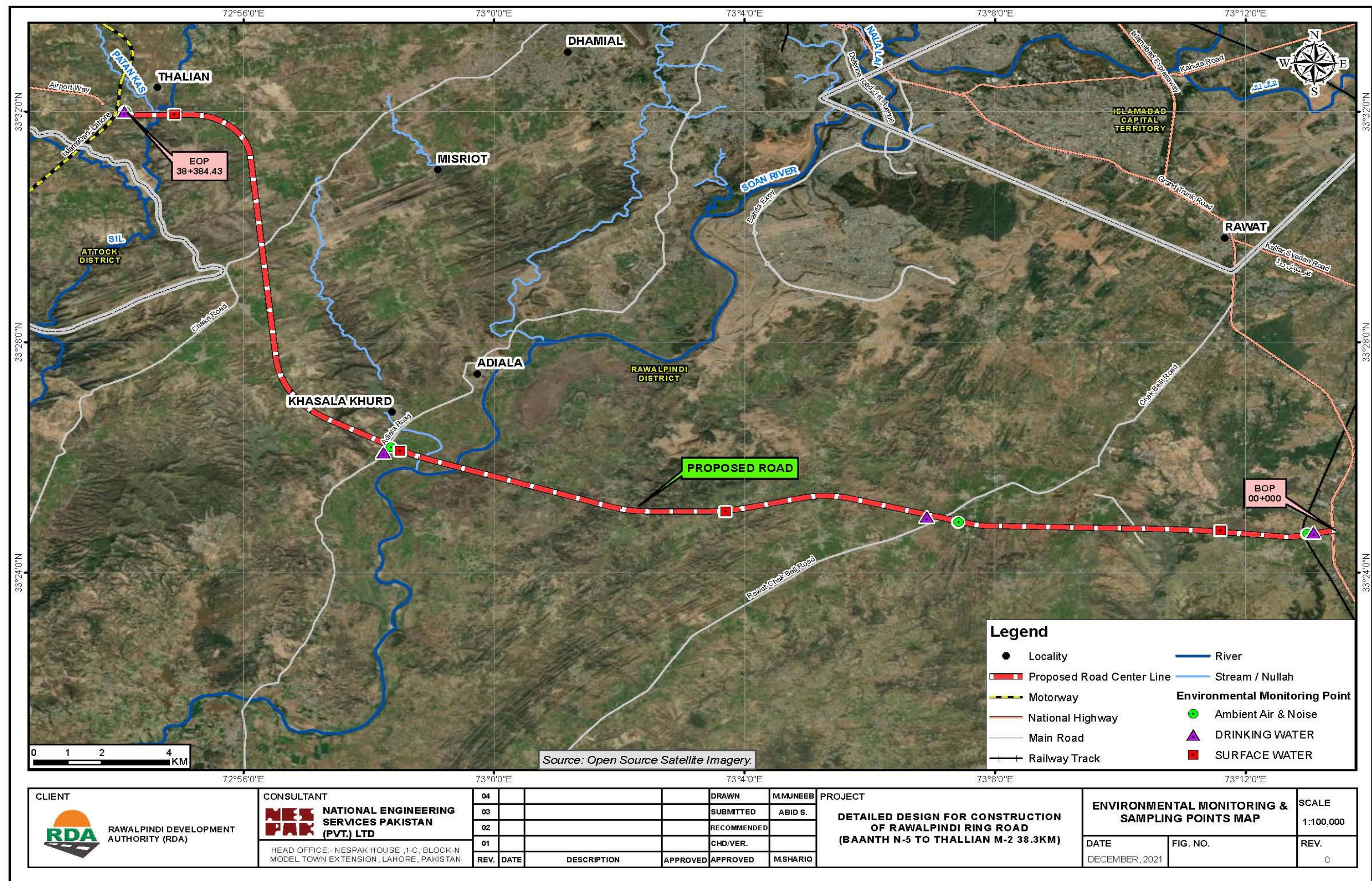


Figure 4-10: Environmental Monitoring & Sampling Points Location Map

4.3.14 Landuse of the Proposed Project

There are different types of landuse i.e. barren / open, built-up, cultivated land, graveyards, green belt, railway track, rivers, road/track, stream/ nullah, residential and commercial details structures, trees/ bushes and water ponds etc. Some scattered houses as well as densely populated houses have also been observed along the entire alignment of the project area.

Landuse of the proposed Project is based on the GIS. Index Landuse map of the Col and RoW is shown in Figure 4.11 and details are given in Table 4.7, whereas detailed maps are provided as Annex-II.

Table 4-7: Summary of Landuse in the Col and RoW

Sr. No.	Landuse Type	Area (Acres)	
		COI	RoW
1	Barren / Open Area	101.40	316.14
2	Builtup Area	6.79	11.4
3	Cultivated Land	148.79	480.45
4	Graveyard	1.27	2.31
5	Green Belt	0.184	1.38
7	Railway Track	0.033	0.097
8	River	0.94	2.54
9	Road / Track	4.15	21.2
10	Stream / Nullah	0.211	0.55
11	Structure	0.912	1.7
12	Trees / Bushes	40.02	115.8
13	Water Pond	0.19	0.47
Total Area		30.4.9	954.34

4.3.15 Environmental Sensitive Receptor of the Proposed Project

Sensitive receptors are people/places more susceptible to the adverse effects of exposure to the pollutants and social disturbance, due to the developmental projects. Thus, sensitive receptors are necessary to be identified, to evaluate the potential impacts of the proposed project on public health and the environment and adopt necessary mitigation measures to minimize the impact.

The sensitive receptors identified for the proposed project within or near the Col are religious and cultural places etc. They are prone to sensitivity during construction phase, due to emission of air pollutants, noise and vibration, traffic jams/access, temporary edifice of construction camps, and mobilization issues. The map of sensitive receptors of the study area is shown in Figure 4.12, whereas stretch wise maps are provided in Annex-III

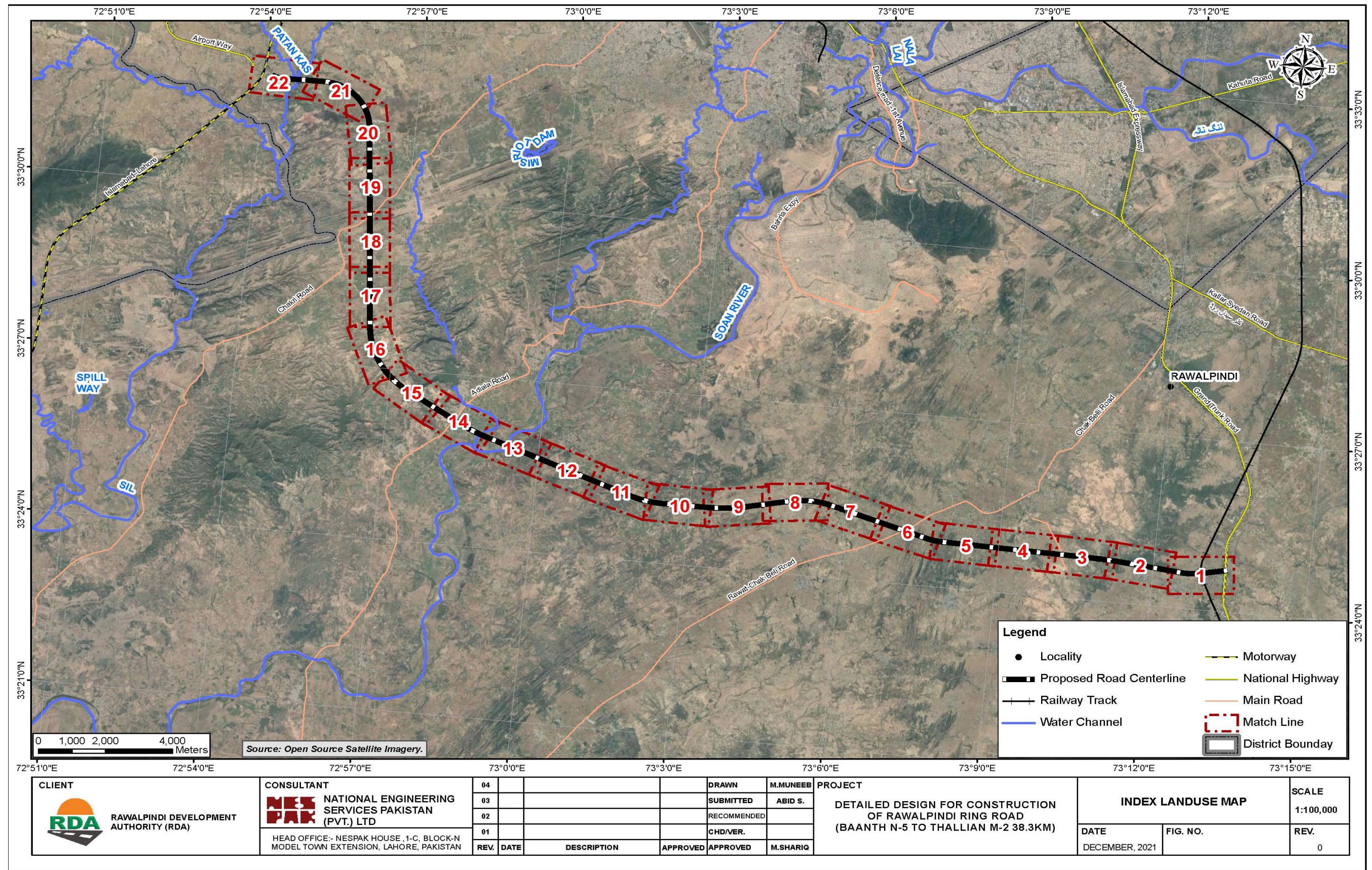


Figure 4-11: Index Landuse Map

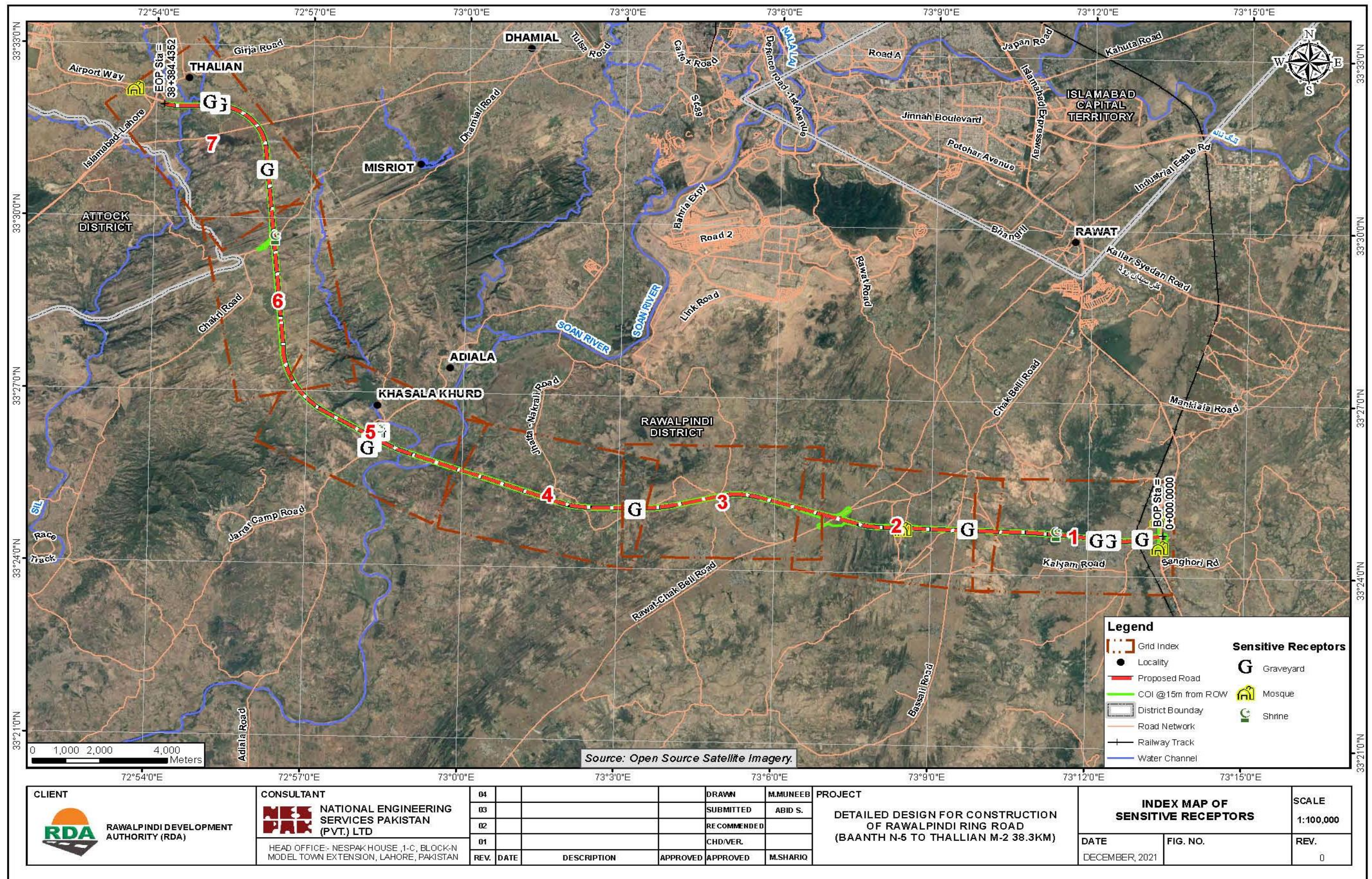


Figure 4-12: Environmental Sensitive Receptors Map

4.4 ECOLOGICAL ENVIRONMENT

4.4.1 Methodology

All the available literature was thoroughly reviewed to have a better understanding of the project area and its surroundings including habitat, flora and fauna. The route alignment was thoroughly examined based on the primary and secondary (Flora of Pakistan-MI-Sheikh, Birds of Pakistan-ZB-Mirza-Mammals of Pakistan-TJ Roberts, Previous EIAs of the proposed area, Manual of silviculture for Pakistan [1965] Champion, Sir H.G.; Pakistan Forest Inst., Peshawar eng; Seth, S.K. Khattak, G.M.) data. The stakeholder Forest, Wildlife, EPA, Fisheries and Agricultural departments were also consulted. This survey broadly covers ecosystem sensitivities (If any), vegetation, other flora and fauna. Number of trees along RoW/Col and in the project vicinity was recorded which includes, majorly pole crops.

4.4.2 Ecosystem

The climate of the project area has a typical version of humid subtropical and dry climate, with five seasons. The study area majorly lies in sub-tropical scrub zone. The dominant trees species of this natural zone are, Kau (*Olea ferruginea*), Phulai (*Acacia modesta*) and sanatha (*Dodonaea viscosa*).

In order to improve the landscape and living environment of the Rawalpindi traits like color or blossom, shade, form or shape, scent and free from disease and nuisance are considered during the selection of trees and shrubs for given location. So, the study area in general is under significant biotic pressure and under retrogression due to various factors such as unsustainable practices, Natural hazards causing the habitat loss, soil erosion and lack of proper functioning of ecosystems. Areas have been accessible to humans for a long time resulting in low diversity and wildlife abundance.

Moreover, the proposed project line is under degradation and cutting of trees, over grazing, over exploitation and other biotic factors. The most important thing to consider is the construction of houses above, below and in the middle of the mountainous terrain which clearly indicates that human accessibility is everywhere which is the main reason of the habitat loss.

In the past the area was covered with huge amount of ground vegetation and dominated trees but now the conditions are at the adverse side because the original or natural habitat has been modified and converted into barren land for construction and for agricultural purposes (said by forest officials).

Species diversity is considered to be an indicator of the health of an ecosystem (McGard-Steed and Morin, 2000). Variation in diversity is among the tools that is caused due to climate, heterogeneity, biotic interaction and habitat. The project area is populated mostly by Shisham (*Dalbergia sisso*), Sanatha (*Dodonaea viscosa*), Olive (*Olea ferruginea*) and Phulai (*Acacia modesta*). Shisham grow vigorously and dominated in all parts of the project area. The site predominantly used for agriculture with field boundaries. Soan and Sil River along with several

streams flow in Study Area. The site is bordered eastern and western side by residential properties, along with agricultural area. Vegetation in area is scattered having several water ponds.

a) Flora

As climate of study area is subtropical, the vegetation of the area falls under subtropical broad leaved evergreen scrub type as per phyto-geographical classification of the area. The tract, in which the project site exists, was once covered with native vegetation consisting, of trees and thick cover of bushy vegetation, with the onslaught of civilization, this vegetation was cleared for agricultural purposes.

As the project area is part of the Potohar plateau, the vegetation is characteristic of that tract. Kau (*Olea cuspidata*) is the climax species. However in the project and the study area, Phulahi (*Acacia modesta*) and Kikar (*Acacia nilotica*) dominate. Shisham (*Dalbergia sissoo*), Mesquit (*Prosopis juliflora*) and Paper Mulberry (*Broussonetia papyrifera*) have also grown as secondary species with Phulahi. With the onslaught of civilization and urbanization of the tract, the original vegetation in and around the tract was removed and replaced by agricultural lands, which is the dominant land use in the tract.

The Project site is proposed construction of road. The present ecological conditions of the project area are fallen in the category of agricultural and degraded land. The project area is designated as agriculture area, so no green developmental activates were considered in the past to improve its ecological balance in the targeted area.

Sub-Tropical Broad-Leaved Evergreen Scrub Forest

These are characterized by winter and spring rains, and dry hot summers. Mean annual rainfall is 250 mm-750 mm and mean annual temperature is 18 °C-24 °C. Dominant tree species include Phulai (*Acacia modesta*), Wild olive (*Olea ferruginea*), Sanatha (*Dodonea viscosa*), Black berries (*Monotheca buxifolia*), Reptonia *buxifolia*, Beri (*Zizyphus numularia*), Gymnosporia royleana, Baikarh (*Adhatoda vasica*), Pistacia integerrima, Tecoma undulate, and Capparis decidua on drier slopes. These are low branching small evergreen trees with varying densities. Some of these tree species are thorny. Most of these tree and shrub species produce substantial feed and fodder for wildlife and livestock.

Floristic Composition

The study study area falls in sub-tropical broad leaved evergreen scrub forest zone. Dominant tree species, include Phulai (*Acacia modesta*), Wild olive (*Olea ferruginea*), Sanatha (*Dodonea viscosa*), Black berries (*Monotheca buxifolia*), Reptonia *buxifolia*, Beri (*Zizyphus mauritiana*), Royle's Spike Thorn (*Gymnosporia royleana*), Baikarh (*Adhatoda vasica*), Zebrawood (*Pistacia integerrima*), Tecoma undulate, and Capparis decidua on drier slopes. These are low branching small evergreen trees with varying densities. Some of these tree

species are thorny. Most of these tree and shrub species produce substantial feed and fodder for wildlife and livestock.

As undergrowth, underneath or between the small trees there are a number of common shrubs such as *Dodonaea viscosa* (sanatha), *Adhatoda vasica* (bhekar), *Otostegia limbata* (awani booti) and *Carissa opaca* (granda). *Dalbergia sissoo* (shisham or tali) is the most valuable tree for furniture and is common both in wild and cultivated form.

These forests types have been subjected to heavy felling and lopping as well as excessive grazing in the past and are now found in degraded condition. These forests occur at height of. The indigenous species are mainly, Phulai and Sanatha, whereas, Poplar, Shisham and mulberry etc. are found in Study Area. The detail of vegetative species of the region are given in Table 4.8 below:

Table 4-8: Names of Trees/shrubs & Herbs of the Region

Sr. No.	Common Name	Scientific Name
1	Banyan/Bhor	<i>Ficus benghalensis</i>
1	Phulai	<i>Acacia modesta</i>
2	Wild olive	<i>Olea ferruginea</i>
3	Sanatha	<i>Dodonaea viscosa</i>
4	Dhak	<i>Butea frondosa</i>
5	Anar	<i>Punica granatum</i>
6	Pear	<i>Pyrus pasha</i>
7	Sukh Chain	<i>Pongamia pinnata</i>
8	Amaltas	<i>Cassia fistula</i>
9	Bottle Brush	<i>Callistemon spp</i>
10	Jasmine	<i>Jasminum humile</i>
11	Holmskioldia	<i>Holmskioldia sanguine</i>
12	Beri	<i>Zizyphus mauritiana</i>
13	Royle's Spike Thorn	<i>Gymnosporia royleana</i>
14	Baikarh	<i>Adhatoda vasica</i>
15	Zebrawood	<i>Pistacia integerrima</i>
16	Poplar	<i>Populus sp.</i>
17	Devil tree	<i>Alstonia scholaris</i>
18	Bougainvillea	<i>Bougainvillea spectabilis</i>
19	Sukh chain	<i>Pongamia pinnata</i>
20	Dharek	<i>Melia azedarach</i>
21	Eucalyptus	<i>Eucalyptus camaldulensis</i>

Agriculture and Crop Pattern

Major portion of the tract forming the project area, nearly fifty four percent (54%) is under agriculture which is predominantly rainfed (Barani). However, the valley lands which are irrigated through tube wells or small dams are fertile and productive. A majority of population is linked with agriculture sector, being the most significant economic parameter for their livelihood. The land in the project area is mostly fertile and suitable for the growth of crops, vegetables and fruits.

Agricultural holdings are small and average is about 5 to 10 Kanals per family. There are generally two crops in a year. Rabi crop is followed by a Kharif crop, and then the land lies fallow for a year until the Rabi sowing. This system is locally known as Do-Fasli Do-Sala. Wheat, bajra and maize are the common crops. Principal crop during Rabi is wheat and Jawar, maize and fodder are the main crops of Kharif. There are no fruit orchards in the project area. Apart from the wheat crops, whatever area is available is used for growing fodder crops for stall feeding of livestock.

The people of this area, do not generally take much pains in crop husbandry, because of the relative!):' unfavorable conditions for agriculture. The cultivators generally content themselves with sowing the seeds broadcast after shallow ploughing and leave the rest to Nature. The use of improved agricultural implements and fertilizers is not very common except for cash crops like potatoes and orchards.

b) Fauna/Wildlife

The project area, on account of nature of vegetation and topography, once rich in vegetation and wildlife has now reduced its potential due to over hunting, loss of proper habitat, conversion of forest land. The wild mammals were not spotted commonly. However, domestic mammals were found to be common in Study Area. Fauna of the tract consists of mammals, reptiles, amphibians and birds. The details are given as under

c) Mammals

The study was once considered as good habitat to many wild species but due expansion of population and commercialization the habitats of many species are decaled as degraded.

However, there is no wild mammalian specie observed in the Project area except some domesticated animals including cats, dogs, etc. However, the following Table 4.9 shows the list of mammalian species present in the region, as the project area is to be considered highly degraded in terms of wild fauna. Jackals are quite common. Foxes are also common, and the piercing bark of the fox is usually heard in the hills. Wild boars are quite common. Hares are to be found on all the low hills and in most of the ravines.

Table 4-9: List of indigenous Mammals

Sr. No.	Mammals	Scientific Name
4	Jackal	<i>Canis aureus</i>
5	Fox	<i>Vulpes vulpes</i>
6	Jungle Cat	<i>Felis chaus</i>
7	Palm Squirrel	<i>Funambulus palmarum</i>
8	Mongoose	<i>Herpestes auropunctatus</i>
9	Indian mole rat	<i>Rattus rattus</i>
10	Field mouse	<i>Funambulus pennant</i>
11	Porcupine	<i>Hystrix indica</i>
12	Rabbit	<i>Oryctolagus cuniculus</i>

Sr. No.	Mammals	Scientific Name
13	Cape hare	<i>Lepus capensis</i>
14	Masked palm civet	<i>Paguma larvata</i>
15	Wild boar	<i>Sus scrofa</i>

d) Amphibians

The amphibians that are found near or around the Project area are given in the Table 4.10 below.

Table 4-10: Amphibians of the Study Area

Sr. No.	Local/ English Name	Scientific Name
1	Common frog	<i>Rana tigrine</i>
2	Common toad	<i>Bufo bufo</i>
3	Marble frog	<i>Uperodon systoma</i>

e) Reptiles

The study supports a good variety of reptiles. In project area, the most common reptile that is worth mentioning and is occasionally witnessed by the hikers is Monitor Lizard. These are generally large reptiles, although some can be as small as 12 centimeters in length. They have long necks, powerful tails and claws, and well-developed limbs.

The reptiles that are found near or around the Study Area are given in the Table 4.11

Table 4-11: Reptiles of the Study Area

Sr. No.	Local/ English Name	Scientific Name
1	Fringed toed Lizard	<i>Acanthodactylus cantoris</i>
2	Spiny tailed Lizard	<i>Uromastix hardwickii</i>
3	Common Krait	<i>Bungarus caeruleus</i>
4	King Cobra	<i>Ophiophagus Hannah</i>
5	Viper	<i>Vipera xanthina</i>

f) Birds – Avifauna

Many bird species have been reported in and around the Study Area. These include passage migrants, vagrant, resident, breeding and irregular visitors. The migratory birds descend from higher altitudes during the winter months. Avifauna of the tract consists of small and medium sized birds of different colors, flying from one tree to the other or from crop to crop. Most common birds are House Sparrow, House Crow and Mynah. Birds like Cuckoo, Bulbul, Hoopoe, Parrots, Blue Birds, and Little Egrets etc were frequently sighted. The common birds observed and reported in the Study Area are given in Table 4.12 below:

Table 4-12: Birds Found in Study Area

Sr. No.	Common Name	Scientific Name
1	Rock Pigeon	<i>Columba livia</i>
2	Myna	<i>Acrida thestritis</i>
3	Grey Partridge	<i>Perdix perdix</i>
4	House Sparrow	<i>Passer domesticus</i>
5	Red-billed chough	<i>Pyrrhocorax pyrrhocorax</i>
6	Magpie	<i>Pica pica</i>
7	Alpine Chough	<i>Pyrrhocorax graculus</i>
8	Grey shrikes	<i>Lanius excubitor</i>
9	Spotted doves	<i>Spilopelia chinensis</i>

Fisheries

Many developing and developed countries are facing degradation of freshwater resources over the last decades up to an alarming situation mainly due to rapid regional development especially in underdeveloped countries and agricultural runoff from fields containing fertilizers and pesticides. The use of agricultural chemical manures and municipal water influence the water quality significantly.

The people frequently suffer from waterborne diseases because of using contaminated drinking water. About 30% of all reported diseases and 40% of deaths in the Pakistan are attributed to fecal contamination of drinking waters. In Pakistan, the main causes of waterborne diseases are contaminated drinking water, lack of sanitary facilities at treatment plants, and release of industrial effluents and domestic sewage into the water bodies.

The Soan River is among those waterways where housing developments have been established along the banks. According to about 5.5 million residents of Rawalpindi/Islamabad discharge municipal sewage into the Soan River. Due to encroachment along the riverbanks, the ecosystem and surface runoff have drastically affected the pollution levels of the river. Due to the inadequate drainage of wastewater into the river, an excessive increase of heavy metals and nutrients in river water above the national standards has been observed Soan and Sil are two rivers that traverse through the Study Area.

River Soan is one of the important aquatic systems of the Punjab province in Pakistan and flows into Indus River near Kalla Bagh (District Mianwali). There are several kinds of fish found in these rivers. Rahu, Mari, Thaila, Gulfam and Daulafish can be found in the upper reaches of the Soan River. No fish was found in ponds of the Study Area.

It was recommended by the official of Fisheries department Rawalpindi that during design especially in bridges special care must be taken to avoid blockade of water and to ensure smooth water and fish flow by provided steps and other appropriate structures in Soan River as the river is providing grounds to aquatic regeneration so, it is strongly recommended that design engineers should consult itself to Fisheries department for the purpose of discussion regarding the design parameter to safeguard the soan river ecosystem.

g) Wetlands

There are no designated wetlands in falling in the project area.

h) Protected Areas (Game Reserves/ Wildlife Sanctuaries/Reserve Forests)

There is no Game Reserve, Reserve Forests and wild sanctuaries reported in the project alignment. Further the forests located near the project area are listed in Table 4.13. However, no impact is anticipated due to the proposed interventions as the project area is far away from the boundary of below listed forests.

Table 4-13: Forests Located Near the Project Area

Sr. No.	Name	Area (Acre)
1	Takhar Pari Forest	2,210
2	Khairi Murat Reserved Forest	12,680
3	Dhungi Reserved Forest	4,746
4	Adiala Reserved Forest	1,330

4.5 SOCIAL ENVIRONMENT

This section deals with the social conditions of the Project Area. During the desk/ office study, available reports/ documents were comprehensively studied. During the field survey interviews and meetings with the local residents, shopkeepers, students, pedestrians, Govt. employees and retire official of different departments, drivers (taxi, rickshaw, wagon etc.), were held and observations were also recorded after giving due consideration during survey.

4.5.1 Political and Administrative Setup

The proposed project area falls in the administrative jurisdiction of Tehsil Rawalpindi of the Rawalpindi District. The Tehsil administration is under the Tehsil Municipal Administration (TMA). The Cantonment Board is looked after administratively by Cantonment Executive Officer (CEO). The total area of the District Rawalpindi is 5,285 square kilometers out of which Tehsil Rawalpindi covers a total area of 1682 square kilometers.

4.5.2 Demographic Characteristics of the Project Area

According to Census of 2017 the population of Rawalpindi District is 5,405,633 with an average annual growth rate of 2.52 percent from 1998 to 2017. The male population of District is more than the female population. Out of the total population, 50.72 percent are males and 49.28 percent are females and the sex ratio of the district is 102.96. According to census report 2017, the average household size for the district is 6.08 persons.



4.5.2.1 Rural and Urban Distributions

According to DCR Rawalpindi 1998, the urban population is 1,788,273 or 53.2 percent of the total population of the district which grew at an average rate of 3.5 percent during 1981-98. There are one Municipal Corporation, Three municipal committee, four cantonments and two town committees. There are 1164 Mouzas (a smallest revenue unit) in 1998 of which 34 had population over five thousand, 161 had 2 to 5 thousand, 300 had 1 to 2 thousand, 568 had under 1 thousand persons while 101 were un-inhabited. Project area entirely falls in rural area of tehsil Gujjar khan & Rawalpindi of Rawalpindi district.

According to Census of 2017, the major portion of the district falls in the urban area having population of 2,875,516 constituting 53.19 percent of the total population, while the rural population of the district is 2,530,117 constituting 46.79 percent of the total population with number of households of 470,588 and 418,177 respectively.

4.5.2.2 Religion

The population of the Rawalpindi District of which the Project Area is an integral part is predominantly Muslim i.e. 97.72 percent. The next higher proportion is that of Christians with 2.11 percent. While other minorities like Ahmadis, Hindus, etc. also live in very small numbers. The population of the project area is also predominantly Muslims. **(DCR Rawalpindi, 1998)**

4.5.2.3 Ethnic Structure

One of the important races and tribes living in the Rawalpindi District are the Rajputs, amongst whom the important sub-divisions are Bhatti, Rawal, Janjua, and Chohans. People of the District Rawalpindi are well built and of medium height and are considered to be among best soldiers in the Pakistan Army. The main castes of population in the settlements of the Project area are Arrain, Syed, Pathan, Jat, Sheikh, Gujjar, Awan, Rajput, Jatun, Butt, Komboh, Raja, Mughal, Khokhar, and Qureshi etc.

4.5.2.4 Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by majority of the population of the district i.e. Rawalpindi followed by Urdu, Pashto, Hindko and Pothohari etc

4.5.2.5 Sex Ratio

Sex ratio, i.e. number of males for every 100 females, was 102.96 per cent recorded in 2017 Census. The ratio was 99.60 per cent in rural areas and 106.01 in urban areas.

4.5.2.6 Migration

The total number of life time in migrants in Rawalpindi district were 710,804 or 21.1 per cent of population of the district, of the total life time in migrants 635,542 persons are settled in the towns. Of total district migrants 52.6 per cent came from Punjab, 28.7 per cent were from Sindh, KPK and Baluchistan. 12.2 per cent from Azad Kashmir and Northern Areas while remaining 6.0 per cent were Pakistanis who repatriated from other countries. There are only 0.5 per cent cases of migrants whose birth place is not reported.

4.6 ECONOMIC CONDITIONS

4.6.1 Economical Active Population

The economically active population is defined here as the persons working, most of the time during the year preceding the census date March 1998 looking for work, laid off and unpaid families helper assisting their family. The economically active population as enumerated in the last census was 21.9 per cent of the total population or 29.4 per cent of the population 10 years and over i.e. the population exposed to the risk of entering the economically active life at any time. Of the total male population 41.4 per cent were economically active, while 58.6 per cent not economically active 25.5 per cent children under ten years, 22.1 per cent students, 2.1 per cent domestic workers while 8.9 per cent were land lords.

4.6.2 Unemployment

Unemployment rate is measured as ratio of looking for work and laid off in total economically active population comprising employed, looking for work, laid off and un paid family helpers, generally representing in percentage. The unemployment rate in the district was 21.1 per cent which was mainly due to unemployment amongst male representing 21.8 per cent. While unemployment rate among women was just 0.9 per cent. This is because of their small proportion in their total economically active population. The unemployment rate was almost three times higher in rural as compared to urban areas representing 36.0 and 11.9 per cent respectively.

4.6.3 Occupations

Majority of the population of the Project area is running their own small level businesses like shops of furniture, carpet, ceramics, lights, auto shops, mechanic workshops, spare parts shops, cold drink shops and PCO's, hotels & restaurants, CNG stations, petrol pump, medical stores, health clinics, departmental stores, fishing shops etc. Beside this, the people of the project area also resort to labor jobs, while others go for government and private jobs in the Project Area.

4.6.4 Industry

This district is not famous for industrial goods like other districts. The progress has been mostly in the private sector. Apparently there is no shortage of skilled manpower. There are at present about 939 industrial units including Kohinoor Textile Mill, Wattan Woolen Hosiery Mill, Banday and Yousaf Textile mills etc. operating in the district.

4.6.5 Roads

Murree, a fine hill resort about 46 km from Rawalpindi is connected by an excellent metalled road. The system of communication in Rawalpindi Murree, Gujar Khan, Texila, Kotali Sattian, and Kahuta is very satisfactory. The district has total metal led road length of 1,146 km.

4.6.6 Railways

The main line of Pakistan Railways and the grand Trunk road parallel to the railway runs through the district from North and South from Rawalpindi to various sides such as Peshawar, Kohat, Mianwali, Faisalabad, Lahore and Karachi etc.

4.6.7 Educational Facilities

There are three (03) Universities (Fatima Jinnah Women University, PMAS-Arid Agriculture University and National University of Sciences and Technology), for males and females, 17 Degree Colleges, 27 Intermediate Colleges, 424 Secondary High Schools, 15 Higher Secondary Schools, 514 Middle Schools, 1888 Primary Schools, 3 Technical Training Institutions, and 391 Mosque Madras's working in the Rawalpindi District. In addition, there are also Rawalpindi Medical College, Army Medical College and Islamic International Medical College imparting education in the medical field.

In addition to these, Anjman Faiz-ul-Islam Model High School, Anjman Faiz-ul-Islam Technical Institute, Government Islamai Higher Secondary School, and Cane Public Primary School, St. Marry Cambridge School, Al-Sadique Public School, Beacon House School, Asif Public School, Degree College for women, Superior College Rawalpindi, Punjab Post graduate Institute of Poultry sciences, Rawalpindi Institute of Technology, and Arid Agriculture University are also available along the project corridor. For higher education, students have to move to colleges and other higher level educational institutions in the city.

4.6.8 Health Facilities

The major health facilities available in the District are Central Government Hospital, District Headquarter Hospital, Police Hospital, General Hospital Rawalpindi, Holy Family Hospital, T.B. Hospital, WAPDA Hospital, Central Jail Hospital, Pakistan Railway Hospital, Infectious Diseases Hospital. About 200 dispensaries are working in urban and rural areas of the District.

Likewise, Benazir Bhutto General Hospital and other Basic level private health facilities are also available in the communities. However, in case of serious ailments, people seek medical assistance from other hospitals in the city.

4.6.9 Archeological and Cultural Property/ Places of Interest

The most common physical and cultural heritage of District Rawalpindi is discussed as following:

i) Shrine

There is a shrine of Sufi saint Hazrat Syed Hassan Shah Bukhari in the city Saddar area. An annual “Urs” is also held at the shrine each year. A shrine of Shah di Talian is also observed. The number of participants in the “Urs” varies ranging from two hundred (200) to three hundred (300) people. In the project area a little number of shrines was also reported by people like Darbar Sain Ghulam Hussain, Baba Clyan Shraif, Baba Fazal Shah and Mander in Takhatparri village.

ii) Mosques

There are also small roadside mosques including Gulshan-e-Madina, Abu-Bakar, Bilal, Ghousia, Baba Fazal shah, Jamia Baanth, Jamia Bosalli, Jamia bhattian Noor Din & Doke Gujjrian, Jamia Maira Mohra, Masjid Qutab Ferozwal, Jamia Sain G. Hussai njamia umer and jamia usmania etc, along the entire stretch of the Project route. Those mosques have been constructed with mutual contributions of Government and the local residents of concerned communities.

iii) Graveyards

There are many local graveyards consisting of number of graves. The presence of shrines, mosques and graveyards has a very sensitive religious and cultural significance in our society.

iv) Recreational Site

The famous recreational sites in the city are Ayub National Park and Liaquat Memorial Park (Company Bagh).

4.7 IMPACT ASSESSMENT SURVEY OF THE PROJECT AREA

The information regarding impact assessment is derived from primary data collection. A social survey was carried out in the project area to identify the impacts and their magnitudes on the affected population. A sample of 96 respondents was taken on the basis of random sampling technique, which included project affected persons, local residents, Farmers, shop keepers, pedestrians, drivers, students, Govt employees etc. The purpose of this survey was to get responses about the perceived impacts and preferences towards the project implementation.

4.7.1 Survey Findings

Detailed findings of the survey comprising of different parameters are discussed in the following section.

A. Demographic Characteristics

About 96 respondents, comprising of local population along the project corridor were contacted to carry out socio economic baseline survey.

i. Sex Ratio of the Respondents

The sex ratio is proportional distribution of the sexes in a population aggregate, expressed as the number of males per 100 females. During the baseline survey, 96 respondents were interviewed, comprising 100% males due to some traditional restrictions in the project area.

ii. Age Composition

The demographic characteristics of the survey show Table 4.14 that 10% of the respondents were 15 to 25 years of age, 17% was between the age group of 26 to 35 years and 22% fall between the age group of 36 to 45 years. The vast majority of the respondents i.e., 51% were bearing up to 46 years of age and above of this age group. These age brackets of the respondent show that by and large respondents were mature enough to express their opinion/concerns about construction of ring road and foresee its impacts.

Table 4-14: Age Composition of the Respondents

Sr. No.	Age Composition	Number of Respondent	Percentage
1	15 – 25	10	10
2	26 – 35	16	17
3	36 – 45	21	22
4	46 and above	49	51
Total		96	100

The pie chart given below, (Figure 4.13) reflects the age composition of the respondents.

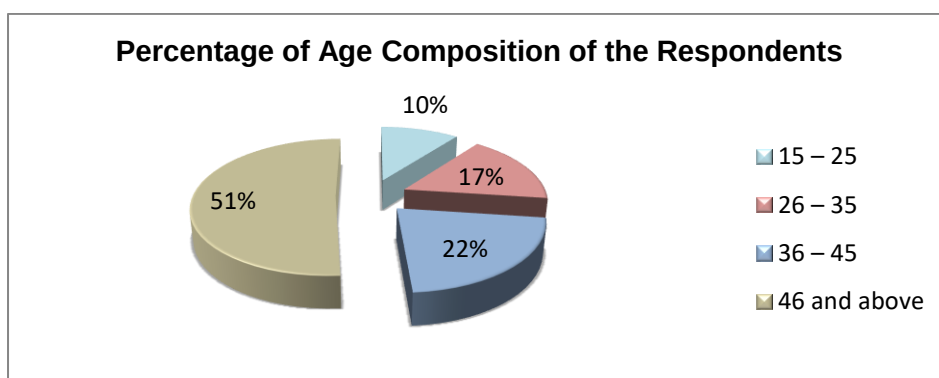


Figure 4-13: Age Composition of the Respondents

iii. Educational Level

Educational distribution of the respondents is shown in Table 4.15. The data in the table represents that only 10% of the respondents were illiterate. Contrary to this, 15% were educated up to primary level, 30% were with middle schooling, and 08% were matriculate. Whereas, 20% respondents were reported themselves intermediate level. While 17% of the respondents were found graduates and above. The graphical representation of educational status of project people is depicted in Figure 4.14 below;

Table 4-15: Educational Level of the Respondents

Sr. No.	Educational Level	Number of Respondent	Percentage
1	Illiterate	9	9
2	Primary	13	13
3	Middle	16	17
4	Matric	22	23
5	Intermediate	19	20
6	Graduation & above	17	18
Total		96	100

The pie chart given below shows the educational level of the respondents.

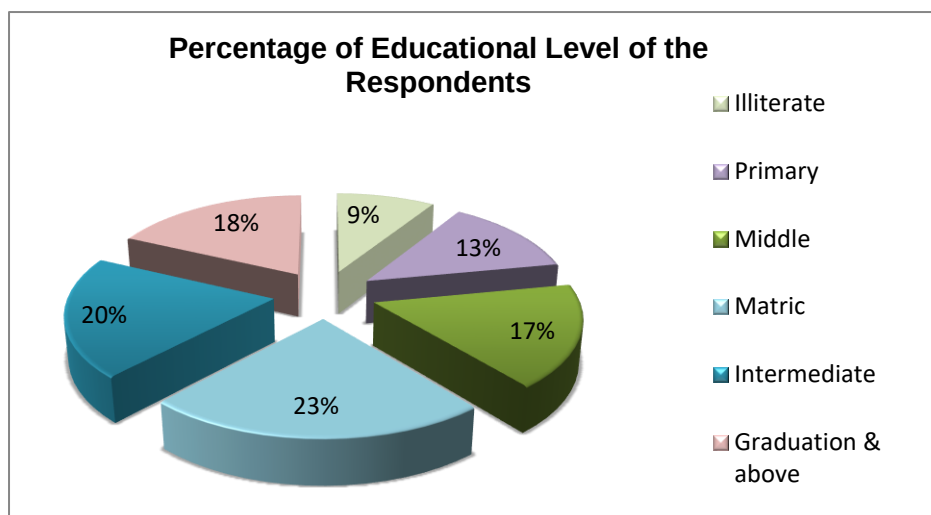


Figure 4-14: Educational Level of the Respondents

iv. Marital Status

The marital status of the sampled respondents was also inquired during the survey. About 64% of the respondents were married and 36% were unmarried. Details are given in Table 4.16.

Table 4-16: Marital Status of the Respondents

Sr. No.	Marital Status	Number of Respondent	Percentage
1	Married	61	64
2	Un-Married	35	36
Total		96	100

The pie chart given below (Figure 4.15) shows the marital status of the respondents.

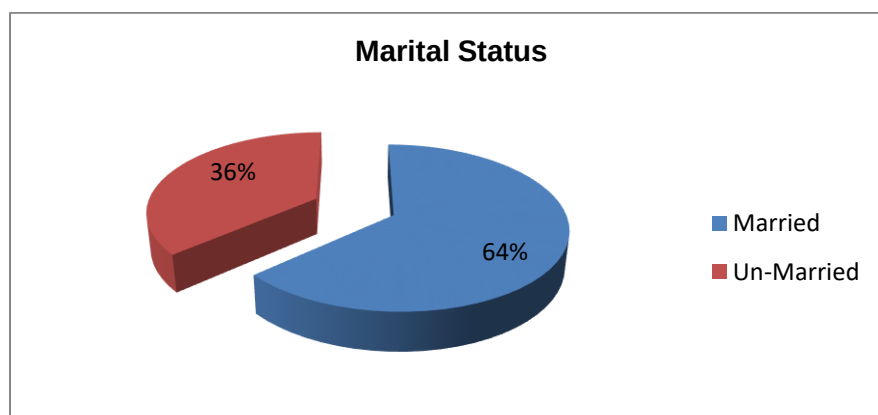


Figure 4-15: Marital Status of the Respondents

v. Occupation

Socioeconomic condition of the respondents was also studied during the field survey. About 13% of the respondents were running their own business or shops. While 19 percent were working as laborer at different places and workshops for earning their livelihoods and doing private jobs and 8% are students. A vast majority i.e 50% was involved in agriculture which is the main source of income. During survey, efforts were made to interact with the people representing all walks of life. The detailed statistics regarding occupational status of the respondents is presented in Table 4.17 given below. Figure 4.16 shows the graphical view of occupational status of the interviewed people in project area of influence.

Table 4-17: Occupation of the Respondents

Sr. No.	Profession	Number of Respondent	Percentage
1	Businessmen/ shopkeepers	12	13
2	Govt.Employee	10	10
3	Student	8	8
4	Private Job/Labour	18	19
5	Agriculture	48	50
Total		96	100

The occupational distribution of the respondents is given below in the form of pie chart.

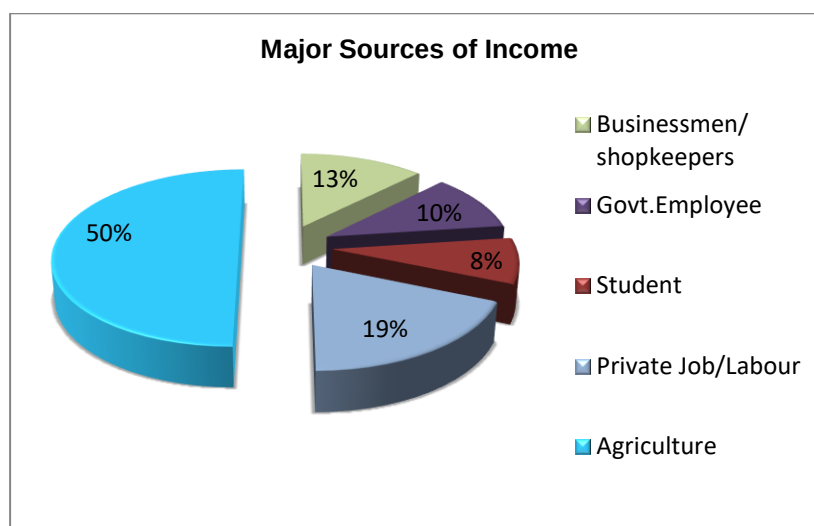


Figure 4-16: Occupation of the Respondents

vi. Religion

Respondents were asked about their religion status during the survey. Significant number of the respondents i.e. 100% were reported their religion Islam.

vii. Ethnic Structure

The most common ethnic groups found in project area as given below in Table 4.18. The field data shows that Syed were 23%, followed by Awan 32% while Rajpoot and Raja were 17 and 19% percent respectively. While 9% belongs to some other ethnic groups as reflected in given Figure 4.17 below;

Table 4-18: Ethnic Structure of the Respondents

Sr. No.	Ethnic Group	Number of Respondent	Percentage
1	Awan	31	32
2	Syed	22	23
3	Raja	18	19
4	Rajpoot	16	17
5	Others	9	9
Total		96	100

The Ethnic Group of the respondents is given below in the form of pie chart.

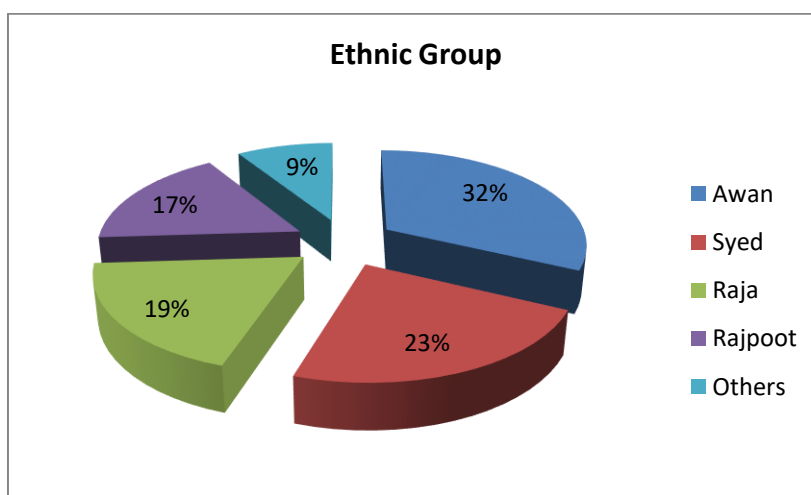


Figure 4-17: Ethnic structure of the Respondents

viii. Mother Tongue of the Respondents

Pothohari is the pre dominant language being spoken by 66% respondents of the project area. It was reported that 24% of the respondents speak Punjabi while 10% respondents speak Urdu language as shown in Table 4.19. The graphical representation of language spoken in the project area is depicted in Figure 4.18 below;

Table 4-19: Mother Tongue of the Respondents

Sr. No.	Language	Number of Respondent	Percentage
1	Punjabi	23	24

Sr. No.	Language	Number of Respondent	Percentage
2	Urdu	10	10
3	Pothohari	63	66
Total		96	100

The pie chart given below shows the language spoken by the respondents in project area.

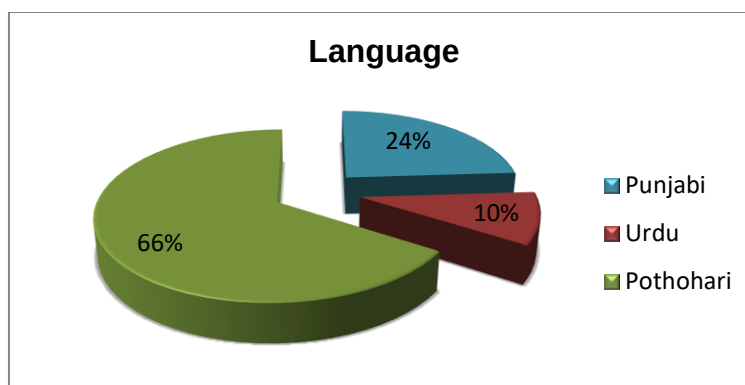


Figure 4-18: Mother Tongue of the Respondents

ix. Family System

About 85 percent of sampled population was living in joint family system where grandparents are also living under same roof and 15 percent respondents reported as nuclear family system. The detail is shown in Table 4.20 below;

Table 4-20: Family Structure

Sr. No.	Family Structure	Number of Respondent	Percentage
1	Joint	82	85
2	Nuclear	14	15
Total		96	100

The pie chart given below (Figure 4.19) shows the family structure of the respondents.

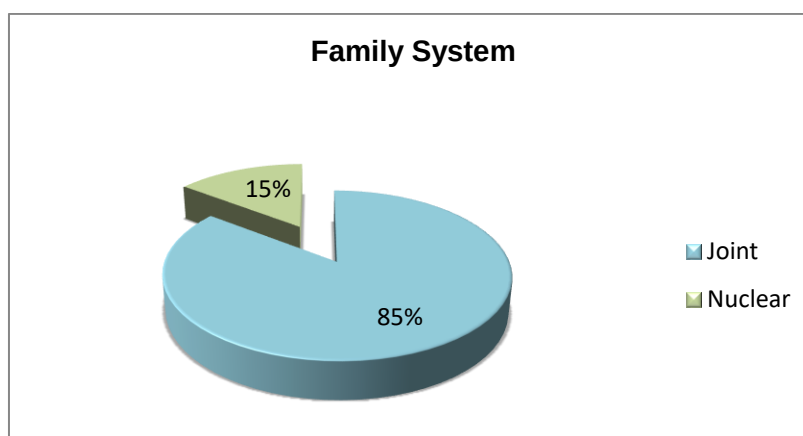


Figure 4-19: Family structure of the Respondents

B. Socio- Economic Characteristics

i. Average Monthly Income of the Respondents

From the Table 4.21, it is clear that majority of the respondents 30% fall in the income group of 30,001 to 45,000 rupees, 23% of the respondents were earning their monthly income between the ranges of 20,001 to 30,000 rupees per month. The respondents who earn upto 20,000 per month were 19 percent of the total respondents contacted during the survey. Rest of the respondents 28% were those who were earning more than 45,000 per month.

Table 4-21: Average Monthly Income of the Respondents

Sr. No.	Average Monthly Income	Number of Respondent	Percentage
1	Up to 20,000	18	19
2	20,001 to 30,000	22	23
3	30,001 to 45,000	29	30
4	Above 45,000	27	28
Total		96	100

In the pie chart the income groups of various respondents are shown below (Figure 4.20).

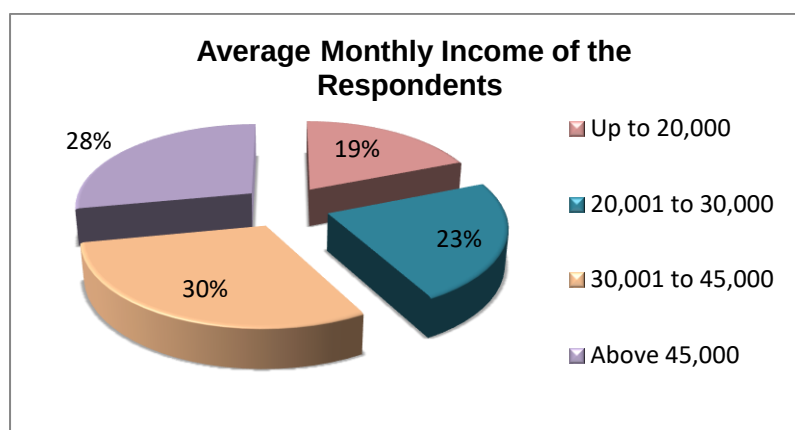


Figure 4-20: Average Monthly Income of the Respondents

ii. Expenditure of the Respondents

Table 4.22 shows, about 17% respondents reported their monthly expenditure upto 20,000, and 27 % respondents found within the range of 20,001 to 30,000 per month. While, 31 percent fall between the expenditure range of 30,001 to 45,000 and 25 % were those who recorded their monthly expenditures more than 45,000 per month. The graphical view of average monthly expenditures has shown in Figure 4.21 below;

Table 4-22: Average Monthly Expenditures of the Respondents

Sr. No.	Average Monthly Expenditures	Number of Respondent	Percentage
1	Up to 20,000	16	17
2	20,001 to 30,000	26	27
3	30,001 to 45,000	30	31
4	Above 45,000	24	25
Total		96	100

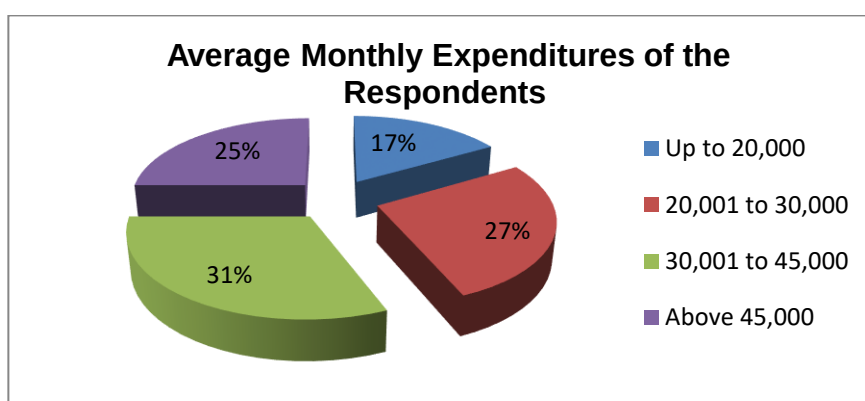


Figure 4-21: Average monthly expenditure of the Respondents

iii. Ownership Status of the Houses

Sampled respondents were asked about their housing ownership status in order to know their level of living standard as reflected in Table 4.23. Majority of respondents 82% were living in their own houses. Contrary to this, 10% were living in rented houses while 7% did not respond to this question.

Table 4-23: Ownership Status of Houses

Sr. No.	Type of Ownership of House	Number of Respondent	Percentage
1	Owner	79	82
2	Renter	10	10
3	No Response	7	7
Total		96	100

In the pie chart the ownership status of various respondents are shown below (Figure 4.22).

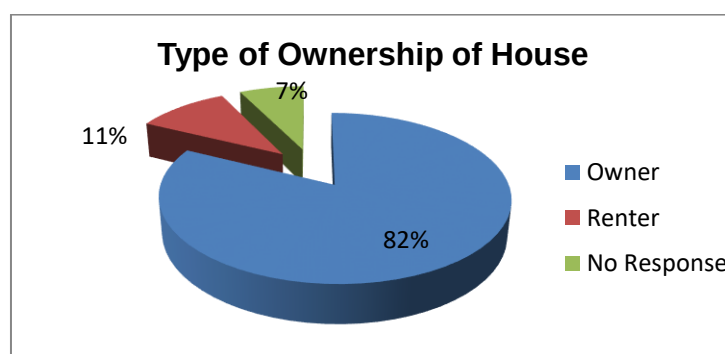


Figure 4-22: Ownership Status of the Respondents

iv. Nature of Construction of Houses

A large number of the respondents 70 % live in Pakka houses that are constructed with superior materials and workmanship while 16% respondents have Semi pakka houses that are houses made of bricks masonry with mud mortar. Remaining 14% live in katcha houses. Table 4.24 shows Construction pattern of houses in project area

Table 4-24: Nature of Construction of Houses

Sr. No.	Type of House	Number of Respondent	Percentage
1	Pakka	68	70
2	Semi Pakka	16	16
3	Katcha	14	14
Total		96	100

In the pie chart the Nature of Construction of Houses are shown below (Figure 4.23).

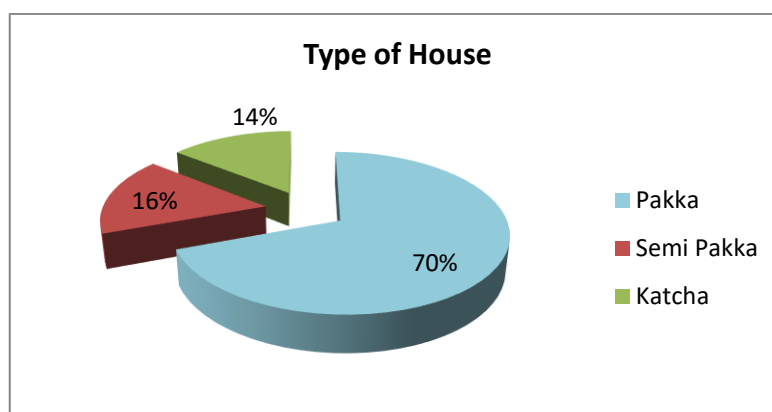


Figure 4-23: Nature of Construction of Houses

C. Land Acquisition

The respondents were also inquired about their land acquisition or any other asset required due to the project implementation if any. Major apprehension was raised regarding land acquisition as private land acquisition is involved in the project. The responses were presented below in Table 4.25.

Table 4-25: Acquisition of Private Land

Sr. No.	Land / Asset Acquisition	Number of Respondent	Percentage
1	Yes	82	85
2	No	14	15
Total		96	100

In the pie chart (Figure 4.24), the status of Land/assets acquisition is shown below.

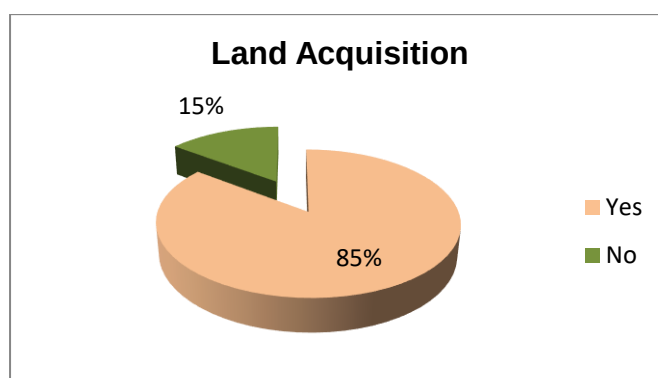


Figure 4-24: Acquisition of Private Land

i. Awareness Regarding the Proposed Project

100% respondents had awareness about the project.

ii. Implementation of the Proposed Project

During the survey 68% respondents were in favor of the proposed project keeping in view its importance & need if they are compensated on the basis of current market rates. While 32% of the respondents were not in favor of the project because they have no other land for their house and livelihood, refer Table 4.26 & Figure 4.25.

Table 4-26: Implementation of the Proposed Project

Sr. No.	Frequency of Project Acceptability	Number of Respondent	Percentage
1	Yes	65	68
2	No	31	32
Total		96	100

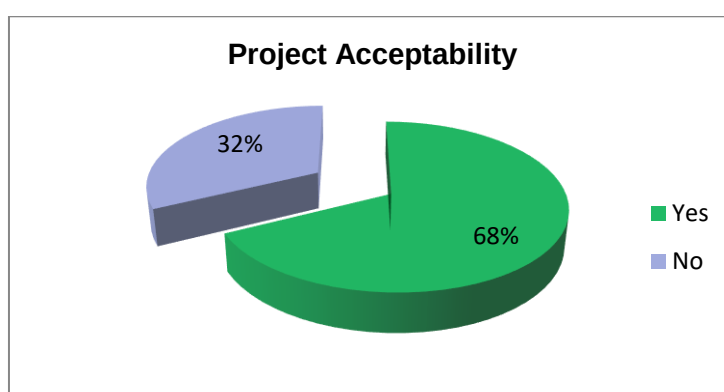


Figure 4-25: Implementation of the Proposed Project

iii. Perceived Impacts

Table 4.27 provides the glance of various impacts perceived by the respondents regarding the construction of proposed project. Major apprehension raised by the respondents were private land acquisition and resettlement. About 42% respondents were those who were going to lose their fertile agriculture land due to the proposed project. Whereas, 26% and 28% of the respondents were going to lose their houses and livelihood respectively. Reaming 04 percent considered tree cutting as negative impacts during construction phase.

Table 4-27: Perceived Impacts

Sr. No.	Impacts during Construction Phase	Number of Respondent	Percentage
1	Loss of Land	40	42
2	Loss of House	25	26
3	Loss of Livelihood	27	28
	Loss of trees	4	4
Total		96	100

The impacts perceived by the respondents during construction phase about the proposed project are shown in (Figure 4.26).

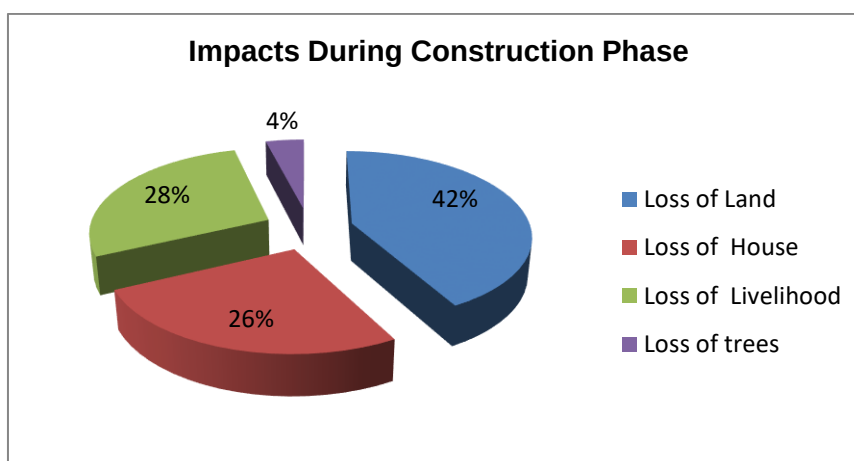


Figure 4-26: Perceived Impacts by Respondents

iv. Perceived Impacts of Project during Operation Phase

Data presented in Table 4.28 provides the detail of impacts anticipated at operational stage by the interviewed people. Almost 32 percent of respondents declared this project helpful for the development of the project area and 19 percent expected as this project will increase value enhancement of the area. While, 29 percent responses were probably considering that operational phase of project will Boost of economic activities and increase in income generating opportunities. Remaining 20% did not give any response Figure 4.27 given below is about graphical presentation of perceived impacts during operation phase.

Table 4-28: Perceived Impacts during Operation Phase

Sr. No.	Impacts during Operation Phase	Number of Respondent	Percentage
1	Development of the project area	31	32
2	Value enhancement of the area	18	19
3	Increase income generating activities	28	29
4	No Response	19	20
Total		96	100

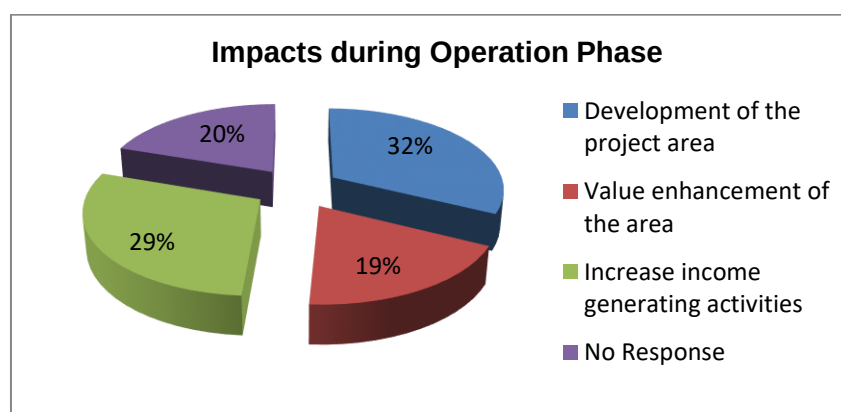


Figure 4-27: Perceived Impacts during Operation Phase



v. Protective Measures Suggested by the Respondents

To minimize the adverse impacts, protective measures also suggested by the surveyed people such as construction activities should be completed well in time, respondents said that adverse impacts on residential, commercial and religious structures should be minimized. Proper compensation should be given to those who will face the physical and economic displacement. Diversion plan should be provided to road users to reach their terminus safely. The u turns and overhead bridges are needed near the populated areas and institutions for pedestrians.

vi. Pressing Needs

Water scarcity is a natural and human-made phenomenon, while inexorable rise in demand for water to grow agriculture, food, supply industries and sustain urban and rural populations has led to a growing scarcity of freshwater in many parts of the world; consequently, water scarcity emerged as a global issue. The residents in the project area are facing problems of clean drinking water, sewerage. Facility of CNG is also not available for the majority.

The use of poor water quality causes several environmental health related problems and number of diseases related to renal complexities, skin allergies, reproductive, blood disorders and carcinogenic problems. During the survey most pressing need voiced by the respondents both males and females was the provision of clean drinking water (water filtration plants) in the area. The local people also demanded supply of CNG and improved medical facilities in the area. Employment in different sectors was also expressed by the people of the Project Area.

5 STAKEHOLDER CONSULTATION

5.1 GENERAL

Timely and broad-based stakeholder involvement is an essential element for an effective environmental assessment, as it is linked with Project Planning, appraisal and development in general. Public involvement during Environmental Impact Assessment (EIA) has a tendency to improve project design environmental soundness and social acceptability.

This section describes the outcome of the public consultation sessions held with different stakeholders that may be directly or indirectly affected by the proposed project. Public Consultation is a mandatory for development projects. The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national / international safeguard policies.

5.2 OBJECTIVES

The objectives of stakeholder consultation were to contribute to the openness, transparency and dialogue. Special efforts were made to ensure that the communication with the public should be efficient and well balanced. The concerned stakeholder groups were identified to participate in the assessment process. Specific tasks and purposes of consultations with stakeholders have been given in the Table 5.1.

Table 5-1: Tasks and Purposes of Consultations

Task	Purpose of Consultation with Stakeholders
Why consultation with the stakeholders?	- To build trust to ensure sustained support for the Rawalpindi Ring Road Project and build resilience for times of crisis. - To learn about public concerns that needs to be addressed and taken into account in designing of the project concept and preparation of mitigation measures and programs. - To learn about the strengths, skills and organizations that the stakeholders can bring to support project planning and implementation.
Modes and benefits of consultation	- Listening and dialogue with stakeholders to keep the project at tuned to public concerns early, to pre-empt breakdowns in public confidence. - Engaging the public as advocates for the project construction and to support the implementation of social, resettlement, environment and health programs.

The other objectives of this process were to:

- Informing the public about the proposed project;
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;

- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socio-economic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts (positive & negative) of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the consultation session for valuable suggestions related to project design;
- Reduce the chances of conflict through an early identification of controversial issues, and consult them to find acceptable solutions; and
- Creating a sense of ownership of the project among all the stakeholders.

5.3 CONSULTATION AND PARTICIPATION PROCESS

For ascertaining the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them. These meetings were held in open atmosphere and carried out in the vicinity areas of proposed project. The meetings with stakeholders were carried out from November 25, 2021 to December 01, 2021.

5.4 METHODS OF PUBLIC CONSULTATION

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

- Scoping Sessions;
- Formal Meetings;
- Informal Meetings; and
- Individual Interview.

5.5 IDENTIFICATION OF STAKEHOLDERS

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the local residents, farmers, shopkeepers, students, teachers, laborers, Drivers, private business owners, government department employees, private job holders, Local Representatives and retired official etc. All the stakeholders had different type of stakes according to their professions which are listed down along with their apprehensions. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

5.6 LOCATIONS OF THE PUBLIC CONSULTATIONS

Project area falls in Gujar Khan and Rawalpindi tehsils of Rawalpindi District. The public consultations were conducted with the community members of the following villages (refer Table 5.2) in these two tehsils.

Table 5-2: List of Villages Consulted

Sr. No.	Tehsil	Mouza
1	Gujar Khan	Baanth
2		Bagwal Dargai
3		Chamba Papai
4		Hardo Jagi
5		Qutab Ferozwala
6	Rawalpindi	Basali
7		Nothian Baniya
8		Dhakki Kalan
9		Maira Mohra
10		Mohra Garh
11		Lillah Kamalpur
12		Risala Khurd
13		Maira Kallan
14		Adyala
15		Kohliyan Par
16		Pilo
17		Ghareeban
18		Thalian

5.7 CATEGORIES OF STAKEHOLDERS CONTACTED

Different categories of stakeholders contacted, during consultation are given in the Table 5.3.

Table 5-3: Stakeholders Contacted in the Project Area

Sr. No.	Stakeholder Category
1	Local residents
2	Shop keepers
3	Farmers
4	Private business owners
5	Drivers
6	Students
7	Teachers
8	Laborers
9	Government Employees
10	Private Service
11	Retired Officials
12	Local Representatives

5.8 STAKEHOLDERS AND THEIR APPREHENSIONS

Among all stakeholders some major stakeholders were identified in the proposed project area. Plate 5.1 and Plate 5.2 shows the pictorial view of interviews and consultation meetings held with the stakeholders. Table 5.4 contains the list of major stakeholders and their apprehensions.

Table 5-4: Major Stakeholders and their Apprehensions in the Project Area

Sr. No.	Stakeholders	Apprehensions
1	Local Residents/ Communities and Affected Persons.	Project Affected Peoples (PAPs) (legal title holders and encroachers) will have to lose their land and housing structures due to the land acquisition for the proposed project and will ultimately result in permanent physical and economic displacement. During construction period, local residents will face difficulties while walking to nearby places existing in the vicinity of proposed project area. Movement problem for local residents, dust and noise problem, privacy / safety issues, disturbance of public utilities, traffic jam and environmental pollution are the major concerns.
2	Shopkeepers	Loss of structures and business and livelihood due under impact of commercial structures. Reduction in number of customers during construction phase, noise and air pollution, movement problem.
3	Motorized transport users and Drivers	Appropriate detour, management of traffic, dust & noise, vibrations, disruption to passengers, increase travelling time and fuel consumption during construction.
4	Customers	Movement problem for customers, dust, noise and vibration problems and health & safety issues.
5	Farmers	The design of road should be least disturbing the local agriculture, crops, land and economic activities.
6	Students	Movement problem for students, dust, noise and vibration problems, health & safety issues.
7	Government Officials	Government buildings (schools & dispensaries) will be affected due to widening of the road. Traffic congestion, dust, noise and vibration, disruption to travelers, increase travelling time during construction and tree cutting.
8	Private Service	During construction period they will face difficulties to reach their offices, increase travelling time and fuel consumption. Will face difficulties walking to nearby places existing in the vicinity of proposed project area.
9	Private business owners	During the construction phase, they may face the issue of dust and movement, disturbance to customers, loss of business and reduction in number of customers.
10	Teachers	Movement problem, dust, noise and vibration problems, safety issues, traffic congestion and increase in travelling time.

5.9 CONSULTATION MEETINGS AND FORMAL & INFORMAL GROUP DISCUSSIONS

Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with different types of stakeholders as mentioned above, to know their concerns.

Scoping sessions were conducted with these stakeholders at various locations of the proposed project area.

Generally, it was found that mostly people were already aware of the proposed project. After the meetings, respondents including local residents and other stakeholders showed support for the proposed project without any delay. This project will be beneficial in terms of control over traffic congestion as well as good infrastructure development, not only for the local residents but also good for the economic development of the area.

5.10 CONCERNS / SUGGESTIONS OF THE STAKEHOLDERS

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

- Avoid private land acquisition and resettlement as much as possible through change in design.
- Commercial and residential structures will be affected due to the proposed Rawalpindi Ring Road Project and all affected persons should be compensated properly on the basis of current market rates for their land and land basis assets;

Community is very much concerned about the religious structures falling within the proposed RoW. Affected religious structures (Mosques, graveyards) should be relocated with the consent of the local community; Disturbance to the graveyards due to the proposed project in different communities should be strictly avoided through change in design as locals consider this issue very sensitive;

- Crossing and overhead bridges for pedestrian should be provided to cross the road to avoid movement problem;
- Construction of proposed project should be completed in time;
- Exposure of noise and dust pollution will cause disturbance and health & safety issues to the local residents and other stakeholders throughout the construction stage due to the movement of construction machinery and transportation of construction materials. The effects of noise and dust pollution on the local residents should be minimized by making necessary arrangements. Dust pollution should be controlled by water sprinkling on regular basis;
- Due to the movement of loaded trucks during the construction period of proposed project, congestion on the access road will increase. Proper diversion route should be clearly defined to avoid traffic blockage and accidents during the entire construction period;
- During construction period, local residents, road users and students will face difficulties while moving to places in the vicinity of proposed project area. Appropriate diversion plan should be developed to avoid the disruption due to use of heavy machinery in daytime and should avoid disturbance to the local residents living in the project vicinity;
- Locals should be given priority for jobs during the construction phase;
- Due to the construction of the proposed project, public utilities will be disturbed. Arrangements should be made to minimize the disruption of public utilities or they may be rehabilitated on priority basis to reduce the impacts;
- Increase in traffic and safety hazards will create problems to the local population and surrounding communities. Accordingly, a detailed Health and Safety Plan (HSE Plan)

- must be developed and implemented to mitigate the construction and operation risks of the proposed project on the local residents and surrounding communities;
- Solid waste produced during construction should be disposed of timely and properly;
 - Construction material and site camp of labor should be located outside the residential area;
 - The labor camps and batching plant should be located away from the populated area to avoid any conflict;
 - Good quality construction machinery may be used to reduce noise and air pollution issues; and
 - This project is helpful to control traffic congestion and road side accident and is dire need of the area.

5.11 MITIGATION MEASURES PROPOSED FOR ADDRESSING THE STAKEHOLDER'S CONCERNS

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

- Significant efforts including change in design should be adopted to minimize the physical, economical disturbance of the local residents and to minimize the impacts of religious structures & graveyards;
- Market based compensation should be paid to affecttees for loss of structures, business, crops and livelihood.
- Local residents should be given priority for jobs while hiring during construction phase of the proposed project;
- Construction machinery should be placed at adequate locations away from the sensitive areas to minimize the impacts related to the noise;
- Project facilities should be located outside the existing residential areas. In order to avoid restricting the daily movement of the local stakeholders, construction vehicles should remain confined within their designated areas of movement;
- The utilities to be shifted due to the implementation of the proposed project should be rehabilitated on priority basis to minimize the impacts on the stakeholders;
- Solid waste generated during construction at site should be disposed of safely at the waste disposal sites approved by the client; and
- All necessary measures should be taken to ensure the safety of traffic during construction, including barricades (including signs boards, pavement markings, flags, and lights). All such barricades need to be set up to facilitate the local traffic.

During the consultations, participants were informed/briefed about the project objectives and extensive question and answer sessions were conducted to clarify the project related works and activities to resolve the environmental, social and resettlement issues. They were briefed that the purpose of the consultations and discussions is to find out the possible solutions of the issues which you may face before and during the construction of the proposed project. The concerns and their possible solutions presented by the participants regarding proposed project were recorded to make further possible recommendations.

The summary findings of the consultations at different locations is presented in an annotated form given below in Table 5.5.

Table 5-5: Summary Findings of the Consultations

Sr. No.	Concerns Raised by Participants	Mitigation Proposed by Participants	Action to be taken by Project Executors
1	Government/DC rates will be applied by the government for our affected land and land based assets, which will not be acceptable.	DC rates are very low, hence, market based rates should be applied for the affected land and land based assets. Community is already very poor and relies on cultivable lands for livelihood.	Market based rates should be given for the affected land and land based assets to avoid any conflict.
2	Participants showed their concerns regarding demolition of their residential structures falling in the proposed RoW.	Participants were of the view that market based rates and additional financial assistance should be given to the project PAPs, so they can build proper residential structures and cattle sheds.	Market based rates should be given for the affected structures and other assets. Besides, additional financial assistance will be given in shape of allowances.
3	Due to land acquisition, livelihood of the local farmers will be disturbed as farming community depends on livestock rearing and produce fodder from proposed affected land.	Proper market based compensation should be given for the affected land and standing crops. Moreover, an ample time should be given to harvest the standing crops before the execution of the project.	Market based compensation should be given for affected assets as well as an ample time should be given for harvesting the standing crops.
4	Human displacement may occur due to demolition of residential structures and loss of livelihood on permanent basis.	Fair and market based compensation for the lost assets can reduce the risk of human displacement. Due to fair markets rates, PAPs will become able to resettle themselves in the same vicinity.	Market based rates should be given for the affected lands, structures and other assets.
5	Sensitive Receptors (graveyard & mosques) will be affected in the proposed project area.	Locals are very much concerned about relocation of graveyards and mosques. Protective measures should be taken to keep safe the sensitive receptors particularly graveyards in the proposed project area. It can create the social issues.	Measures should be adopted to keep safe the sensitive receptors like graveyards or mosque by alteration in design.
6	Commercial structures will be affected due to the project which will cause permanent loss of income.	Fair and market based compensation should be given before acquisition/demolition of such structures so they can keep continue their livelihood.	Compensation should be given before acquiring such assets. PAPs should be given an ample time to re-establish an alternate source income.
7	During the construction period, mobility of the local community will be disturbed.	Alternate route should be provided to the local communities for convenience in mobility.	Alternate route will be provided before the commencement of the civil work on the proposed project.

Sr. No.	Concerns Raised by Participants	Mitigation Proposed by Participants	Action to be taken by Project Executors
8	Disturbance of the social amenities.	Participants were of the view that due to construction of the proposed project, several social amenities will be disturbed. These social amenities should be restored before commencement of the construction work to avoid any inconvenience for the local community.	Social amenities should be restored before execution of the civil work.
9	Due to construction activities as well as influx of labor, movement of the citizens particularly of females, residing in the local area will be restricted.	In order to tackle this situation, construction should be carried out in scheduled hour, so that after construction hours, local community, particularly females can easily move in the area. Moreover, consultations with locals may be carried out to resolve this issue.	People should be aware about complete construction activity plans so that they can move in the area freely and safely.
10	Dust and noise will disturb the nearby residential and commercial structures.	All protective measures should be taken to keep safe the local community from noise and dust.	Contractor should be bound to take all protective and precautionary measures to keep safe the health and properties of the local people. Internationally recognised practices should be adopted in this regard.
11	Job and labor opportunities for local people.	Skilled and unskilled work force should be hired from local community. It will enhance the acceptability of the proposed project among local people.	Contractor should be bound to hire the skilled and unskilled work force from the local community at priority.

Generally, locals were found to be aware and convinced for the proposed project, and indicated their support for the implementation of this project if APs are compensated on the basis of current market rates for their lost assets. Due to the proposed project, traffic congestion and accidents on the GT road will reduce. Local communities demanded that they should be the part of meaningful consultation activities along with other stakeholders at different stages of the Project including the design, construction, and operational periods. Plate 6.2 shows the pictorial presentation of Public Involvement (PI) process and Annex-IV provide the list of participants during focus group discussion.

5.12 DEPARTMENTAL CONSULTATIONS

The Environment and Social team has conducted the Stakeholder's Consultation with relevant departments during the field visits in November and December, 2021. Environment and Social teams have consulted with all the relevant Government departments in District Rawalpindi to



get their views/concerns for the proposed Project. Table 5.6 below presents the details of consultations including stakeholder's designations/department and their views/concerns regarding the proposed Project.

Table 5-6: Summary of Consultation Meeting at Department Level

Sr. No.	Department	Designation	Stakeholder Views/Concerns	Response
1	Forest Department Rawalpindi	Divisional Forest Officer (DFO)	The DFO was briefed by NESPAK Team regarding the proposed Project and other specifications. The flora and forest of the region was discussed in detail. Following recommendations were made by DFO: • Tree cutting should be avoided/minimized to keep the ecological balance of the region. • Compensation for tree cutting should be made as per approved/schedule rates; • Efforts should be made for minimum damages to tree and green cover as the species in the region of the project area are playing important role in soil formation, flood protection and clean environment over all. • Implementation of Tree Plantation Plan for the compensation of trees and to enhance over all environment should be ensured.	• NESPAK team agreed and assured him tree cutting will be minimum. • NESPAK team told the DFO that a plantation plan shall be part of the report and it shall be mandatory for the Proponents to plant 10 trees (at least) as compensation for every single tree. • NESPAK team told him that a proper tree plantation plan would be part of the report with a recommendation that plantation should be carried out through Forest Department and compensation against the tree cutting will be as per law of land.
2	Environment Protection Department, Rawalpindi	Deputy Director	NESPAK team briefed about the Project to Deputy Director. A brief detail of the proposed project was shared along with the tehsils coming along the proposed project. • It was suggested that proper mitigations must be recommended for the proposed impact due to the project. • Tree cutting should be avoided to the extent possible during the widening of proposed road. • Ensure the sprinkling of water during the construction of proposed road to mitigate the air pollution. • It was emphasized that waste management plan should be prepared for the Project to protect the environment as much as possible.	• NESPAK team agreed, detailed Impact Assessment and Mitigation Measures will be provided in this report. • NESPAK team agreed and assured him tree cutting will be minimum. Maximum efforts have been in the design to avoid the trees cutting, however where it is involved, will be compensated fully. Guidelines to prepare the site specific management plans will be provided in the EIA Report. The contractor then prepare the detailed site specific management plan based on these guidelines.

Sr. No.	Department	Designation	Stakeholder Views/Concerns	Response
			- All the relevant acts, laws, regulations, guidelines especially Punjab Environmental Protection (Amendment) Act, 2017 should be followed during the preparation of EIA report; - Stakeholder Consultations with all the relevant departments should be carried out - Environmental Monitoring at all environmental sensitive areas along the route should be considered; - NOCs from all the relevant departments should be acquired prior to project construction.	
3	Wildlife Department Rawalpindi	Deputy Director	The official of wildlife department was briefed about the proposed activities of the proposed Ring Road Project. The official shared that No project area is falling under any protected area of wildlife department. Required details of the faunal species of the region were also provided. Following are the suggestions of the concerned official: - It was suggested that appropriate mitigations measures should be followed during the construction stage to minimize the damage to wildlife and to protect their habitat; and - Loss of trees should be discouraged to keep the eco balance and to protect habitat of wildlife of the region as mentioned in baseline.	Entire concerns / suggestions of the official were recorded and it was briefed that all concerns will be addressed during the design, construction and operation stage of the proposed project. Efforts will be made to avoid in disturbing the natural habitat.
4	Irrigation Department, Rawalpindi	XEN, Small Dams	NESPAK team briefed about the Project and share the details of the proposed project. Following are the concerns and recommendations made by the officials: Proper safety measures should be taken into account to avoid disturbance to existing irrigation channels and nullahs during construction phase;	- Concerns noted down and appropriate measures will be taken during the detailed design to minimize these issues. - NESPAK team told the DFO that a plantation plan shall be part of the report and it shall be mandatory for the Proponents to plant 10 trees (at least) as compensation for every single tree.

Sr. No.	Department	Designation	Stakeholder Views/Concerns	Response
			- Tree should be raised along the proposed alignment Ring Road; and - CCA of Khasala Khurd irrigation channel will be reduced due to the implementation of proposed project. This aspect should be considered during detailed design.	
5	Agriculture Department Rawalpindi	Director Extension	The official was briefed by the NESPAK Team and the proposed project details were presented for better understanding of the project. Crops details of the area were shared along with other details by the official. The tentative compensation rates for agricultural crops were share and discussed among the experts. Following are the recommendation of officials of Agriculture department: - Detailed assessment for the agricultural crops should be carried out to compensate the local communities as per acceptable /market rate; and - There are existing and proposed water ponds/small dams near the proposed alignment, if any of them falling in the proposed RoW, then proper measures should be taken and avoid upto the extent possible.	- In the case of damages to crops, will be fully compensated to the farmer's affectees and all the damages will be paid being assessed by the Department of Agriculture. - The compensation value will be calculated based on market value of the crops and average yields in the Project Area.
6	Fisheries Department, Rawalpindi	Assistant Director	NESPAK Team briefed regarding the project proposed route, in response following points were made part of discourse. The Soan River habitat should be protected and waste management should be a part of the proposed Project to avoid adverse impacts during the construction of bridges and associated structures;	The concerns/suggestions were noted down and appropriate measures have been considered in the EIA report.

Sr. No.	Department	Designation	Stakeholder Views/Concerns	Response
			- The Soan River is providing breeding grounds to fish fauna of the region so, during bridge design back water flow effect must be considered along with the provision of deep area and slopes for fish movements to avoid impacts on fish life; and - During bridge designing fish movement must be kept in mind and the design team must be in close coordination with fisheries department to ensure free movement of the fish and provide the best alternatives.	

Pictorial view of consultation meetings and socio economic survey is presented below:



Meeting with XEN Irrigation Small Dams,
Rawalpindi



Meeting with Deputy Director EPA,
Rawalpindi



Meeting with DFO Forest, Rawalpindi



Meeting with Director Agriculture Extension,
Rawalpindi



Meeting with Deputy Director Wild Life,
Rawalpindi



Meeting with Assistant Director Fisheries,
Rawalpindi



Plate 5.1: Pictorial View of Stakeholder Consultations with Locals in Project Area



Plate 5.2: Pictorial View of Stakeholder Consultations with Locals in Project Area

5.13 FUTURE CONSULTATIONS

The stakeholder consultation and engagement is an ongoing process and will continue throughout the project's construction as well as operation and maintenance phases. The ongoing consultation process could be scheduled on need basis with the stakeholders



including but not limited to the concerned government departments, local administration, community representatives and affected Persons from the proposed project area.

The overarching goal of consultations and community engagement is to support and facilitate the project's design and implementation, to reduce conflicts and project opposition, and to increase project's acceptability.

The community members will be compensated by project proponent and they will be encouraged to participate in project activities during construction and operation phases. The consultations will be made in future to facilitate the community at the local level.

Further consultations to be undertaken as part of the Project EIA process include the Project public hearing. The Punjab EPA will require that public hearings to assess public opinion on the environmental impacts of the Project. The Punjab EPA will advertise the public hearings in a newspaper. The legal requirement is advertisement in at least one English or Urdu national newspaper, but in practice, advertisements are usually placed in two national newspapers and also in local newspapers. The public hearings will be held at least 30 days after the public notice. Concerns raised during the public hearing will be addressed in the EIA report before approval.

The consultations will be carried out during the construction and operation phases of project. Consultations will be undertaken in all the communities twice or more time in a year, depending on the number of concerns raised under each consultation. Ongoing stakeholders' engagement activities include:

- Ongoing reporting on progress on the implementation of environmental and social management measures identified during the EIA process and recording of comments on the effectiveness of these measures;
- Updating communities and other stakeholders about project developments and recording comments on these; and
- Ongoing action of the grievance mechanism.

Efforts will be made to maximize the consultations during the project implementation. The consultations will be carried out with the objectives to develop and maintain communication linkages between the project promoters and stakeholders, provide key project information to the stakeholders, and to solicit their views on the project and its potential or perceived impacts, and ensure that views and concerns of the stakeholders are incorporated during the implementation with the objectives of reducing or offsetting negative impacts and enhancing benefits of the proposed project. The framework for the future consultations is elaborated in Table 5.7, but not limited to the following:



Table 5-7: Future Consultations Framework

Sr. No.	Stakeholders	Project Phase	Frequency of Consultation
1	Institutions/Departments	• Pre-Implementation • During the Project Implementation • At Closure period	• One round of consultation before start of implementation of project. • Bi-annually during operation phase • Once before the closure of the project.
2	Local Communities/ Key Persons	• Pre-Implementation • During the Project Implementation • At Closure period	• Consultation at different stages, before implementation, periodic meetings during construction phase and at the time of Project completion.
5	NGOs/CBOs	• Pre-Implementation • During Project Implementation • At Closure period	• Periodic meetings will be conducted as per requirement of the Project.

After suggesting the possible solutions of the stakeholders' concerns, the solutions (final EIA report) will be disclosed once again before the stake holders and general public. EIA report will be accessible to interested parties on request and the version of final report will be available in the project office and its summary will be available in national language.

5.14 FUTURE INFORMATION DISCLOSURE PLAN

After suggesting the possible solutions of the stakeholders' concerns, the solutions (final EIA report) will be disclosed once again before the stake holders and general public. EIA report will be accessible to interested parties on request and the version of final report will be available in the project office and its summary will be available in national language.

5.15 GRIEVANCE REDRESS MECHANISM (GRM)

Grievance Redress Mechanism (GRM) is important for development projects where ongoing risks or adverse impacts are anticipated. These mechanisms serve as a way to meet requirements, prevent and address community concerns, reduce risks, and assist larger processes that create positive social change. The major objective of GRM is to implement and maintain a procedure for handling environmental and social concerns of the project stakeholders. This procedure will include a redress mechanism scaled to the project's identified risks and adverse impacts, focusing on stakeholders.

Project proponent will establish, maintain and implement a Grievance Redress Mechanism to facilitate resolution of affected persons (APs) concerns and complaints about the project's performance at site, in line with the requirement of Punjab Environmental Protection Agency (EPA). It will consist of three Tiers wherein grievances will be redressed and coordinated by Environmental/Social Representative of project proponent under the supervision of Deputy Project Director at Project Management Unit Level and by the Project Director at Project Contractor level. The GRC will address affected people concerns and complaints promptly, using an open, effective, understandable and transparent process.



5.15.1 Type of Grievance

The following are some of the environmental issues could be subject for grievance from the affected people, concerned public and NGOs.

- Dust, noise and air pollution from construction activities;
- Nuisance;
- Intensive schedule of construction activities;
- Inappropriate timing of construction vehicle flow;
- Traffic Movement;
- Water Pollution;
- Waste disposal;
- Disturbances to flora and fauna;
- Health and safety;
- Criminal activities; and
- Failure to comply with standards or legal obligations.

5.15.1.1 1st (I) Tier

The grievances/ concerns may be addressed directly under the supervision of Deputy Project Director. The following members are recommended to form Project Complaint Cell (PCC) to look into the environmental impacts and social issues for resolutions through visit or examination at first level:

- Deputy Project Director (In charge/Head)
- Environmental/Social Representative
- Representative from Aps (if required)
- Representative of Engineering Section PMU
- Representative of Engineering Section RDA

5.15.1.2 2nd II Tier

The grievances/ concerns may be addressed under the supervision of Project Director. The following members are recommended to form Grievances Redressal Committee (GRC) to look into the environmental impacts and issues for resolution:

- Project Director (In charge/Head);
- Environmental/Social Representative;
- Representative from APs;
- Environmental Engineer of Supervision Consultant (SC); and
- Environmental Engineer of Construction Contractor (CC).

Project Director (PD) would nominate one Representative of Env. /Social as member who will act as Project Environmental Grievance Officer (PEGO) from proponent/client site. The complaint would be lodged to GRC. The GRC will review the case on merit and address the problem in accordance with prevailing rules/ procedures applicable to such grievances as per Environmental Management Plan (EMP).

If the complaint is genuine, GRC would ask the contractor to address the grievance within seven days (07) depending upon nature of grievance. Environmental representative of supervision consultant will monitor the contractor and will report PEGO. If the affected person does not receive a response from GRC or his complaint is not settled within thirty (30) days of the registry of the complaint by the GRC then Higher authorities / relevant govt. departments may be contacted for its resolution or it can be elevated to next level.

5.15.1.3 3rd (III) Tier

As a last resort, He/ She may submit the complaint to Punjab EPA or contact the appropriate Court / local judiciary. At each stage the Grievance Redress Committee will act as third party to ensure a fair and just resolution, and assist in grievance mediation. Appeals to the GRC will be free of charge, and all reasonable expenses incurred will be paid from project funds. Once the operation phase commences and the PIU no longer exists, the PIU portion of the GRC will be eliminated.

The flow chart of the proposed redress mechanism is shown below in Figure 5.1.

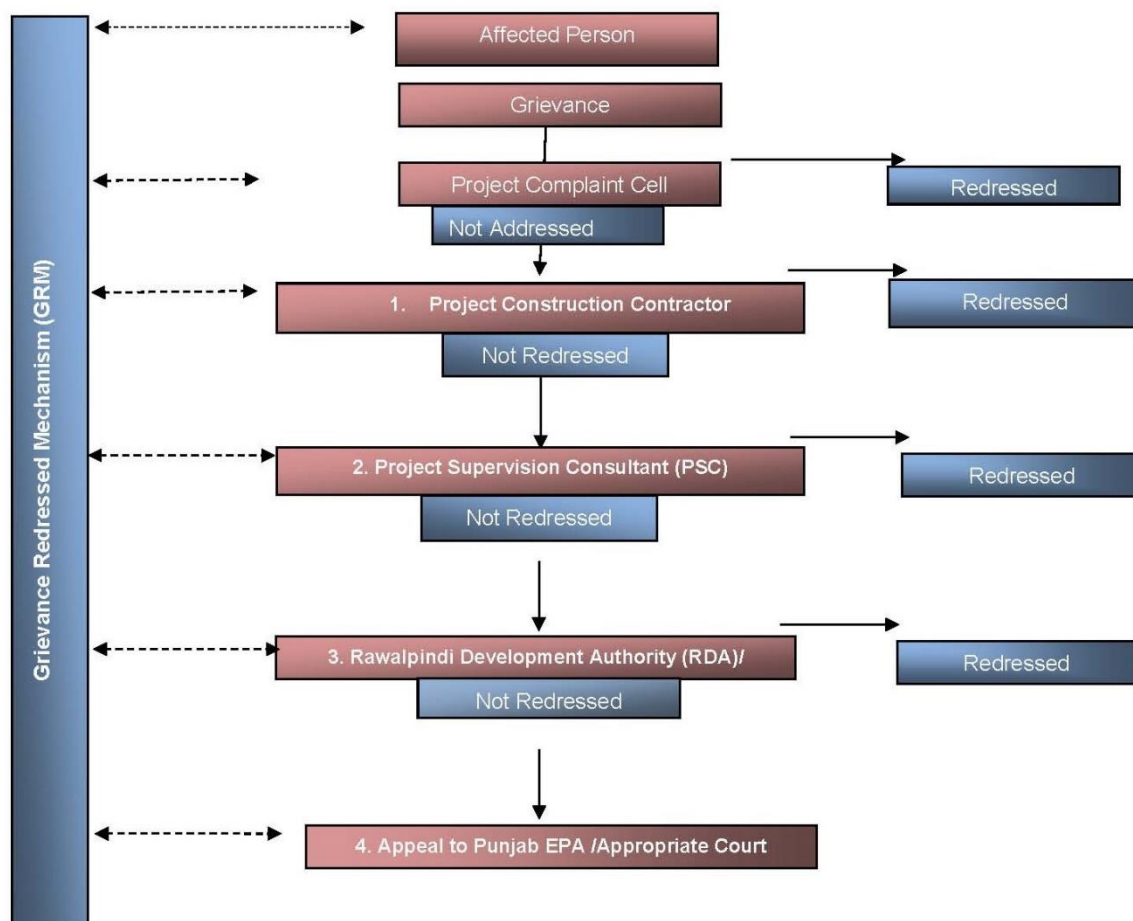


Figure 5-1: Grievance Redress Mechanism (GRM)



5.15.2 Responsibilities of GRC

The responsibilities of GRC will include the following;

- The GRC shall review, consider and resolve grievances related to environmental/social/technical issues during implementation.
- Environmental Specialist of SC is responsible for conducting investigations on these grievances.
- Any grievances presented to the GRC should ideally be resolved on the first day of hearing or within a period of one week, in case of complicated issues requiring additional investigations upto 30 days.
- GRC meeting will be held in the PD office or other locations agreed by the committee. If needed GRC members may undertake field visits to verify and review the issues at dispute.

5.15.3 Procedures of Filing Complaints and Resolution

Any affected person can register his complaint through application to PMU or Contractor office located in project area. The complaint would be lodged in complaint register.

There are several ways one can report a grievance:

- Contact the PEGO over the phone call. The contact details will be provided in the PMU/GRC office.
 - Send an email, text message, or in-writing to the address provided in the PD office/RDA office.
 - The grievance log/register will remain available to the public at the Project Management unit office, construction site and other key public offices.
1. The PEGO will direct the Environmental Engineer of Supervision Consultant (EE-SC) for resolution of complaints from contractor at the same day and report back to PEGO. The EE-SC will have maximum one week to resolve the complaint. If complaint is not addressed within a week time, then a meeting of GRC would be convened by PEGO to discuss the issue.
 2. The grievance will be reviewed and will be decided by the GRC. In case the grievance is not connected to the project related activity or in case the project authority finds that they are working within the applicable Punjab-EPA standards, the grievance will not be further processed. In these cases, this will be explained in writing to the grievant.
 3. In all the other cases the GRC will investigate whether they have failed to work to the intended standard and if they have identified measures which might be taken to protect against the incident occurring again.
 4. The decisions made by GRC will be submitted to competent authority (Project Director/RDA).
 5. The grievance mechanism will be made public through the public consultations and information leaflets during implementation.

6 ANTICIPATED IMPACTS AND MITIGATION MEASURES

6.1 GENERAL

This chapter identifies the beneficial as well as the potentially significant adverse environmental and social impacts during design/pre-construction, construction and operation phases of the proposed project on the physical, ecological and socio-economic domains of the environment. The appropriate mitigation and remedial measures are proposed in this chapter. A project impact evaluation matrix has been developed to evaluate the potential impacts of the proposed Project. A brief qualitative description of each aspect and the affected environment in both RoW and the project's corridor of impact is presented below.

6.2 NOTION OF SIGNIFICANCE

The term “Environmental Impact” or simply “Impact” covers the negative, adverse or harmful as well as positive, desirable or beneficial impacts of the project on environmental settings. Prediction of impacts of the proposed activity is based on factual data; however, the significance of these impacts involves a value judgment technique. The nature of the impacts may be categorised in terms of:

- Direction** - Positive or Negative
- Duration** - Long or Short Term
- Effect** - Direct or Indirect
- Extent** - Wide or Local

Impact significance depends on both the nature of the impact and on the sensitivity of the receptor. The more sensitive the receptor the greater will be the significance of impact from that proposed activity. For this EIA, activities and nature of impact are combined with the sensitivity of the receptor to evaluate the significance of the impact. The significance of impact is characterized as very low, low, moderate, high and very high. Environmental issues having “moderate”, “high” and “very high” significance are provided with mitigation measures.

Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact established using the impact significance criteria matrix as shown below. Most of the potential impacts can be mitigated by implementation of various types of mitigation measures; however some residual environmental impacts may remain after mitigation.

Magnitude of Impact	Sensitivity of Receptors			
	High (4)	Medium (3)	Low (2)	Negligible (1)
Major (4)	16	12	8	4
Moderate (3)	12	9	6	3
Minor (2)	8	6	4	2
Negligible (1)	4	3	2	1

Score	Impact Significance
1	Negligible
2 – 4	Low
5 – 8	Medium
9 – 12	High
> 12	Very High

6.3 METHODOLOGY FOR IMPACT EVALUATION

The methodology adopted for the evaluation of the impacts included the following assessment tools, (i) project impact evaluation matrix and (ii) overlays. These tools were used to identify the significance and magnitude of the impact as well as the nature, reversibility, extent etc.

a) Project Impact Evaluation Matrix

The Impact Evaluation Matrix was developed by placing project activities along one axis (i.e. Y-axis), and on the other axis (i.e. X-axis) the different environmental parameters likely to be affected by the proposed Project actions grouped into categories i.e. physical, ecological and socio-economic environment. For the impact assessment, project impact evaluation matrix was used by dividing the project action into different phases (design/pre-construction, construction and operational phases). A Project Impact Evaluation Matrix is given as Table 6.1.

Project Impact Matrix

Environmental Component Project Component	Physical Environment					Ecological Environment						Socio Economic Environment																	
	Soil (Erosion/Stability/ Contamination)	Air Quality	Noise Level	Surface & Ground Water Quality	Solid Waste Generation	Aquatic Ecosystem	Terrestrial Ecosystem	Endangered Species	Migratory Birds	Loss of trees	Loss of Crops/Orchards	Conflict over Resources	Mobility of Locals	Public Infrastructure	Accessibility	Housing Infrastructure	Religious Structures	Community Stability	Tourism And Recreation	Grazing Area	Gender Issues	Cultural & Social Issues	Health& Safety	Aesthetic	Security Situation	Living Standards	Employment Opportunities	Restoration of Livelihood	Economic Uplift
A. Planning & Design Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Topographic Survey	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	9	0	0	0	0
Geotechnical Investigation	0	0	2	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	2	4	0	9	0	0	0	0
Temporary Acquisition of Land	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0
Parmanent Acquisition of Land	0	0	0	0	0	0	0	0	0	10	9	6	0	6	0	8	10	9	0	0	0	9	0	0	4	6	0	0	0
B. Construction Phase																													
RoW / Site Clearance	9	9	9	8	8	8	7	8	0	10	9	0	6	6	6	8	9	0	0	6	6	8	9	4	9	0	6	0	4
Earthwork in Filling and Excavation	9	9	9	8	8	9	4	9	0	0	0	0	6	2	3	0	0	2	0	0	0	7	9	4	9	0	6	0	4
Establishment of Construction Camps & Workshop	2	2	4	0	0	0	4	0	0	0	0	8	0	0	0	0	0	4	0	0	4	4	8	4	9	0	6	6	6
Transportation & Storage of Construction Materials	4	6	6	4	6	9	2	9	0	0	4	0	8	0	0	0	0	4	0	0	0	6	6	4	6	0	4	0	0
Use of Construction Material and Heavy Machinery	3	8	9	0	4	9	4	9	0	0	0	6	6	2	6	0	0	0	0	0	0	6	8	0	9	0	4	0	0
Installation and Operation of Batching and Asphalt Plants	4	8	8	2	4	6	4	0	0	0	0	2	4	0	0	0	2	0	0	0	6	6	6	4	9	4	4	0	0
Spoil Disposal	3	3	0	6	6	4	6	0	0	0	0	0	0	0	0	0	0	2	0	0	4	6	4	6	9	0	0	0	0
Structural & Civil Work	8	8	8	8	8	9	6	9	0	0	0	2	6	2	6	0	0	2	0	0	6	6	8	4	9	0	8	0	8
Drainage Work	6	6	6	7	6	8	6	8	0	0	0	2	0	2	0	0	0	2	0	0	5	4	9	4	9	0	8	0	8
Miscellaneous Work (Road Ancillaries, Traffic Signs and Signals etc.)	0	4	6	4	4	6	2	6	0	0	0	0	0	2	0	0	0	0	0	0	6	0	6	0	9	0	6	0	6
Pavement Work	2	4	6	2	4	9	2	9	0	0	0	0	0	0	0	0	0	0	0	0	2	2	8	0	9	0	6	0	6
Finishing and Comissioning	0	2	4	0	4	6	2	6	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	9	0	4	0	4
C. Operational Phase																													
Operation of Road	0	2	2	0	0	4	4	4	0	6	0	0	6	4	8	0	0	6	4	0	0	8	6	8	7	8	6	6	6
Inspection & Monitoring	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	6	0	7	0	4	0	0
Road and Bridge Maintenance	0	4	4	2	0	0	2	0	0	0	4	0	4	4	4	0	0	0	0	0	0	0	6	2	7	0	4	0	0
Maintenance of Miscellaneous Work	0	0	2	0		0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	4	0	7	0	4	0	4

Positive Impact Score
0
2 to 4
5 to 8
9 to 12
>12

Impact Significance
Negligible
Low
Medium
High
Very High

Adverse Impact Score
0
2 to 4
5 to 8
9 to 12
>12

Table 6-1: Project Impact Evaluation Matrix

b) Overlays

In order to identify spatial based impacts, overlays were used. An overlay is based on a set of transparent maps, each of which represents the spatial distribution of an environmental characteristic. Information for an array of variables such as land use, infrastructure, vegetation etc. was collected for the standard geographical units within the project's Col, recorded on a series of maps, typically one for each variable. These maps were overlaid to produce a composite map. The resulting composite maps characterize the Project area's land use, physical, social, ecological and other relevant parameters related to proposed intervention. The overlays maps used in this EIA study for the quantification of the landuse categories referred in Chapter 5.

6.4 DELINEATION OF PROJECT CORRIDOR OF IMPACT (COI)

Before proceeding to the environmental analysis of the Project, it is imperative to delineate the Col. The Col has already been described in Chapter-1. There are two (02) types of project corridors which have been used for the environmental baseline information, impacts assessment and mitigation purposes and is described briefly below.

6.4.1 Corridor of Impact (Col)/ Area of Influence

Keeping in view the national regulatory requirements, impacts and risks have been identified and analyzed within the project Col. For a linear Project, Col is a limit that identifies the area where direct and indirect impacts of the project activities are envisaged like existence of crops, orchards, brick kilns, water ponds/ structures, built up structures, public utilities, nullahs etc. Col (120 m) also includes the RoW (90 m). This is limited to 15 m from the RoW each side for collection of baseline information, impacts assessment and mitigation measures of physical, ecological as well as social resources.

Apart from the Col, which is along the centerline, some components are non-linear such as the Construction/Contractor camps, vehicle, equipment yard, material quarry areas, while access tracks are also considered part of the Col for the study and termed as Project Area or Area of Influence. Therefore, in this report Col the Study Area and Area of Influence are used accordingly.

The location of Construction/Contractor camps, vehicle, equipment yard, material quarry areas and access tracks are usually finalized by the Contractor. Some of the project components which are not finalized yet, the assessment for those components is generic in nature and will be updated accordingly as the more information is made available. Col of the proposed project is shown in Figure 1.2.

6.4.2 Right of Way (RoW) / Project Area

RoW is the corridor where direct impacts of the proposed Project are anticipated. In the RoW there will be direct impact on the environment like relocation of the physical infrastructure, clearing of vegetation, cutting of trees, loss of crops due to the road construction and some

indirect impacts on shrubs, ornamental trees etc. are also envisaged. RoW is taken as 90 m from the centerline strip. RoW of the proposed project is shown in Figure 1.2.

6.5 POTENTIAL POSITIVE IMPACTS

The positive impacts due to the proposed project are mentioned below:

- The proposed Project shall provide an efficient / intelligent transport corridor. Main objective of this road is to provide a safe, congestion free and high speed facility to the commuters of project area and heavy traffic;
- The corridor will largely contribute to the economic and social development of the region;
- Apart from the usual benefits of saving in time this link will transform the entire pattern of transportation in the surrounding areas resulting in uplift of economic condition of local community;
- This link will bring about further revolution in road transport and time saving journey for passengers. It will also contribute to ensure smooth and efficient movement of trade, goods and traffic in relatively shorter time;
- Development of businesses during the construction stage will cause socio-economic uplift of the locals along the project corridor. The socio-economic impacts like employment, education, living standards and cultural uplift during the interaction with locals are the indirect benefits due to the Project implementation;
- Raising of new trees on either side of the proposed road shall render a positive impact on the flora of the area and will also cause a positive impact on the landscape of the area, which shall be of permanent in nature;
- Presence of adequate flora will absorb CO₂ gas, through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles;
- During the operation of the proposed project, it will result in lesser fuel consumption and decrease in operating cost;
- Improved communication infrastructure will promote new business opportunities. In addition, such an activity will also increase the land value that will benefit the local residents; and
- The proposed project is expected to increase the land values, especially in nearby villages. Land owners will have an opportunity to sell their land at increased prices and start new businesses.

6.6 POTENTIAL ADVERSE IMPACTS

Apart from positive impacts, there are some potential significant adverse environmental and social impacts on the local environment. The proposed Project is divided into three (03) stages i.e. Pre-construction / Planning and Design Stage, Construction Stage and Operation and Maintenance (O&M) Stage. The Pre-Construction Stage includes all stages before the construction Stage (i.e. site investigation work i.e. topographical, seismic studies etc.); Construction Stage includes all stages from mobilization of Contractor to the completion of Project; and Operation Stage starts after the Construction Stage which includes the inspection and repair works.

Adverse impacts envisaged at these three (03) stages of the proposed road project along with their proposed remedial or mitigation measures are detailed below:

6.7 ADVERSE IMPACTS DURING PLANNING AND DESIGN PHASE

Potential adverse impacts during the planning and design stage of the Project are given below:

6.7.1 Technical Design and Layout Planning

Potential Impacts

Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the Project area. Also low utilization of the available spaces and designing the structures without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality. This future traffic factor if not considered in the design properly, will also affect the project road and public safety of the proposed Project. Similarly, the locals may also face access problems for their land. This impact is medium adverse in nature.

Mitigation Measures

- The technical design of the proposed project must consider all the above mentioned factors for the final design and should meet all the local and international standards;
- The proponent, itself or through third party, must review and validate all the design considering the possible impacts (as mentioned) before the start of construction of proposed Project; and
- Proposal of pedestrian bridges may also be considered to facilitate the locals so that they can access their land.

6.7.2 Topography

Potential Impacts

The project area has plain topography and excavation of land is involved for the proposed Project. A significant physical change in the topography of the project area is expected. This adverse impact is low in nature.

Mitigation Measures

Mitigation measures will involve adoption of best engineering design measures keeping in view of the aesthetics of the project area and provision of green areas for the landscape in design. The proposed design has tried to minimize these impacts.

6.7.3 Drainage

Potential Impact

Improper storm water drainage design of the proposed Project may result in stagnant water due to which following impacts are expected to arise:

- Deterioration of road surface and reduction of its bearing capacity;
- Inconvenience for commuters/pedestrians;
- Stagnant water may provide the breeding ground for disease vector; and
- Foul odour may be generated.

This adverse impact low in nature.

Mitigation Measures

Mitigation measures will include provision of appropriate drainage structures with appropriate design capacity to avoid flooding especially during the rains. Proper slopes shall be incorporated in design to avoid the stagnant water on At-grade road surface.

6.7.4 Seismicity

Potential Impact

In Building Code of Pakistan (Seismic Provisions, 2007), the whole region of Pakistan is classified into five main Seismic Hazard zones i.e., i) Zone-1, ii) Zone-2A, iii) Zone-2B, iv) Zone-3, v) Zone-4 based on the peak horizontal ground acceleration and its ultimate tendency to damages during seismic events. The proposed Project Area falls in the seismic zone classified as "Zone-2B" with g-value 0.16 to 0.24, and is considered as Moderate Hazard seismicity zone.

No change (+/-) in the impact of seismology risk of the area is expected during the project construction phase as none of the project activities is expected to be of such a powerful extent to influence the tectonic risk. This adverse impact is medium in nature.

Mitigation Measures

- The proposed structure should be designed and constructed keeping in consideration high intensity earthquakes. For seismic hazard analysis, updated structural and seismic evaluations should be conducted by the design engineer/consultant. Moreover, geo-technical investigations must be conducted prior to construction phase;
- Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural, geotechnical and earthquake engineering; and

- The structure of the proposed Project should also be studied by the proponent (RDA) (itself or through third party) to evaluate its durability/strength to withstand moderate to high intensity earthquake.

6.7.5 Route (Alignment) Optimization

Potential Impacts

Improper route selection of proposed Project may lead disturbance to settlements (Baanth (Start Point on N-5), Jalhari Bahi Khan, Chamba Papai, Kalam Awan, Hardo Jagi, Mohra Mehar Bakhsh, Qutab Ferozwala, Bhagwal Dargai in tehsil Gujar Khan and Kalam Teli, Lohsar, Tamar, Ratyal, Basali, Nothia Bania, Dhakki Kalan, Jhatta Hattial, Maira Mohra, Mandhal, Gai Mir Baaz Main, Khingar Kalan, Bhattian Nur Din, Hoshial, Gai Mir Baaz Kharji, Lilla Kamal Pur, Chappar, Tarahia, Dhapai, Mian Ahmada, Khasala Kalan, Khasala Khurd, Mara Kallan, Kolan Parr, Kohala Muaffi, Pilo, Thallian, Ghareeba in tehsil Rawalpindi) which may arise some social issues. This impact would be of moderate significance.

Mitigation Measures

The alignment for the proposed project is carefully aligned to avoid social issues upto maximum extent including resettlement, damage to infrastructure, etc. The finalized alignment should strictly be followed to avoid social disturbances.

6.7.6 Change in Hydrologic Regime

Potential Impacts

The proposed Project will cross (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs. There might be change in water flow pattern and disturbance to water flow occurred which will cause impact on downstream of these water bodies. Moreover, when flood flows encounter a restriction in the natural stream, adjustments take place in the vicinity of the restriction. The portion of flow not directly approaching the bridge opening is redirected towards the opening by the embankment. This impact is medium adverse in nature.

Mitigation Measures

For the crossing of the irrigation channel (Khasala Khurd), Sill and Soan Rivers, Nullahs and other similar structures bridges will be constructed. Bridges shall be properly designed to accommodate design flows. Provision of culverts to control flood damages and provision of safety of embankments will be considered during the designphase.

6.7.7 Flora

Potential Impacts

During the pre-construction phase, activities such as installation of construction camps, construction of temporary roads & mobility of construction staff may damage the local vegetation/trees. As the heavy machinery and camps will be moved and installed, which require significant space due to which available vegetation is expected to be removed. This impact is Site-specific, Permanent, Irreversible, Possible, Medium Significant and needs to be encountered prior to the start of construction stage.

Mitigation Measures

- The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover;
- It is recommended to establish the construction camps where no or minimum vegetation exists.
- Similarly, the alternate routes for roads and points for camps are recommended where no loss of vegetation is expected; and
- The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement.
- Compensation to the forest department for all type of plants (saplings, sub-mature, mature trees and other green assets) will be paid by the proponent as desired by the Punjab, Forest Department and as per law of land.

6.7.8 Fauna

Potential Impact

As movement and installations of machinery and vehicles will take place so, noise and habitat loss is expected. The routes of the available wildlife and other habitats may be affected due to camps set-up and machinery movements and installations. Temporary road may also affect the habitat of locally available fauna. This impact is Site-specific, Temporary, Irreversible, Possible and Low Significant.

Mitigation Measures

- The standard measures must be adopted to minimize noise due to machinery movements and installations;
- Wildlife movements and routes must be considered during activities and should be avoided to their maximum level;
- The alternate routes and points are recommended to avoid any damage to locally available fauna;
- The camps shall be properly fenced and gated to check the entry of animals in search of eatable goods; and
- Similarly, wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them.

- Wild boar should be also managed to avoid any inconvenience.
- Fruit trees along with other broad leaved trees must be considered for plantation to balance the local ecosystem.
- Proper waste management plan may be considered mandatory to safeguard the local environment.

6.7.9 Land Acquisition and Resettlement

Potential Impacts

The proposed Rawalpindi Ring Road Project will be constructed on a new alignment for which approximately 8,992.32 Kanals (8,161.03 Kanals in Tehsil Rawalpindi and 831.29 Kanals in Tehsil Gujar Khan) private and government land will be acquired on permanent basis. The major issue in the proposed project will be land acquisition and resettlement. This will result in loss of land, crops, orchards, infrastructure, livelihood, commercial activities, disturbance to people and loss of income sources.

The ownership record of affected land will be prepared by the Revenue Department according to separate categories of the land. The impact will be permanent and high adverse.

Impact on Residential Structures

In the RoW, housing structures of different categories will be affected fully due to the proposed Project interventions. These households are losing their residences permanently and will have to relocate and move their dwellings elsewhere with their family members.

Impact on Commercial Structures

Different types of commercial structures will be impacted due to clearance of RoW for the proposed Project activities. These structures will have a temporary impact on sources of livelihood until the re-establishment of their business in a new location.

Impact on Religious Structures

The religious structures are very sensitive to impact and need special care during execution of the project, because people think that these structures might not be rebuilt if once demolished. Mosques, graveyards and shrines are falling in the RoW of the proposed Project. Shifting and demolishing of these structures may cause serious social issues.

Due to adverse impact on the residential structures, human disturbance will occur which create magnitude social, gender, livelihood and cultural issues. This impact can be categorized as negative, local, high, permanent and irreversible.

Mitigation Measures

The LAA of 1894 is the main law regulating land acquisition for public purpose. This impact

can be mitigated by ensuring compliance of LAA, 1894, addressing community grievances on priority basis and timely compensation to affectees.

The process of land acquisition and compensation should be followed in a transparent manner to minimize the impacts to provide judicious compensation to the displaced by providing sufficient budget in the project cost. According to LAA 1894, the following points are to be considered while determining compensation for the project affectees:

- Due consideration should be given to minimum land acquisition in design phase by selecting careful route alignment for the construction of proposed Project;
- Land that will be falling under RoW should be acquired according to LAA, 1894 for the proposed Project;
- Route of the proposed road should be realigned to avoid the impacts on religious and structures;
- Compensation should be evaluated and provided as per market rates;
- The effort will be made by making changes in design to avoid the sensitive and religious structures and to minimize the issues at possible extend. If needs demolishing and shifting of graveyards, a mechanism will be developed with the community consultation; and
- Proper consultations and coordination's with affected people will be carried out during land acquisition and resettlement process.

6.7.10 Renting / Leasing Land

Potential Impacts

The Contractors will require renting / leasing for:

- The development of Contractor camps and facilities i.e. storage, workshops, equipment parking and washing areas;
- Aggregate quarries; and
- Access roads/tracks for haulage, transportation etc.

The approximate area required for the establishment of one Contractor's camp facilities will be 1500m² at the different locations. Land utilization for project activities and subsequent operation of project may induce temporary as well as permanent changes in the existing landuse pattern. This impact can be categorized as direct, low, site-specific, short term, temporary, medium probability and reversible.

Mitigation Measures

It is the foremost option to establish the Contractor camps at the acquired land to eliminate the issues of land leased etc. However, if this option is not feasible than the land for above mentioned facilities should be selected and leased prior to the start of construction phase.

Land for above mentioned facilities will be directly rented from the private landowners by the Contractors. The provisions of the LAA, 1894 will not be involved as the acquisition of the land will be renting / leasing and will be covered by short-term lease agreements between the

landowners and Contractor. Rental terms should be negotiated to the satisfaction of the concerned landowners and the agreement should be in local language to make the process clear.

In addition, these project facilities should be located at a minimum distance of 500 meters from the existing settlements, built-up areas, archaeological and cultural monuments as the case may be. Prior to the commencement of the construction activities, the Contractor should submit a construction camp development/management plan to the Engineer-incharge and the EPA, Punjab (if required) for its scrutiny and approval. As far as possible, waste/barren land i.e. areas not under agricultural or residential use and natural areas located at high elevation should be used for setting up the contractor camps.

6.7.11 Public Utilities

Potential Impacts

Due to the proposed project, public utilities (transmissions lines, PTCL exchange/ transmission system, gas pipelines, water supply, sewerage and drainage pipe lines etc.) may be affected creating disruption of public services and inconvenience to the local residents. This impact is medium adverse in nature.

Mitigation Measures

Mitigation measures will include:

- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and
- All public utilities likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work.

6.7.11.1 Physical, Religious and Cultural Resources

Potential Impacts

According to the field survey, various mosques, graveyards and shrines are coming under the area of influence. All these structures will be directly affected and demolishing of these structures may cause serious social issues. The location of these sensitive receptors (structures) are shown in Figure 4.12. This impact is permanent and highly negative in nature.

Mitigation Measures

Due consideration shall be given to minimize the adverse impacts on the religious and community structures and places. The effort will be made by making changes in design (where possible) to avoid the sensitive and religious structures and to minimize the issues at possible extend. If needs demolishing and shifting of graveyards, a mechanism will be developed with

the community consultation and proper consultations and coordination's with locals will be carried out to resolve this sensitive issue.

6.8 ADVERSE IMPACTS DURING CONSTRUCTION STAGE

6.8.1 Site Accessibility During Construction

Potential Impact

The proposed Project can be approached through various major road and railway network. The construction material, equipment and machinery will be arrived at proposed workshop area and construction camps sites. From these camps, the material, equipment and machinery will be transferred to work site.

Existing approach roads: The proposed Project is approachable through major roads such as Rawat Chakbeli road between village Maira Mohra and village Jhatta Hathial, Adiyala road near village Bhattian Nur Din, Chakri Road and finally terminates at Thallian Interchange on Motorway M-2 etc. Detail of major approach roads are provided in the Table 6.2.

Table 6-2: Major Approach Roads for the Proposed Project

Sr. No.	Road Name	RD Stretch
1.	Grand Trunk Road	00+100
2.	Kalyam Road	00+700
3.	Harraka - Timber Ratyal Road	05+000
4.	Bassali Road	06+200
5.	Rawat - Chak Beli Road	09+800
6.	Adiala Road - Rawat Road Link	13+300
7.	Jhatta - Nakrali Road	13+400
8.	Adiala Road	24+000
9.	Chakri Road	31+800
10.	Pilo Road	35+500
11.	Thallian Interchange on Motorway M-2	38+300

Apart from above existing road, few accessibility tracks needs be developed which may cause damage to trees and crops, soil erosion, soil contamination, air and noise problems. This impact is medium adverse in nature.

Mitigation Measures

According to usual practices during the construction of road, the access road will be developed within the RoW of the proposed road. This will limit and reduce the additional impact of the establishment of the access roads for the proposed project. For the development of access roads/tracks, contractor will be bound to consider the following mitigations to further reduce the severity of this impact:

- Selection of access roads/tracks should be based upon certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities;
- The approach roads should be selected to avoid any soil degradation and erosion impacts;
- Special care should be taken for known sensitive area to ensure that all interested parties are aware of the type and location of working. Measures should be taken where necessary to protect such areas physically; and
- Mitigations for the loss of trees and crops, soil erosion, soil contamination, air and noise pollution, waste generation, and loss of agricultural land provided in below sections will be adopted.

6.8.2 Traffic Issues

Potential Impact

The proposed road will be approached through various major roads as mentioned in sub-section 7.8.1. These roads serve as main approach roads to the proposed Project Area and due to the proposed construction activities and movement of heavy project vehicles for construction material supply, traffic problems may arise for the commuters and transporters travelling to the proposed areas. The problems will include traffic jams and inconvenience to the public passing through the Project Area. It will also increase traffic load on the existing road network or access roads ultimately deteriorating the existing conditions of the roads. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions, vibrational impacts, etc. Considering these consequences, this impact can be categorized as medium adverse in nature.

Mitigation Measures

To minimize traffic problems in the proposed project area, following measures will be considered:

- Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population;
- Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions along the major roads;
- The speed of the vehicles will be controlled (at 30 to 40 km/hr) to reduce the probability of severe accidents, soil erosion, debris flows due to vibrations and dust emission;
- Damages of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work;
- Proper sign boards will be provided for smooth flow of traffic;
- Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents; and
- Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and displays.

Traffic Management Plan will be implemented to avoid traffic accidents, jams/public inconvenience. (Refer TMP in the Annex-V)

6.8.3 Resource Conservation

Potential Impact

Resources involved in the construction of proposed project would include water, fuel and construction materials.

Excessive water consumption by the construction staff may stress water resources in the project area and in certain cases may disturb the existing water supplies in the project area.

Construction material to be used for construction includes coarse aggregates, fine aggregates, asphalt, cement, lining material, earthworks, reinforced and structural steel etc. Almost all the materials to be used in the construction of proposed project are non-renewable and therefore their efficient use is necessary for the future use.

Fuel will be used to operate construction machinery. Efficient use of energy resources is important to reduce air emissions. For conservation of energy, efficiency of the engines and burning processes is important. The impact is low adverse in nature.

Mitigation Measures

Following practices shall be adopted to conserve these natural resources:

- Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purpose;
- Plan for the provision/purchase of adequate insulation to reduce heat loss through batching plants;
- Reduction of wastage of water through training of workers involved in water use;
- Reuse of construction waste materials may be adopted wherever possible;
- Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment;
- Efficient and well maintained equipment and machinery should be used;
- The equipment and machinery should be turned off when not in use;
- Ensure adequate insulation to reduce heat loss through batching plants;
- Regularly monitor CO and CO₂ content of the flue gases to verify that combustion systems are using practical excess air volumes;
- Use of solar panels at construction camps may be considered and plan for use of solar panels at operational phase may also be considered; and
- A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.

6.8.4 Community Health and Safety

Potential Impact

Community health and safety issues during the construction of proposed Rawalpindi Ring Road Project may include dust, noise, and vibration from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor. Significant community health and safety issues associated with road projects may also include:

- Pedestrian safety;
- Traffic safety; and
- Emergency preparedness.

The construction activities and vehicular movement at construction sites may result in roadside accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. Quality of groundwater and surface water resources available in the nearby local communities may be affected due to the construction activities, oil spillage and leakage, roadside accidents, etc. The proposed project will also have potential of air (dust pollution), noise and vibrational impacts on nearby community (Baanth (Start Point on N-5), Jalhari Bahi Khan, Chamba Papai, Kalam Awan, Hardo Jagi, Mohra Mehar Bakhsh, Qutab Ferozwala, Bhagwal Dargai in tehsil Gujar Khan and Kalyam Teli, Lohsar, Tamar, Ratyal, Basali, Nothia Bania, Dhakki Kalan, Jhatta Hattial, Maira Mohra, Mandhal, Gai Mir Baaz Main, Khingar Kalan, Bhattian Nur Din, Hoshial, Gai Mir Baaz Kharji, Lilla Kamal Pur, Chappar, Tarahia, Dhapai, Mian Ahmada, Khasala Kalan, Khasala Khurd, Mara Kallan, Kolian Parr, Kohala Muaffi, Pilo, Thallian, Ghareeba in tehsil Rawalpindi.) The labor works with different transmittable diseases like HIV/AIDs and COVID-19 etc. may cause spread out of those diseases in the local residents of above mentioned settlements along the proposed Rawalpindi Ring Road Project. The construction areas located near the, settlements, may cause accident for the people moving near to these areas. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

- The World Bank/IFC EHS Guidelines, 2007, defines community health and safety in terms that guarantee as-built infrastructure conforms to acceptable standards (structural safety, flood and fire risk), water supply sources are of suitable potable quality, emergency response planning is in place for built environments, traffic safety provisions are enforced alongside transport hazard assessment and mitigation, and disease prevention measures are taken. The Contractor will prepare the site specific community health and safety plan in compliance with relevant sections of the IFC General Environmental Health and Safety Guidelines (WB/IFC 2007), Pakistan Labor Laws, Punjab Occupational Safety and Health Act (2019);
- The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones;
- The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage;

- The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust;
- The Contractor will provide temporary lighting to facilitate construction during night time;
- The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable);
- The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities;
- Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements;
- An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links;
- Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes: Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to residential areas and by eliminating any unusable impounding of water; and
- The communicable disease of most concern during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, COVID-19 will be prevented by successful initiative typically involving health awareness; education initiatives; training health workers in disease treatment; immunization program and providing health service.

Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as determined necessary by the supervisory consultant.

These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.

6.8.5 Occupational Health and Safety

Potential Impact

Occupational Health and Safety (H&S) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, carpeting, pavement piling / foundations & abutments, finishing and testing & commissioning. In nutshell, occupational health and safety issues associated with the construction of proposed Project will primarily

include physical hazards; chemical hazards; and noise.

Physical Hazards: Road construction personnel can be exposed to a variety of physical hazards, principally from operating machinery and moving vehicles but also working at elevation on bridges. Other physical hazards (e.g. exposure to weather elements, noise, work in confined spaces, trenching, contact with overhead power lines, falls from machinery or structures, and risk of falling objects).

The falls during inspection or maintaining pile rigs, steel fixing during subways & bridges, erection of framework and other related activities. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact. Welding hazards include electric shock, fumes and gases, fire and explosions, falls from height, eye and head injuries etc.

Other impacts will be fall from height, contact with heavy electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the H&S issues e.g. struck by moving vehicles or other equipment, slips or trips, struck by flying objects, such as dirt or splashed fluids, caught in pinch points, shear points, crush points, falling from machine etc. The proposed project area is also sensitive from the law and order point of view and the security as well as the safety of the Contractor and Consultant staff will be a major issue.

Chemical Hazards in proposed Project construction may be principally associated with exposures to dust during construction and paving activities; exhaust emissions from heavy equipment and motor vehicles during all construction activities; diesel fuel used as a release and cleaning agent for paving equipment and in generators; and handling and storage of bitumen.

Noise: Construction and maintenance personnel may be potentially exposed to extremely high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources cannot be prevented, control measures should include the use of personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure.

In addition, disasters such as earthquakes and fires may occur. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

Mitigation Measures to prevent and control physical hazards include:



Moving Equipment and Traffic Safety

- Establishment of work zones to separate workers on foot from traffic and equipment by:
- Routing of traffic to alternative roads when possible;
- Where worker exposure to traffic cannot be completely eliminated, use of protective barriers to shield workers from traffic vehicles, or installation of channeling devices (e.g. traffic cones and barrels) to delineate the work zone;
- Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;
- Reduction of maximum vehicle speeds in work zones; and
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).

Elevated and Overhead Work

- The area around which elevated work is taking place should be barricaded to prevent unauthorized access. Working under personnel on elevated structures should be avoided;
- Hoisting and lifting equipment should be rated and properly maintained, and operators trained in their use. Elevating platforms should be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings); equipment movement protocols (e.g. movement only when the lift is in a retracted position); repair by qualified individuals; and installation of locks to avoid unauthorized use by untrained individuals;
- Ladders should be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions; and
- Provide appropriate Personal Protective Equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

Fall Protection

- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others;
- Establishment of criteria for use of 100 percent fall protection (typically when working over 26 meters above the working surface, but sometimes extended to 7 meters, depending on the activity). The fall protection system should be appropriate for the structure and necessary movements, including ascent, descent, and moving from point to point;
- Safety belts should be not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident; and
- When operating power tools at height, workers should use a second (backup) safety strap.

⁶ IFC Environmental, Health, and Safety Guidelines-TOLL ROADS



Mitigation Measures to prevent and control chemical hazards include:

- Use of millers and pavers with exhaust ventilation systems and proper maintenance of such systems to maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels;
- Use of the correct asphalt product for each specific application, and ensuring application at the correct temperature to reduce the fuming of bitumen during normal handling;
- Maintenance of work vehicles and machinery to minimize air emissions;
- Reduction of engine idling time at active construction sites;
- Use of extenders or other means to direct diesel exhaust away from the operator;
- Use of protective clothing when working with cutbacks (a mixture of asphalt and solvents for the laying of pavement), diesel fuel, or other solvents; and
- Provide appropriate PPE in conjunction with training, use, and maintenance of the PPE.

Furthermore, the noise reduction options that should be considered which include:

- Selecting equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing vibration isolation for mechanical equipment;
- Providing noise protection PPEs (ear plugs/ear muffs) to the construction workers;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Developing a mechanism to record and respond to complaints; and
- Regular monitoring of noise levels at active sites or near noise producing equipment/machinery and compare it to the available occupational noise standards.

Drowning Hazard Mitigation Measures

- Occupational Safety and Health Administration (OSHA) does not provide specific criteria to determine when the risk of drowning is present. It is considered to exist at any time the depth of water exceeds 5 ft (1.5 m)⁷ (or is subject to sudden depth fluctuations to 5 ft (1.5 m) or greater). For depths less than 5 ft (1.5 m), the risk of drowning may exist if swift currents are present, or if a fall into the water may result in the person becoming unconscious or otherwise disabled. Even for depths as shallow as 2 ft (0.6 m) or less, drowning protection may be required under some conditions.
- Employees should not work alone, where practical, in situations where a drowning hazard exists;
- Drowning protection must be provided for workers in areas where the danger of drowning exists and passive fall protection (OSHA-specified nets or railing) are not present to prevent workers from entering the water. When active fall protection (lanyards, etc.) is provided, or the workers must work outside the railing, drowning protection is required; and
- A skiff or boat for emergency rescue operations, equipped with paddle or oars, a ring buoy or other life preserver and a reach extension device. Where water current

⁷ Safety and Health on Bridge Repair, Renovation and Demolition Projects. U.S Department of Transportation. Publication Number: FHWA-RD-98-180.



exists, the skiff or boat must be motorized or occupied at all times. Under all conditions, the skiff or boat must be located such that it is available for immediate use if an emergency arises.

Monitoring of OHS Activities:

During the construction phase of proposed Project, occupational health and safety monitoring programs of the contractor (s) should verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards at the construction site and camps, and the implementation of prevention and control strategies. The occupational health and safety monitoring program should include:

- Regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used;
- *Surveillance of the working environment:* The contractors should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards;
- Continuous and efficient surveillance of worker's health during the entire construction phase by the nominated officials of contractors; and
- *Training:* Training activities for employees (construction contractor & supervision consultant staff) and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually required to submit to the employer adequate training documentation before start of their assignment.

General Mitigation Measures for OHS of Workers and Community during Construction Phase:

- Complying with the safety precautions for the construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the Project Contract;
- Formulation of layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers;
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- Proper maintenance of facilities for workers shall be monitored;
- Provision of protective clothing for labourers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves, etc. Ensure strict use of wearing these protective clothing during work activities;

- Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site;
- Provision of proper safety and diversion signage, particularly at sensitive/accident-prone spots; and
- Disasters such as earthquakes, flooding, due to heavy rain and other manmade disasters such as fires may occur, and that must be considered for minimizing their impacts. Therefore, an Emergency Response Plan for earthquakes and manmade disasters should be developed by the construction contractor; and
- Construction Camp Management Plan (CCMP) and effective implementation of GRM may reduce this impact.

Contractor(s) shall prepare a comprehensive OHS Plan including work method statements for all hot works to avoid incidents during construction stage. A guideline OHS Plan is provided in Annex-VI.

The Contractor will prepare the site specific occupational health and safety plan in compliance with relevant sections of the IFC General EHS Guidelines (WB/IFC 2007), Pakistan Labor Laws and Punjab Occupational Safety and Health Act (2019).

These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.

6.8.6 Soil Erosion

Potential Impact

Construction activities such as clearing of earth, levelling, piling, compaction, carpeting, pavement finishing will affect the existing soil condition in the RoW. The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season causing soil erosion. During the rain, the eroded soil mix with stagnant water to transform into slush, which can affect movement of vehicles and machinery and construction work as well as limit the movements of local people.

Soil erosion may also occur in the workshop areas as a result of improper drainage system of equipment washing-yards and improper management of construction activities.

For this proposed project, disposal sites are not finalized yet however, it will be near to project site to minimize disposal cost. This impact is, however, high to low adverse in nature.

Mitigation Measures

Good engineering practices will help to control or minimize the soil erosion both at the construction sites and in peripheral areas. All the disturbed areas need to be protected against soil erosion by stripping and stockpiling of all the available topsoil for later re-vegetation. Special slope protection measures will be adopted in the sensitive areas and along the shoulders of roads and excavations shall be kept confined to the specified foundation spots as per the approved engineering drawings. Unnecessary excavations should be avoided.

The provision for vegetation with a fast growing crop and a native seed mix immediately after fill placement to prevent scour and to encourage stabilization will be made in the design. Use of stone pitching or riprap will also be provided in the design at appropriate places especially around flyovers, bridges, culverts. Provision for rip-rap in discharge zones from drainage structures will be made in the design to reduce erosion. Down drains/chutes will be lined with rip-rap/masonry or concrete to prevent erosion. Side slopes will be adjusted to a gradient necessary to reduce erosion potential or, if steeper, stabilized, covered with riprap or other material to prevent soil erosion. Site restoration plan for the Project will be strictly followed.

6.8.7 Soil Contamination

Potential Impact

The soil contamination occurs at all construction stages: during the design and survey work, during the construction of road, directly during the work on the construction site. Each stage of construction results in a new pollutant appearing each time. Land may be contaminated due to the spillage of chemicals, fuels, solvents, oils, paints, concrete, solid waste generated at campsites etc. This normally happens when these materials are transported in open or loosely capped containers. Various types of machinery will be used at the construction sites. This machinery will not only pollute the atmosphere at the construction sites and adjacent territories, but also have a negative impact on the soil surface layer.

The possible contamination of soil by oils and chemicals at camp sites, workshop area and equipment washing-yards may limit the future use of land for agricultural purposes. This impact can be categorized as high to low adverse in nature.

Mitigation Measures

The following practice will be adopted to minimize the risk of soil contamination:

- The Contractors will be required to instruct and train their workforce in the storage handling and management of materials and chemicals that can potentially cause soil contamination;
- Material Safety Data Sheets (MSDS) will be strictly followed during handling and storage of chemicals;
- Soil contamination due to concrete transportation will be minimized by placing all containers in casings;
- Solid waste generated at the camp sites will be properly treated and safely disposed only in the demarcated waste disposal sites/areas;
- If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned; and
- Use of modern, well-maintained machinery and vehicles by the contractor to avoid emissions and leakages;
- Soils removed during construction would be stockpiled for reuse where possible; and
- Runoff from washing of equipment and gadgets should be drained into either a septic tank or a sand-gravel bed for removal of the grit and contaminants.

6.8.8 Borrow/ Open Pits

Potential Impact

Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. Borrow/ Open pits may also become potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area. This impact is medium adverse in nature.

Mitigation Measures

Mitigation measures will include:

- Necessary permits will be obtained for any borrow pits from the competent authorities;
- In borrow pits, the depth of the pits will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4;
- Soil erosion along the borrow pit will be regularly checked to prevent/ mitigate impacts on adjacent lands;
- In case borrow pits are filled with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and
- Borrow pits will be used for construction waste, but during the excavation, top 20 cm soil cover will be preserved for vegetation after the filling of the pits. This is the best way to restore the flora of that area.

Quarry Management Plan is attached as Annex-VII.

6.8.9 Construction Camps/Camp Sites

Potential Impact

Approximately two (02) construction camps are proposed to be established during construction period for the subject Project. Due to the proposed camp sites, loss of vegetation and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur. These impacts may include waste, soil pollution, groundwater pollution, dust, etc. However, the impact will be medium adverse in nature. For these impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. Table 6.3 summarizes potential impacts and proposed mitigation measures associated with construction camps.

Table 6-3: Summary of Workers Camp Impacts & Mitigation Measures

Potential Impact	Proposed Avoidance and Mitigation Measures
<i>Environmental</i> ▪ Temporary habitat loss or disturbance ▪ Temporary visual intrusion	<i>Environmental</i>

Potential Impact	Proposed Avoidance and Mitigation Measures
- Noise emissions at a single location - Waste generation - Discharge of sanitary effluents and rainwater run-off to nearby water bodies	- Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas. - Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures. - Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary. - Provide adequate warnings of impending works to all potential receptors within a 1 km corridor surrounding the RoW via public notices and local news.
Social Worker camp site: consultation surrounding potential construction camp sites revealed concerns regarding the location of proposed sites for Worker Camps.	Social State land will be a second preference for worker camp locations, followed by land where there is a willing lessee. Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values. Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. This will include, in appropriate languages: - A briefing on camp rules - A community relations orientation to increase awareness about the local area, cultural sensitivities and the project Code of Conduct - Awareness-raising on health considerations, including sexually transmitted diseases (STDs). The construction contractor is required to develop a Construction Camp Management Plan to address: - Discipline; - Community liaison; - Ethnic tensions and; - Communicable diseases. A Code of Conduct and Camp Rules will be required within the Construction Camp Management Plan, which provides policies and a disciplinary framework with respect to worker behavior.



Potential Impact	Proposed Avoidance and Mitigation Measures
Camp Location The final location will be determined by the construction contractors and agreed with the PMU-RDA.	Camp Location The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption.

Some additional mitigation measures should include:

- The contractor(s) should provide plan to PMU-RDA for removal & rehabilitation of site upon completion;
- Photographical and botanical inventory of vegetation before clearing the site; and
- Compensatory plantation to be scheduled when construction works near end.

A sanitation plan for the construction camp has been proposed which is attached as Annex-VIII.

6.8.10 Wastewater Generation at Construction Camps

Potential Impact

Approximately two (02) construction camps are proposed to be established during construction period for the subject project.

Wastewater will be generated at the construction camps and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc. apart from soil contamination. Water from dewatering activities (during rainy season) has the potential to contain suspended solids and oil and grease and if disposed of untreated may affect the soil quality. The Table 6.4 below shows anticipated composition and estimate of the wastewater to be generated by construction workers during the course of the construction phase of the project assuming that on average the water demand per person is 40 liters per day and that 80% of the water demand will become wastewater.

Table 6-4: Estimated Wastewater Generated by Workers in Construction Camps

Sr. No.	No. of Workers*	Estimated Total Water Demand** (liters/day)	Estimated Wastewater Generated (liters/day)***
1	300	12,000	9,600

* "Tentative Work Force Requirements Including Client and Contractor Staff"

** = (300) x (40) = 10,000 liters/day

*** = (250) x (80%) = 9,600 liters/day



This 9,600 liters/day of wastewater is from the whole (2 nos.) of construction camps while the wastewater quantity for each camp will be much less. This impact can be categorized as medium adverse in nature.

Mitigation Measures

To dispose the liquid waste generated from the construction activities, the following steps will be taken by the Contractor:

- Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks (as shown in Figure 6.1).
- Proper monitoring to check the compliance of PEQS will be carried out; and
- Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit.
- The Contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal.

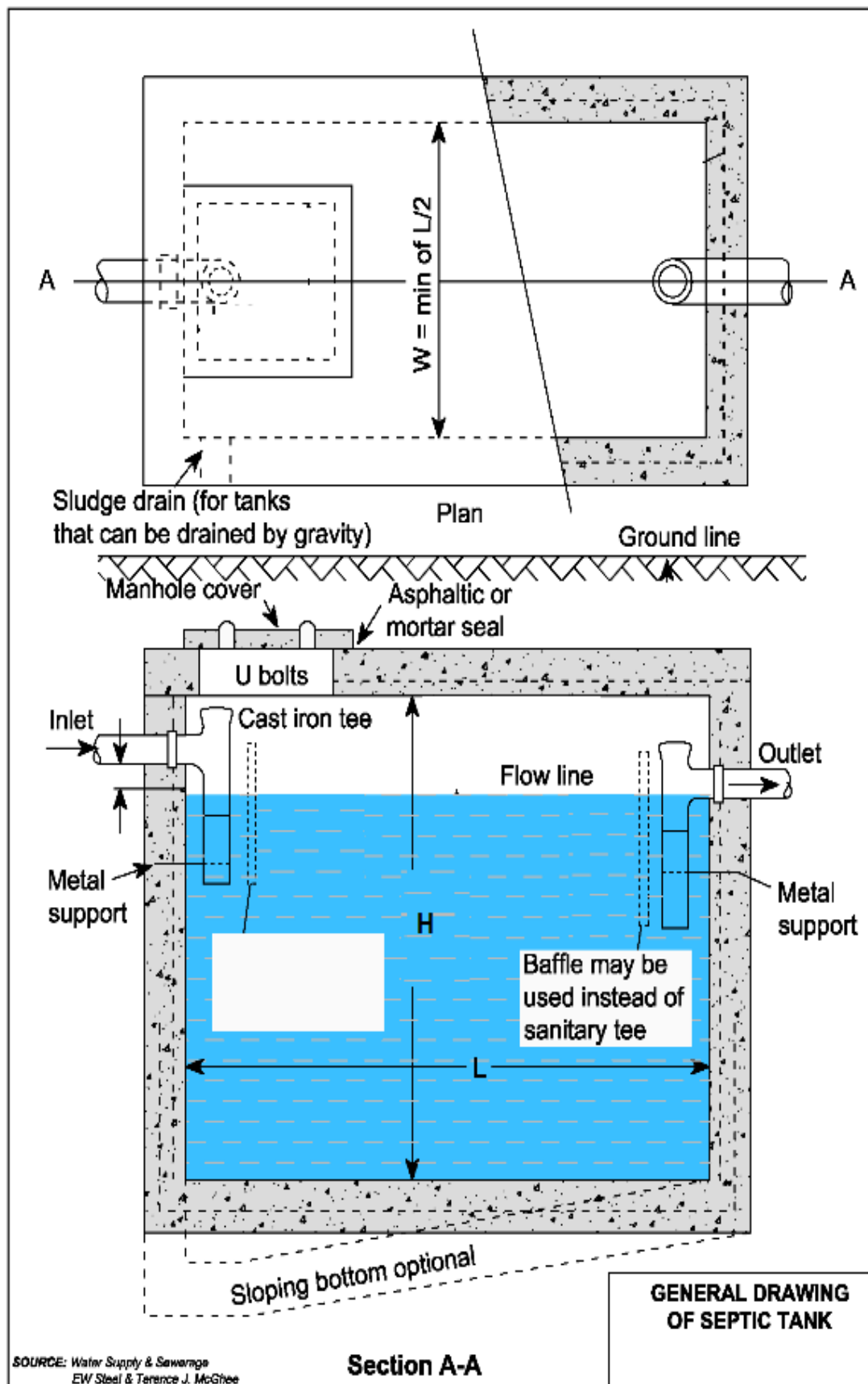


Figure 6-1: General Drawing of Septic Tank



6.8.11 Solid Waste Generation at Construction Camps

Potential Impact

Considering the labourers (about 300 in numbers) residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.45 kg/capita/day⁸ is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 135 kg of solid waste will be generated from construction camps on daily basis. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues. Other type of wastes may include inorganic construction wastes including hazardous waste. The estimated quantity of excavation material for ROW clearance cannot be provided at design stage. The contractor will provide the estimated quantity of excavation material during the construction phase. These wastes will be generated due to the construction activities and the materials used for construction. This waste would require proper disposal to minimize land and water contamination. This impact can be categorized as medium adverse in nature.

Mitigation Measures

- All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste;
- The Contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.

6.8.12 Waste Generation at Construction Site

Potential Impact

The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials etc.). The handling and storage of oil and other hazardous waste will be a source of environmental pollution during the excavation, foundation, levelling, carpeting and pavement activities. The quantification of construction material waste is not available but it is anticipated that less amount of such waste will be generated along the route length.

Improper disposal of construction waste can lead to nuisance and hazards towards environment and local population. The unspent materials and debris produced from consumed up materials, if left as such and allowed to mix with soil underneath, can degrade the quality

Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day.



of receiving soils and render them unfit for plantation. Leakages of oils, lubricants, chemicals, and other similar substances from their storage sites can spoil the receiving soils and may undermine ability of the spoiled soils to support growth of vegetation and plants. This impact can be categorized as medium adverse in nature.

Mitigation Measures

Mitigation measures will include:

- Waste Management Plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors;
- Reusable material will be used as a filling material during ground levelling;
- Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and
- The site will be restored back to its original conditions after construction completion.

6.8.13 Impact on Water Resources (Surface and Groundwater Contamination)

Potential Impact

The proposed project will traverse through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs at different locations. The bridges are proposed on these water resources these surface water resources may get contaminated by the fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at the construction camp sites. Moreover, runoff from the chemical storage areas may also contaminate the surface water bodies.

Surface water might get contaminated due to the disposal of construction waste generated due to the Project activity and also result in jeopardizing the health of natives that use this water for meeting domestic requirement. The impact on these water bodies will be only for the period of construction and will vanish as the construction work is over. In addition to that, construction waste, if left unattended will result in forming leachate which will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it.

This impact can be categorized as medium adverse in nature.

Mitigation Measures

As a mandatory step, all the effluents will be disposed as per the requirements of PEQS. Moreover, to reduce the risk of surface and groundwater contamination, good management practices will be adopted to ensure that fuels, chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner. These measures are described below:



- Construction camps will be established in areas with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS are met;
- The surface and groundwater reserves will be adequately protected by installing screens and barriers to protect the source of contamination such as construction and oily waste that will degrade its potable quality;
- The proponent will ensure that the construction work is confined within the RoW and water bodies are prevented from pollution during construction;
- The solid waste will be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Regular water quality monitoring according to determined sampling schedule;
- The contractor will ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged;
- Work on irrigation canal areas will be kept to a minimum, protective walls be constructed;
- To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structures in urban areas;
- Prohibit washing of machinery and vehicles in surface waters, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Construction work close to the streams or other water bodies will be avoided, especially during monsoon period;
- Wastes will be collected, stored and taken to approved disposal site.
- Wastewater effluent from the Contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the PEQS, the BOD concentration in sewage must be brought down to less or equal to 80 mg/l before being discharged into a natural stream having capacity to dilute the effluent. For wastewater apart from BOD, COD of 150 mg/l will also be checked; and
- Similarly, if the sewage after treatment is to be discharged on to the land it will meet the requirements of the PEQS for disposal of wastewater.

6.8.14 Waste Management from Asphalt and Batching Plants

Potential Impact

Concrete and asphalt have limited usable life, after which they become waste. If not used within the time span, their wastage will have major financial implications. Further, their disposal will become very difficult because of the large quantities involved. This impact is medium adverse in nature.

Mitigation Measures

- The contractor will develop specific environmental management plans for asphalt plants and concrete batching plants. These plans will incorporate the general measures as applicable to the entire project, but will also have focused mitigations for solid waste from these plants; and
- The plan will be reviewed and approved by Supervision Consultants.



6.8.15 Disposal of Mucking Material

Potential Impact

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

Mitigation Measures

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

6.8.16 Blockage of Water Channels and Natural Drainage

Potential Impacts

The proposed Project alignment will traverse through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs. These water channels and drains may be blocked and the catchment of the downstream may be disturbed during construction phase. This impact can be categorized as high to low adverse in nature.

Mitigation Measures

To minimize the impact of the project on the geophysical environment, a number of measures have been included in the design that will need to be taken into account when constructing the project facilities. A second class of measures is related to the day-to-day management of the project during construction.

Following specific measures are required to minimize potential impacts:

- Unnecessary widening beyond the proposed design of the road shall be avoided at straight portions and on bends;
- The natural drainage pattern will not be disturbed, where possible, culverts and bridges will be constructed where required;
- Surplus soil and cleared vegetation will be disposed of so as to avoid disturbing the natural drainage; and
- The Proponent in consultation with Irrigation Department finalize the design, where required.

6.8.17 Green House Gas (GHG) Abatement

Potential Impact

The main sources of greenhouse gases (CO₂, CH₄, NO_x etc.) during the construction activities of the proposed project will include both mobile and stationary sources. The mobile source will be the construction and transportation vehicles while the stationary source will be the batching and asphalt plants. Emission of greenhouse gases cause global warming and other climatic



changes on regional and global scale. This impact is can be categorized as high to low adverse in nature.

Mitigation Measures

- Regular motioning of the vehicles for engine efficiency;
- Avoid idling of construction vehicles;
- Alternative energy resources shall be considered where possible; and
- The Contractor shall ensure the compliance with PEQS, 2016.

6.8.18 Discovery of Heritage Sites and Structures during Excavation

Potential Impact

During excavation, there is a chance of finding artifacts. In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate of Archeology and Museums Punjab to take further suitable action to preserve those antiques or sensitive remains. This impact is medium adverse in nature.

Mitigation Measures

- PMU-RDA or the Contractor should acquire an approval from the concerned department prior to construction; and
- Follow steps mentioned in a *Chance Find Procedure* (attached as Annex-IX) in the event, if any unknown cultural heritage is found during any excavation activity.

6.8.19 Emergency Response

Potential Impact

The construction of the proposed project may encounter emergencies. In addition, disasters such as earthquakes and fires may occur. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. This impact is medium adverse in nature.

Mitigation Measures

ERP attached as Annex-X should be adopted in case of any emergency.

6.8.20 Natural and Man-Made Disasters

Potential Impact

Natural disasters (earthquakes) and accidents such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths. The workers shall be trained and facilitated to cope with such disasters. This impact is medium adverse in nature.



Mitigation Measures

Mitigation measures include the following:

- An ERP for earthquakes and manmade disasters should be developed by the Contractor in coordination with SC and PMU RDA should be implemented in close consultation with the RESCUE Services and other concerned departments;
- Training of the Contractor and PMU RDA staff and employees regarding the emergency procedures and plans should be regularly conducted;
- Emergency numbers should be clearly posted at all disposal stations; and
- Minor incidents and near misses should be reported, and preventive measures should be formulated accordingly by the PMU RDA Management.

Refer ERP attached as Annex-X

6.8.21 Accidental Risks

Potential Impact

The project involves excavation operations. This increases probability of accidental injuries to workers and general public. This impact is medium adverse in nature.

Mitigation Measures

Following mitigation measures are suggested:

- Contractor should designate one of the staff members to act as lead person for emergency response and safety issues;
- Contractor should be responsible to provide first aid facilities at construction site as well as camp;
- Contractor should provide safety equipment such as helmets, goggles, ear plugs, gloves, safety shoes etc. to the workers;
- Safety signage should be erected at potentially dangerous working areas;
- Proper lighting arrangements should be ensured for night shift working, if required;
- Contractor should be responsible to provide insurance against accidental death and injuries to workers and public; and
- Public and animal access to construction site should be restricted by providing fences.

6.8.22 Air Quality

Potential Impact

Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability.



Potential impacts on the air quality during the construction stage will be due to the fugitive dust and the exhaust gases generated in and around the construction site. Dust is a major component of air pollution, generated mainly from the following construction activities:

- Site clearance and use of heavy vehicles and machinery/equipment etc. at construction site;
- Procurement and transport of construction materials such as sand, cement, etc. to the construction site;
- Other Gaseous emissions during construction result from operating of construction vehicles, plant and equipment;
- Increase in air pollution levels without project and with project during construction period (for mobile & stationary sources) is predicted from construction machinery, equipment, which reveals that there shall not be significant contribution towards pollution due to the construction activity of the project if mitigation plan will be implemented and
- monitored in proper sense; and
- Asphalt heating.

The sensitive receptors identified within or near the RoW are educational institutions and religious and cultural places etc. which may be affected during construction phase, due to emission of air pollutants. The construction activities will also result in increased air pollution in the area. The overall impact on the quality of air during the construction phase will, however, be temporary and limited to the project's implementation phase only. This impact is high adverse in nature.

Mitigation Measures

The impacts construction phase of the proposed project could be effectively mitigated by the implementation of simple procedures by the Contractor including but not limited to the following:

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Open burning of solid waste from the Contractor's camps and at construction site should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations;
- Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS (as amended) for carbon emissions and noise;
- Contractors shall comply with submitted work schedule, keeping emission operations away from sensitive receptors and residential areas;
- Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s);



- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. Diesel operated equipment should be equipped with well-maintained fuel filter and may be replaced timely (if required). In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators;
- Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a pre-set time can reduce emissions, without intervention of the operators;
- PEQS, 2016 applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works;
- Roads (used for earthmoving equipment and general transport) should be regularly sprayed with water during dry weather;
- All excavation work should be sprinkled with water;
- Construction workers should be provided with masks for protection against the inhalation of dust;
- Vehicles used for construction should be tuned properly and regularly to control emission of exhaust gases;
- Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards; and
- Regular monitoring of air quality in accordance with PEQS, 2016.

6.8.23 Noise/Vibration

A. Noise

Potential Impact

The noise and vibration will be produced due to the operation of construction machinery and equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment's. Noise and vibration are perceived as one of the most undesirable consequences of construction activity. The above machinery is expected to generate noise levels that would be severe in the project area.

The cumulative effects from several machines can be significant and may cause significant nuisances. However, these increased noise levels will prevail only for a short duration during the preconstruction and construction stage. The noise produced by construction equipment is presented in Table 6.5 below as reference.



Table 6-5: Noise Produced by Construction Equipment

Sr. No.	Equipment	Noise dB(A) at 15ft from Source
1	Wheeled loading	90
2	Grader	90
3	Vibration pavement roller	86
4	2-wheel vibration pavement roller	81
5	3-wheel pavement roller	81
6	Tire pavement roller	76
7	Bulldozer	86
8	Wheeled pneumatic dredger	84
9	Sprayer	87
10	Power generator	98
11	Impact drill	87
12	Impact pile driver	112
13	Truck	92
14	Concrete mixer	91
15	Concrete pump	85
16	Mobile lift	96
17	Pneumatic hammer and rock crusher	98
18	Breaker	84
19	Pneumatic spanner	95

Source: Quagliata, A., Ahearn, M., Boeker, E., Roof, C., Meister, L., & Singleton, H. (2018). *Transit Noise and Vibration Impact Assessment Manual* (No. FTA Report No. 0123).

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels; and
- Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed.

The sensitive receptors identified within or near the RoW are educational institutions and religious and cultural places etc. which may affect during construction phase, due to noise and vibration.

Though the construction method has not been determined yet, however it is believed that the adopted method of construction shall produce less noise and vibration if the suggested mitigation measures are adopted. This impact is high adverse in nature.

Mitigation Measures

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



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

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

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

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

Maintenance

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

Noise Perimeter Zones

Noise Perimeter Zones (NPZ) are another administrative control to limit exposure to noisy processes or equipment to as few workers as possible. NPZ are areas where noise levels of 90 dB (A) or more are roped off and marked to keep out all workers who don't have to be there. NPZ can be set up using a sound level meter to find the safe distance from the source (90 dB (A)) and the NPZ can be set up at that distance. Noise does not radiate from the source at the same level in all directions. Noise from machinery can be higher in one direction than another because the noise can also be either absorbed or reflected from surfaces it contacts, such as the ground or a wall. Therefore, measurements should be taken at several points in an area where people might be working. Once noise levels that are 90 dB (A) or more are determined, rope off this area as the Noise Perimeter Zone. Exclude all workers who do not



need to be in that zone. All workers who need to work within the zone must wear hearing protection.

Compliance with Noise Standards at Residential Areas and Sensitive Receptors

- Selection of up-to-date and well-maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;
- Confining excessively noisy work to normal working hours in the day, as far as possible;
- Preferably, restricting construction vehicles movement during night time;
- Heavy machinery like percussion hammers and pneumatic drills shall not be used during the night without prior approval of the client;
- Vehicles and equipment used shall be fitted, as applicable, with silencers and properly maintained;
- Use of low noise machinery, or machinery with noise shielding and absorption;
- Contractors shall comply with submitted work schedule, keeping noisy operations away from sensitive receptors, residential areas; implement regular maintenance and repairs; and employ strict implementation of operation procedures;
- The Contractor shall comply with PESQ, 2016.

B. Vibration

Potential Impact

The duration and amplitude of vibration generated by construction equipment varies widely depending on the type of equipment and the purpose for which it is being used. In assessing vibration from construction equipment, it is useful to categorize the equipment by the nature of the vibration generated. Various equipment categories according to type of vibration and/or activities in each category are listed below:

Equipment or activities typical of continuous vibration include:

- Excavation equipment;
- Static compaction equipment;
- Tracked vehicles;
- Road traffic;
- Vibratory pile drivers;
- Pile-extraction equipment; and
- Vibratory compaction equipment.

Energy from construction equipment is transmitted into the ground and transformed into vibration, which weakens with distance. The magnitude and attenuation of ground vibration is dependent on the following:

- The efficiency of the energy transfers mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment);
- The frequency content;



- The impact medium stiffness;
- The type of wave (surface or body); and
- The ground type and topography.

Any vibration would result in nuisance effects, and will be localized and temporary and will unlikely result in structural damage to buildings or walls of the adjacent private properties. However, there is likelihood of human discomfort and damage to infrastructures (crack formation) due to the vibration caused by construction machinery. This impact is high adverse in nature.

Mitigation Measures

- Vibration measurement during construction phase by the contractor near the settlements/sensitive receptors in RoW along the proposed Project alignment.
- Vibration monitoring of existing operations or construction activity can range from simple, single-location measurements to more complex, simultaneous, multi-instrument measurements. The simple approach consists of taking measurements at the most sensitive location along the proposed project or the location perceived by the complainant to have the worst level of vibration. This information can be used to identify unusual conditions that may be contributing to the high vibration condition and to identify a course of action to reduce the impact;
- Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels to residential properties;
- Residents to be pre-warned of high vibration events and any operations being undertaken outside recommended hours;
- The vibration from rolling and compacting activities would be considered intermittent and short-term, and likely to be tolerated if prior warning is given to potentially affected residents. Residents would therefore be pre-warned of high vibration and any operations being undertaken outside recommended hours. Public notification would be given a minimum of 72 hours prior to plan works. Residents would be made aware of the construction times and the duration they would likely be affected, through letter drops, personal meetings/phone calls as necessary; and
- The equipment operators to be made aware by the contractor of potential vibration issues problems and of techniques to minimize vibration effects during construction works.

6.8.24 Flora

Potential Impact

The project may involve destruction of vegetation due to the proposed project activates. It is initially examined that approximately 3,700 mature, sub-mature, pole crop and saplings of different tree/plants species may be removed during the construction phase of the project. The provided number of trees is approximate and tentative which needs proper detailed field surveys, assessment and authentication with help of Forest department.



Moreover, trees of small, medium and large sizes may be removed due to the layout of the project for which compensation should be made to concerned parties (if any, local communities, forest and other relevant departments).

Exhaust of noxious gases from movement of heavy machinery and dust will pollute air which will adversely affect health and vigor of plants. During construction activities, the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements).

This impact is Site-specific, Temporary, Irreversible, Possible and High Significant.

Mitigation Measures

- Cutting and / or disturbance of trees shall be avoided, as far as possible and select the alternate site for the proposed project as the impact on local ecosystem (especially trees) is expected as high. So, that negative effects on the process of natural regeneration of species are minimized and possible alternate area must be considered for proposed project, in which minimum ecological and environmental losses are expected;
- A tree plantation program shall be implemented with the recommendations and technical support of Punjab, Forest Department;
- NOC for tree cutting from Punjab, Forest Department is mandatory;
- As a compensation and enhancement measure 37,000 trees must be planted in place/lieu of felling of 3,700 trees in consideration of mortality while following the plantation plan. It is pertinent to mention that trees should be relocated/transplanted/replanted (where possible) instead of cutting and may be replanted within the 500 meters' radius of its original location;
- The compensatory plantation shall be carried out in the project area (in the available space) or in the vicinity of project area like associated roads and nearby parks / green areas, etc. to reduce the negative impacts of the tree cutting in the immediate project area and overall;
- Final and actual plantation and trees compensation cost will be finalized after assessment by Punjab, Forest Department. All the activities will be executed as per agreement/MOU between proponent and Punjab, Forest department while strictly considering law of land.
- The proponent shall implement the program with the help of Forest Department and with the consultation of concerned consultant ecologist;
- Open fires should be banned in the area to avoid hazards of fire in the area;
- Clearing of vegetation cannot be avoided at the areas specified for project structures, but damage to the natural vegetation may be minimized by establishing camp sites, workshops and batching plants on waste/barren land rather than on forested or green land.
- However, if such type of land is not available, it shall be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth;
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement;
- The Contractor's staff and labor shall be strictly directed not to damage any vegetation such as trees or bushes; and



- Contractor shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall be strictly prohibited.

6.8.25 Fauna

Potential Impact

During construction phase the existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. The existing fauna will leave the directly affected areas due to construction activities and human intervention. Some animals particularly reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.

Birds as well, will tend to move away from the construction areas and find shelter and food elsewhere due to the activities mentioned above for fear of being hunted / trapped.

Noise generated from machinery particularly during the night hours will even scare the wildlife residing in habitats located at some distance from the construction areas. Food and refuse at the Contractor's camps may attract animals that might in turn be hunted by the workers. This impact is Indirect, Site-specific, Temporary, Reversible, Possible and Medium Significant.

Mitigation Measures

- Care shall be taken during construction activities for avoiding purposely or chance killing of animals;
- If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed;
- Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard;
- The Contractor must be held responsible for instructing his work force accordingly and for enforcing this restriction. In addition, this shall have to be controlled by the Wildlife Department.
- Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding;
- Noise generating activities shall not be carried out during the night by the work force;
- Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and
- Noise produced due to construction activities may be kept to acceptable level.

6.8.26 Agriculture

Potential Impact

Mostly the alignment of the proposed project fall in the very rich agricultural area and damages of crops are expected during construction activities.



The clearance of RoW may affect about 480 acres of agriculture land which may cause loss of income to affectees.

The areas used for the construction of haul routes and sub-camps will result only in temporary loss of cultivatable land, as the land can be again brought under cultivation following completion of the construction works. However, standing crops in RoW of the proposed Project may result in permanent loss of cultivatable land. The impact on agriculture in the project area is high adverse in nature.

Mitigation Measures

- The budget for the proposed project will include provision for payment of compensation to farmers for the loss of any standing crops, or crops already sowed. Will be applicable for all crops standing on land within the acquisition area at the time of dispossession;
- The compensation value shall be calculated based on market value of the crops and average yields in the project area;
- In order to reduce the loss of agricultural land during the construction stage, existing haul routes (if required) will be preferred by the Contractor, and the width of any new haul route shall be limited to the bare minimum required and approved by the engineer;
- Removal of all Contractors' facilities from the Project area shall be a contractual requirement, and as such the land used for the construction camps can be restored to facilitate agriculture and the land used for the construction camp shall become cultivatable.
- Compensation for the loss of crops to the land owners and cultivators as the case may be will be paid, in accordance with the prevailing market prices and uniformity in rates will be ensured within the local areas; and
- As far as possible, land within the RoW (which will be acquired) or otherwise barren land without any crop outside the RoW will be selected for the camp sites and disturbance to the crops and natural vegetation will be avoided as much as possible.

6.8.27 Social and Cultural Conflicts

Potential Impact

During the construction phase of the proposed Project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact is negative, local, low, short-term and probable.

Mitigation Measures

- Local labor especially from nearby communities should be given preference for the construction works;
- Careful planning and training of work force to minimize disturbance to the local people;
- Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and



- Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.

6.8.28 Community Disturbance, Health and Safety

Potential Impact

During construction there will be a number of activities which, if not mitigated, are likely to cause disturbance to communities in the Project area; these are:

- Due to the proposed Project, entry/exit problems and bifurcation of settlements, agricultural land/fields may occur for the residents as well as a hindrance in agricultural activities, i.e. hindrance in movement of agricultural machinery and transportation of agricultural products. This will result in causing inconvenience to the residents/farmers and affect their daily activities; also reducing the frequent interactions between families;
- Increased traffic on public routes;
- Health and safety risk will also be posed to the community due to the existence of a construction site(s) and the storage and use of hazardous chemicals; and
- Movement of plant and vehicles throughout the Project area, especially along haulage routes passing alongside private land during disrupting local movement and posing traffic safety issues.

The impacts on community are high adverse in nature.

Mitigation Measures

To mitigate this impact, the provision of subway will be made. Furthermore, it is suggested to install some kind of barriers for crossing the road and to restrict the pedestrians to use the overpasses. Other mitigation measures are:

- Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities;
- Maintaining a grievance procedure to facilitate stakeholders in expressing concerns;
- Proper traffic diversion plans before the start of the construction;
- Proposal of pedestrian bridge for the locals;
- Appropriate budget for traffic/safety sign boards;
- Timely completion of the proposed Project;
- Maximum the unskilled labor and where possible skilled labor should be arranged locally; and
- Environmental and Social Cell of the Contractor will be responsible for stakeholder engagement and timely information dissemination.



6.8.29 Communicable Diseases

Potential Impact

The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists. Majority of the people living in the surrounding of the Project, and potential Labor are not aware of the source, mode of communication or consequences of HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the Labor camps and the field offices of the Project to prevent the communicable diseases like Cholera, Typhoid and Tuberculosis.

There is a chance of spreading of an epidemic of Coronavirus disease (COVID-19) due to close interaction of the labor force during construction not only among the workers but also in the area. This impact is high adverse in nature.

Mitigation Measures

The Contractor shall:

- Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored;
- Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages;
- Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;
- Locating a labour camp at least away from the villages (local settlement), and
- Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.

Guidelines to combat with COVID-19 are attached as Annex-XI.

6.8.30 Gender Issues

Potential Impact

Gender-based violence: Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may



also lead to an increase in human trafficking whereby women and girls are forced into sex work.

Child labor and school dropout: Increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

There are two basic conventions on child labor adopted by the ILO, and one adopted by the United Nations. The ILO Minimum Age Convention, 1973 (No. 138) and its accompanying Recommendation (No. 146) set the goal of elimination of child labor, and the basic minimum age for employment or work (in developing countries at 14 years of age or the end of compulsory schooling, whichever is higher; and 15 or the end of compulsory schooling for developed countries). The Convention sets a minimum age of 2 years younger for “light work,” i.e., 12 and 13 years, respectively; and a higher minimum age for dangerous or hazardous work (basically 18 years of age, but 16 in certain circumstances). The Convention also has various other flexibility clauses.

Inhabitants of the project area have mix economic background and different sources of income. Children of low income groups mostly involve in different earning activities, as their parents prefer to get their children hired in small shops as helpers, and waiters in hotels for earning money, and supporting household livelihoods. However, the Punjab Restrictions on Employment of Children Act, 2016 prohibits the employment of child and restrict the employment of adolescents in certain occupations and processes such as construction industry, and whoever employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment.

The child labor impact might arise during construction stage, as large number of skilled and unskilled labor will be required by the contractor for the construction activities of the proposed project. This impact is medium in nature.

Positive Impact

In the proposed Project area there is no possibility of inclusion of females in employment opportunities (labour works) due to cultural and religious norms. However, the proposed Project will have positive impacts on the females of the Project Area due to smooth traffic flow and ease in travelling to hospitals, educational institutions, markets, etc.

Mitigation Measures

- The Contractor will be required to provide qualified key personnel to address the specific risks identified in the project. Contractors will specify key staff with the technical skill and experience to implement the mitigation measures;
- The bidding documents will include specific requirements that minimize the use of expatriate workers and encourage hiring of local workers, thereby minimizing labor influx;
- The bidders will be required to submit Codes of Conduct (CoCs) with their bids. The CoCs will set clear boundaries for acceptable and unacceptable behaviours of all



- individuals and companies and will be signed by companies, managers and individuals;
- All project consulting firms will also be required to submit Codes of Conduct with their proposals;
 - The contractor will be required to establish anti-sexual harassment policies that governs conduct in the workplace;
 - The contractor will be required to provide mandatory and repeated training to workers on sexual exploitation and abuse and HIV/AIDS prevention and on the content and obligations derived from the code of conduct; and
 - Provisions will be set in contracts for dedicated payments to contractors for SEA prevention activities (e.g. training) against evidence of completion. The portion of the contract price will be guaranteed by a performance security linked to environmental and social contractor performance.

6.8.31 Impacts on Livelihood

Potential Impact

The construction activity may disturb the business and livelihoods of the shopkeepers and workers doing their businesses along the proposed alignment due to the excavation activities. In this respect, the most critical areas include Baanth N-5 Interchange, Chakbeli Road Interchange, Adiyala Road Interchange, Chakrii Road Interchange and Thalian M-2 Interchange.

The main commercial activities in these areas include shops, grocery stores, workshops, restaurants, cattle farm, poultry farms and factory. At this stage the assessment of livelihood impacts has been carried out on the basis of the alignment and proposed construction camps. During the construction phase, these locations will be finalized and on that basis the livelihood impacts will be determined more accurately.

Mitigation Measures

- Proper compensation should be provided to all the affectees losing their livelihoods along the route;
- Relevant stakeholders should be engaged to design livelihood restoration measures including affectees of the proposed Project area;
- Initial assessment of compensation should be carried out for the income loss of the affectees based upon the current approximation of the proposed alignment. This assessment should be reviewed and revised on the basis of final route alignment during the construction phase;
- Project Construction should be completed on time; and
- Proper awareness and training should be conducted among the affectees regarding proposed Project benefits, reasons for acquiring lands and compensations to be provided.



6.8.32 Influx of Labor

Potential Impact

For the implementation of proposed Project activities, skilled and unskilled labor is required by the Contractor. Mostly, skilled and unskilled workers have been associated with the Contractor since long which they utilize, where they are required for the projects, and while other workers are hired from the different areas that belong to different cultural backgrounds. Social problems and conflicts that are associated with Labor Influx are as follows:

- Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other;
- Increased risk of illegitimate behaviour and crime: The influx of workers and service providers into communities may increase the rate of crimes and a perception of insecurity by the local community. Such illegitimate behavior and crimes can include theft, physical assaults, substance abuse, sexual assault and human trafficking;
- Impacts on community dynamics: Depending on the number of incoming workers and their engagement with the host community, the composition of the local community, and with it the community dynamics, may change significantly. Pre-existing social conflict may intensify as a result of such changes;
- Increased burden on and competition for public service provision: The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional and separate supply systems;
- Increased risk of communicable diseases and burden on local health services: The influx of people may bring communicable diseases to the project area, including STDs, or the incoming workers may be exposed to diseases to which they have low resistance. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, this can result in an additional burden on local health resources;
- Local inflation of prices, accommodations and rents: A significant increase in demand for goods and services due to labor influx may lead to local price hikes and crowding out of community consumers. Depending on project worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of local residents; and
- Increase in traffic and related accidents: Delivery of supplies for construction workers and the transportation of workers can lead to an increase in traffic, rise in accidents, as well as additional burden on the transportation infrastructure.

This impact is negative and temporary in nature.

Mitigation Measures

Suggested mitigation measures for smooth execution of construction activities include:



- Labor camp(s) should be established away from residential population;
- Preference should be given to the local people to work with contractor, and contractor should hire maximum labour force from the project area because this will reduce the labour influx;
- Awareness should be created among the work force to ensure respect for local customs;
- Construction work should be completed within the stipulated time to move workers to next location;
- Labor force should be shuffled with the time;
- An effective GRM should be established for the project to resolve all issues related to the community. Thus, progress regarding resolving the issues should be monitored closely;
- Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all project sites;
- Provide adequate personal hygiene facilities in good condition with adequate supply of clean water;
- Make arrangements to treat the affected workers on time to control the movement of vector borne diseases;
- Sensitize workers and surrounding communities on awareness and prevention of COVID-19, HIV/AIDS and Sexually Transmitted Infections (STI) through training, awareness campaigns and workshops during community meetings;
- Provide proper and free COVID-19, HIV/AIDS and STI health screening and counseling for site workers and community members;
- Develop and enforce a strict code of conduct for workers to regulate behavior in the local communities;
- Taking all sensible precautions to avert illicit, vicious conduct by or amongst the Contractor's personnel, and to preserve unity and harmony, and protection of people and property on and near the sites;
- Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel;
- Site security preparations must be contained within the Bills of Quantities (BoQs) to avoid any delays which might be caused due to insecurity;
- Appropriate fencing, security check points, gates and security guards should be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and
- The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft.

6.9 ANTICIPATED IMPACTS DURING OPERATIONAL PHASE

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

6.9.1 Landscape

Potential Impact

During the operation stage, new saplings of different plants and trees would be planted to enhance the aesthetics and compensate the loss of affected trees. This will have a positive impact of permanent nature. The presence of adequate flora at available spaces along the



proposed alignment will help in absorbing flue gases, emitting from a large number of vehicles and public transport passing through the project area, which shall help improve the air quality. The impact is medium positive in nature.

Mitigation Measures

The saplings planted in the Project area against the trees affected should be properly maintained throughout their growth.

6.9.2 Air Quality

Potential Impact

It is expected that improvement of serviceability and traffic mobility after project completion shall generate some extra traffic due to local development due to the enhanced mobility. The construction of proposed Project will result into ease of traffic movement and reduction of traffic congestion, particularly in the urban areas which are currently having significant traffic density. However, in the longer run, due to increased traffic levels during the operation of the proposed Project, the ambient air quality can be impacted due to the emission of NO₂, CO and Particulate Matter emissions. These emissions are generated due to the combustion of fuel. The impact is medium adverse in nature.

Mitigation Measures

Following mitigating measures are needed to be suggested:

- PMU RDA with the help of PEPA may set up system to monitor air quality along Project area in accordance with PEQS for a specific period to record the quality of air during the operation phase;
- Setting up to system to monitor air quality along the project area in accordance with acceptable International Standards; Monitoring emissions of vehicle as per PEQS;
- Helping the owners and occupants of the affected premises to identify and implement special measure such as hedges and vegetation to reduce air pollution;
- Greenbelt Development Increasing vegetation in the form of greenbelt is one of the preferred methods to mitigate air pollution. Plants generate oxygen, serve as a sink for pollutants, reduce the flow of dust and reduce the noise pollution too alongside the proposed project; and
- A tree plantation plan (as suggested in this EIA report) is strongly recommended to reduce the pollutant propagation to the receptors as an additional advantage of road aesthetics.

6.9.3 Noise and Vibration

Potential Impact

It is expected that improvement of serviceability and traffic mobility after project completion shall generate some extra traffic during the operational phase. The noise levels and vibrations



are anticipated to increase due to increase in traffic volumes, vibrations from engines and tires and mainly use of pressure horns especially near the residential areas and sensitive receptors. The impact is medium adverse in nature.

Mitigation Measures

Provision of adequate noise barriers such as hedges and indigenous tree species will reduce the noise. Further Improvement can be made by enforcing the laws and getting the vehicles tested, regularly after a specific time period, by some reputable vehicle testing laboratory and obtaining a certificate. Noise measurements should be carried out at locations with respect to the schedule specified in the Environmental Management Plan (EMP) to ensure the effectiveness of mitigation measures:

- Use of horn should be strictly prohibited in the close proximity of the residential areas and sensitive receptors;
- Proper signboards should be installed to ensure reduce noise levels in the project area;
- Enforcement and penalties against traffic rules violators;
- Noise barriers may be installed/constructed near the residential areas and sensitive receptors; and
- A tree plantation plan (as suggested in this EIA report) is strongly recommended to reduce the noise propagation to the receptors as an additional advantage of road aesthetics.

6.9.4 Road Safety

Potential Impact

Enhanced vehicular movement and speed in the long run may result in road safety issues like traffic accidents. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move. The impact may be considered permanent and high adverse in nature.

Mitigation Measures

Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic), should be ensured for the smooth flow of traffic moving from major road crossings. Enforcement of penalties for the violators will reduce the significance of this impact.

6.9.5 Drainage

Potential Impact

During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travellers and public due to flooding in



the existing drainage line. In case of chocking of road drainage, the increased surface runoff due to heavy rains may accumulate at different locations of the proposed Project and can cause traffic jams. The impact may consider to be moderate adverse in nature.

Mitigation Measures

- The impact can be controlled/reduced by timely and continuous maintenance/cleaning of the drainage system; and
- Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain around the bridge and at grade road alignment.

6.9.6 Road Maintenance Works and Heavy Traffic

Potential Impact

During the operational phase, different maintenance works will be carried out throughout the project life. Laborers or the staff involved in these maintenance works are exposed to health and safety issues. Poor implementation of HSE plans or noncompliance of PPEs can lead to personal injuries and accidents. Moreover, application of poorly maintained equipment's and material can lead to air and noise pollution. The maintenance works can also cause traffic problems to the travellers. Lack of maintenance may also lead to water and soil pollution. This impact is temporary and minor adverse in nature.

Mitigation Measures

Important points to be attended at the operational stage are as follows:

- Implementation of HSE Plans during the maintenance period;
- Strict implementation of personal protective equipment's PPEs;
- Use of high quality equipment and material by the contractor;
- Continuous improvements in the emergency plans;
- Unless considered an emergency work, debris removal will be timed to avoid periods of fish spawning, incubation and migration;
- Construction equipment will be cleaned where wash water will not enter the watercourse;
- Waste materials (e.g., paint flakes, abrasives, etc.) will be properly contained and disposed;
- Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans;
- Selection of suitable sites for contractor camps and implementation of all the related important protocols for the management of camp activities in order to avoid environmental and HSE issues;
- Understanding and training of staff on Operation and Maintenance Manual;
- Regular maintenance of engineering works;
- Maintain vegetated areas in adequate cover to meet the intended purpose(s);
- Conservation practices that limit particulate matter emissions should be incorporated into long-term maintenance plans;
- Blowing of pressure Horns by the vehicle will be strictly prohibited; and



- Continued public consultation and feedback on it.

Structural Repairs

- In water work will be timed to avoid periods of fish spawning, incubation and migration;
- Appropriate erosion and sediment control measures will be implemented prior to commencement of repair work and will be regularly inspected to ensure their effectiveness;
- Repairs and reinforcements will be conducted in a manner that prevents bridge materials from entering the watercourse;
- Waste materials will be stabilized and/or disposed of in an appropriate manner that prevents entry into the watercourse; and
- Disturbed areas will be restored and re-vegetated to mitigate erosion and sediment introduction into the watercourse.

6.9.7 Flora

Potential Impact

During operational stage of the Project, there will be minimal effect on flora or release of any significant pressure detrimental to flora. Low level impact is expected at operational phase on Flora due to the operation and maintenance activities. This impact is Site-specific, Temporary, Short-term, Irreversible, Unlikely and Low Significant.

Mitigation Measures

- The implementation of plantation plan recommends compensation for cutting of trees and work should be started during operational phase to ensure the ecological balance and to avoid any impact on local environment;
- Large scale planting with suitable indigenous trees, shrubs and ornamental plants in the form of tree groves, and linear plantation will be carried out in accordance with the Tree Plantation Plan to improve aesthetic value and offset the effect of removal of vegetation;
- Proper check and balance for above activities is highly recommended. Plantations so raised must be maintained according to the Silvicultural practices which includes proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and trench-opening, etc.;
- Maintenance and security of the plantation should be done for at-least four years (in consultation with the Forest department). Measures such as fencing, watch guards and fire protection should be considered; and
- All activities must be done under the technical supervision of Punjab, Forest department.



6.9.8 Fauna

Potential Impact

There is no protected area, game reserve, game sanctuary or national park in the Project area so, no major impact on wildlife and livestock in the area is expected through noise, vibration and any type of normal activity in the project area. This impact is insignificant.

Mitigation Measures

- Strict control must be exercised for stoppage of killing/poaching of available wildlife species (if any) by enhancing protection practices; and
- The precautionary measures described (mentioned above) for future shall also be applicable during operation phase as relevant for the conservation of wildlife species in the Study Area.

6.9.9 Increase in Land Value

The proposed Project is expected to increase the land values, especially in villages where little infrastructure is present land owners will have an opportunity to sell their land on increased prices and start new businesses. This impact will be high positive in nature.

6.9.10 Decrease in Operating Cost of Vehicles

During the operation of the proposed road, lesser wear and tear of the vehicles will occur and it will also result in lesser fuel consumption and decrease in operating cost. This impact is high positive in nature.

6.9.11 Economic Boost

Improved infrastructure will promote new business opportunities in Project region. In addition, the local community will be benefited with economic boost, better employment, education & healthcare facility especially for women and children will be improved. This impact will be high positive in nature.

6.9.12 Community Development

Improved communication infrastructure will promote new business opportunities. Due to the construction of the proposed Project, access mobility to other area will become easy. New marketing activities will boost with the development of road. With the boost of commercial activity and enhanced employment opportunities and standard of living of the local people will be raise. This impact will be high positive in nature.

7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 GENERAL

Environmental Management Plan (EMP) is a tool for the implementation of the all the suggested measures to make the project environmentally sustainable. It provides an overall approach for managing and monitoring the environmental, ecological and socio-economic issues of the proposed Project, and describes the institutional framework and reporting mechanism to implement EMP for the Project.

7.2 EMP COMPONENTS

The EMP comprises following main components:

- EMP Objectives;
- Scope of the EMP;
- Environmental Policy, Legislation and Framework;
- Institutional Requirements;
- Environmental Mitigation and Management Matrix;
- Environmental Monitoring Plan;
- Planning for EMP Implementation;
- Training and Capacity Building;
- Communication & Documentation;
- Management Plans;
- Chance Find Procedure;
- Public Disclosure;
- EMP Cost; and
- Summary of Environmental Cost.

7.3 EMP OBJECTIVES

The main objectives of the EMP are:

- Provide project impacts along with the proposed mitigation measures, and a corresponding implementation phase;
- To ensure that all necessary corrective actions are carried out in time to counter any adverse environmental impact;
- To ensure the regular monitoring of those factors which may affect the safety of the environment under a systematic monitoring approach;
- Define the roles and responsibilities of the Project Proponent and Contractor in order to effectively communicate environmental issues among them;
- Provide a procedure for timely action in the face of unanticipated environmental situation;
- Identify training requirements at various levels including Project Proponent, Contractor and Supervision Consultant (SC);

- Provide a monitoring mechanism in the form of an environmental monitoring program, which includes monitoring parameters, monitoring frequency to ensure that all the mitigation measures are completely and effectively implemented;
- Provides estimation of environmental cost for the implementation of EMP;
- Define the requirements necessary for documenting compliance with EMP and communicating it to all the concerned regulatory agencies; and
- Provide other plans considering the project specific requirements.

7.4 SCOPE OF THE EMP

The scope of the EMP includes the following phases of the proposed Project:

- Pre-construction Phase;
- Construction Phase; and
- Operation and Maintenance Phase.

All the activities performed during these phases will be controlled and monitored according to this EMP.

7.5 ENVIRONMENTAL POLICY, LEGISLATION AND FRAMEWORK

The applicable policies, legislation, acts and guidelines are discussed in detail in Chapter 2 of EIA.

7.6 INSTITUTIONAL REQUIREMENTS

The institutional requirements for the construction and Operation & Maintenance (O&M) phases of the proposed Project are provided in below sections.

7.6.1 Institutional Arrangements for Implementation of EMP during Construction Phase

The key players involved during construction phase of the proposed Project are the PMU RDA as employer/proponent, PEPA, the Supervisory Consultant (SC) and the Contractor. The roles and responsibilities of these organizations are outlined below.

The following staff will be involved in the implementation of EMP:

- PMU RDA/Proponent/Employer;
- SC's; and
- Contractor's Environmental Manager.

The employer/ proponent (RDA) will make Contractor bond through contract documents to implement the EIA including EMP and other terms and conditions of the Environmental Permit. The whole EMP will be included as a clause of the contract documents. Construction camps will be established after necessary approvals and submission of Site-Specific EMPs to be developed in the light of the relevant agencies requirements, before commencement of new

works. The organizational setup for implementation of EMP during construction phase is provided in Figure 7.1.

7.6.2 Overall Oversight Arrangements

A Project Steering Committee comprising of Chairman RDA, Project Director (Rawalpindi Ring Road) and Deputy Director, RDA will provide overall guidance and oversight and will be responsible for ensuring effective implementation of the project.

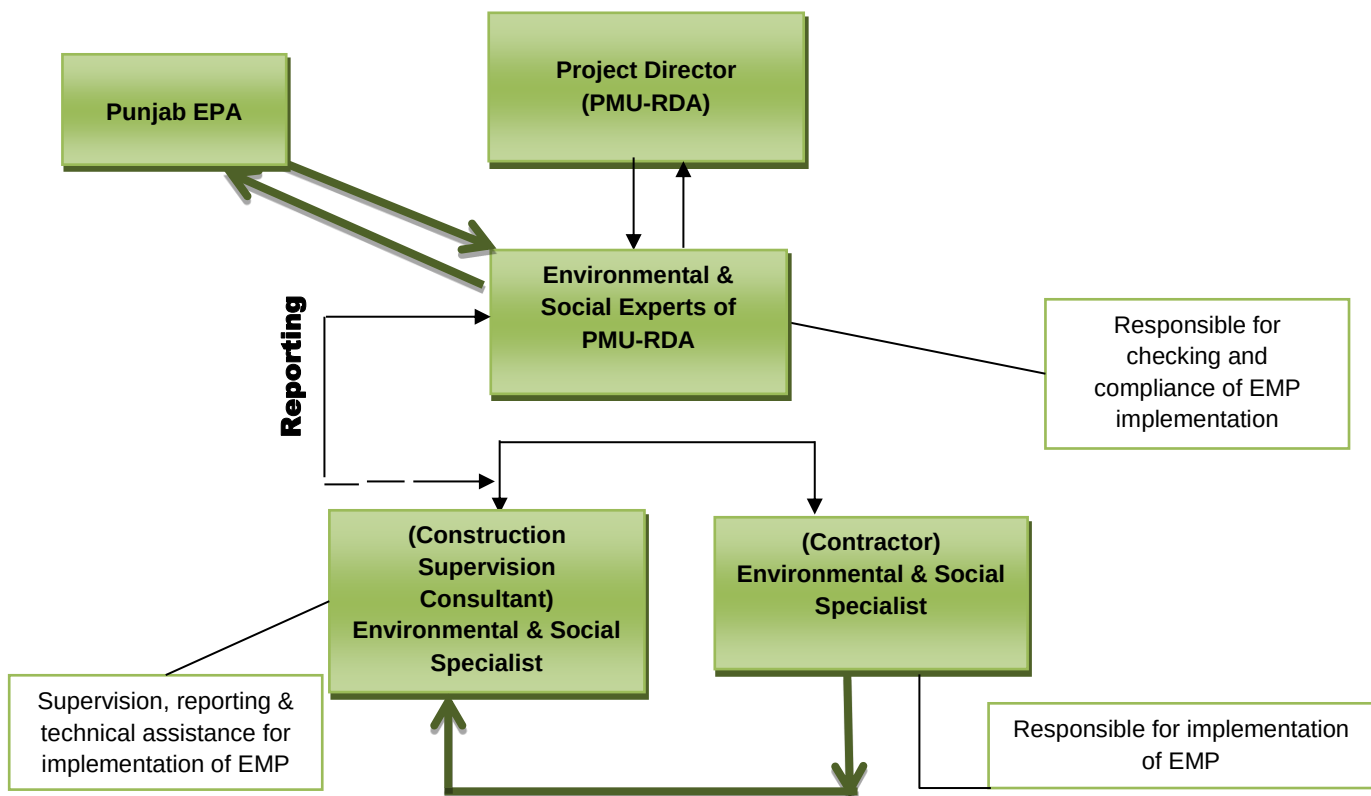


Figure 7-1: Organizational Setup for Implementation of EMP at Construction Phase

7.6.3 Roles and Responsibilities

a) PEPA

As per Punjab Environmental Protection Act, (Amendment, 2017), PEPA is responsible for environmental protection and pollution control. The PEPA is responsible for the approval of the EIA and IEE of all the developmental projects under their jurisdictions. PEPA will undertake audits (as and when required) of the proposed Project activities with respect to the protocols as defined in EMP.

b) Employer Concerned Staff (PMU-RDA)

Project Director, RDA is directly in-charge for the financial and technical matters assisted by Environment and Social staff for the compliance of EIA including EMP. The general monitoring responsibilities will consist of:

- Ensuring that the required environmental training is provided to the concerned staff;
- To carrying out random site visits to the construction sites to review the environmental performance of the Contractor;
- Review monitoring reports for the progress of environment related activities;
- Make sure that the Contractor is implementing the additional measures suggested by the SC in environmental monitoring reports;
- Assessment of the crops, orchards, valuation of property (if any), public utilities and negotiation with the affectees for fixation of compensation to be paid for temporary as well as permanent acquisition of the land;
- To estimate the crop compensation;
- Assist in checking genuine ownerships of the claimants, in consultation with the Revenue staff for prompt payment to the affectees;
- To ensure that the tenants get their rightful compensation as per prevailing law especially in case of loss of crops;
- Assist the Contractor for the timely payments of negotiated prices;
- To assist Contractor for obtaining necessary approvals from the concerned departments;
- Maintaining interface with the other lined departments/stakeholders; and
- Reporting to the PEPA on status of EMP implementation.

c) Supervisory Consultant (SC)

A professional consulting firm will be hired by PMU-RDA and responsible for Contract Administration and Construction Supervision. The firm will be fully empowered as the 'Engineer'. The Consultant will administer the civil work's contracts, make engineering decisions, be responsible for quality assurance, provide general guidance and furnish timely responses to the Contractors in all matters relating to the civil works, and ensure that all clauses of the Contract Agreement including environmental and social clauses between the civil works Contractors' and PMU-RDA are respected. The Project Engineer will have a full-time field based environmental and social specialist to ensure the implementation of EIA including EMP. Two separate experts, one for environment and one for social aspects, will be hired. The environmental and social specialist of SC will also develop training modules, conduct environmental and social trainings for the contractor's staff, and ensure social issues are properly addressed and mitigated during the project life.

Roles and responsibilities of SC will be:

- To oversee the performance of the Contractor to make sure that the Contractor is complying with EMP;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Contractor and PMU-RDA;

- Preparing training materials and implementing programs;
- Ensure the implementation of the mitigation measures suggested in EMP;
- To supervise and monitor environmental activities being performed at site;
- To organize periodic environmental training programs and workshops for the consultant's and contractor's staff;
- Periodic reporting as mentioned in EMP; and
- Suggest any additional mitigation measures (if required).

d) Construction Contractor

The Contractor (s) will be responsible for the implementation of EIA including EMP at site. A full-time field based environmental and social expert, whose responsibility will be to ensure compliance, monitor and report all the EIA including EMP implementation related activities on a regular basis. All mitigation measures for adverse impacts proposed in the EIA including EMP will be duly and timely implemented in letter and spirit. For this purpose, daily, monthly and annual checklists will be formulated and maintained.

Contractor (s) will be bond to appoint site based environmental and social experts with relevant educational background and experience for each construction camp. Contractors' environmental and social experts will carry out following activities:

- Implementation of the mitigation measures at construction site;
- Contractor will be bond through contract to take actions against all the special and general provisions of the contract document;
- Contractor will make sure the compliance of EIA including EMP recommendations and will also be responsible for effective liaison with local heads of villages;
- Provision of proper Personal Protective Equipment (PPEs) to the workers and train them for their proper use;
- To conduct the environmental and health & safety trainings to the workers/labour; and
- Coordinate with Environmental Specialist of SC.

7.6.4 Monitoring and Evaluation Consultant

An independent external monitor will be hired to monitor and provide external monitoring reports of the EMP implementation. M&E consultant will report directly to proponent.

7.6.5 Institutional Arrangement for Implementation of EMP during O&M Phase

The proposed Project will be administrated by PMU-RDA during the O&M phase. The Project Director and his staff (designated Environment and Social Expert) will be responsible for the following:

- Coordinating with the operational staff working under the Regional General Manager to monitor environmental compliance during operation;
- Advising on, and monitoring tree plantations along the road;
- Reporting on the progress of environmental compliance to the PEPA;
- Assessing the long-term environmental impacts of operation;

- Sustaining a working partnership among the PMU-RDA, PEPA, Agriculture, Irrigation, Forest and Wildlife departments of Rawalpindi; and
- Reporting to Project Director of PMU-RDA about progress of the work.

7.7 ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX

Environmental Mitigation and Management Matrix (EMMM) is considered as one of the main elements of EMP. It will be used as the management tool for the implementation of mitigation measures. The plan includes following:

- The envisaged impacts as identified in EIA and their recommended mitigation measures; and
- The person/organization directly responsible for adhering to or executing the required mitigation measures.

It is highlighted that although the responsibilities for executing and monitoring the mitigation measures have been delegated to different organizations, PMU-RDA will hold the primary responsibility for ensuring the full implementation of EMP. Table 7.1 provides information about all impacts to be raised due to project activities during different phases of the Project i.e. pre-construction, construction and O&M (for details refer Chapter 7: Anticipated Environmental Impacts and Mitigation Measures of EIA Report).

The Contractor(s) will be responsible for the preparation of Site Specific EMP (SSEMP) on the same format of this EMP along with the site specific plans based on the guidelines provided in this Chapter.



Table 7-1: Environmental Mitigation and Management Matrix

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
Preconstruction / Design Phase					
1	Technical Design and Layout Planning Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the Project area. Low utilization of the available spaces and designing the structures without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality	• The technical design of the proposed project must consider the key factors for the final design and should meet all the local and international standards. Mitigation mentioned in Section 6.7.1 shall be followed.	• Confirmation of design incorporation. • Audits and Checks	Design Consultant	Proponent
2	Drainage Improper storm water drainage design of the proposed Project may result in stagnant water due to which following impacts are expected to arise • Deterioration of road surface and reduction of its bearing capacity; • Inconvenience for commuters/pedestrians; • Stagnant water may provide the breeding ground for disease vector; and • Foul odour may be generated.	• Mitigation measures will include provision of appropriate drainage structures with appropriate design capacity to avoid flooding especially during the rains. • Proper slopes shall be incorporated in design to avoid the stagnant water on At-grade road surface. Mitigation mentioned in Section 6.7.3 shall be followed.	• Confirmation of design incorporation.	Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
3	Seismicity The proposed Project Area falls in the seismic zone classified as “Zone-2B” with g-value 0.16 to 0.24, and is considered as Moderate Hazard seismicity zone.	- The proposed structure should be designed and constructed keeping in consideration high intensity earthquakes. - Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted. Mitigation mentioned in Section 6.7.4 shall be followed.	Confirmation of design incorporation.	Design Consultant	Proponent
4	Route (Alignment) Optimization Improper route selection of proposed Project may lead disturbance to settlements (Baanth (Start Point on N-5), Jalhari Bahi Khan, Chamba Papai, Kalam Awan, Hardo Jagi, Mohra Mehar Bakhsh, Qutab Ferozwala, Bhagwal Dargai in tehsil Gujar Khan and Kalyam Teli, Lohsar, Tamar, Ratyal, Basali, Nothia Bania, Dhakki Kalan, Jhatta Hattial, Maira Mohra, Mandhal, Gai Mir Baaz Main, Khingar Kalan, Bhattian Nur Din, Hoshial, Gai Mir Baaz Kharji, Lilla Kamal Pur, Chappar, Tarahia, Dhapai, Mian Ahmada, Khasala Kalan, Khasala Khurd, Mara Kallan, Kolian Parr, Kohala Muaffi, Pilo, Thallian, Ghareeba in tehsil Rawalpindi) which may arise some social issues.	The route alignment has been finalized and efforts have been made to avoid social issues upto maximum extent including resettlement, damage to infrastructure, etc. Mitigation mentioned in Section 6.7.5 shall be followed.	- Confirmation of design incorporation. - Audits and Checks	CC, Design Consultant	Proponent
5	Change in Hydrologic Regime The proposed Project will cross (01) Irrigation Channel i.e. Khasala	For the crossing of the irrigation channel (Khasala Khurd), Sill and Soan Rivers, Nullahs and other similar structures bridges will be	- Confirmation of design incorporation. - Audits and Checks	CC, Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	Khurd, Rivers (Soan and Sill) and Nullahs. There might be change in water flow pattern and disturbance to water flow occurred which will cause impact on downstream of these water bodies. Moreover, when flood flows encounter a restriction in the natural stream, adjustments take place in the vicinity of the restriction. The portion of flow not directly approaching the bridge opening is redirected towards the opening by the embankment.	constructed. Bridges shall be properly designed to accommodate design flows. Mitigation mentioned in Section 6.7.6 shall be followed.			
6	Flora During the pre-construction phase, activities such as installation of construction camps, construction of temporary roads & mobility of construction staff may damage the local vegetation/trees. As the heavy machinery and camps will be moved and installed, which require significant space due to which available vegetation is expected to be removed.	• The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover • The alternate routes for roads and points for camps are recommended where no loss of vegetation is expected • The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement Mitigation mentioned in Section 6.7.7 shall be followed.	• Confirmation of design incorporation • Checks and audits of suitable place • Tree compensation record	CC, Design Consultant	Proponent
7	Fauna As movement and installations of machinery and vehicles will take place so, noise and habitat loss is	• The standard measures must be adopted to minimize noise due to machinery movements and installations;	• Confirmation of design incorporation	CC, Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	expected. The routes of the available wildlife and other habitats may be affected due to camps set-up and machinery movements and installations. Temporary road may also affect the habitat of locally available fauna.	- Wildlife movements and routes must be considered during activities and should be avoided to their maximum level; - The alternate routes and points are recommended to avoid any damage to locally available fauna; - The camps shall be properly fenced and gated to check the entry of animals in search of eatable goods; - Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them. - Wild boar should be also managed to avoid any inconvenience. Mitigation mentioned in Section 6.7.7 shall be followed.	Checks and audits of suitable place		
8	Land Acquisition and Resettlement The proposed Rawalpindi Ring Road Project will be constructed on a new alignment for which approximately 8,992.32 Kanals (8,161.03 Kanals in Tehsil Rawalpindi and 831.29 Kanals in Tehsil Gujar Khan) private and government land will be acquired on permanent basis. The major issue in the proposed project will be land acquisition and resettlement. This will result in loss of land, crops, orchards, infrastructure, livelihood,	The LAA of 1894 is the main law regulating land acquisition for public purpose. This impact can be mitigated by ensuring compliance of LAA, 1894, addressing community grievances on priority basis and timely compensation to affectees. Due consideration should be given to minimum land acquisition in design phase by selecting careful route alignment for the construction of proposed Project. Mitigation mentioned in Section 6.7.9 shall be followed.	- Compensation and land records - Confirmation of design incorporation.	CC, Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	commercial activities, disturbance to people and loss of income sources.				
9	Renting/Leasing Land The development of Contractor camps and facilities i.e. storage, workshops, equipment parking and washing areas; aggregate quarries; and access roads/tracks for haulage, transportation etc. will required renting/leasing land. The approximate area required for the establishment of one Contractor's camp facilities will be 1500m ² at the different locations.	Land for above mentioned facilities will be directly rented from the private landowners by the Contractors. Rental terms should be negotiated to the satisfaction of the concerned landowners and the agreement should be in local language to make the process clear. Mitigation mentioned in Section 6.7.9.10 shall be followed.	Compensation and land lease records	CC	Proponent
10	Public Utilities Due to the proposed project, public utilities (transmissions lines, PTCL exchange/ transmission system, gas pipelines, water supply, sewerage and drainage pipe lines etc.) may be affected creating disruption of public services and inconvenience to the local residents. This impact is medium adverse in nature.	- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and - All public utilities likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work. Mitigation mentioned in Section 6.7.11 shall be followed.	- Confirmation of design incorporation. - Work order issuance after prior meeting and issuance of prior notification to public and concerned department. Audits and Checks	CC, Design Consultant	Proponent
11	Physical, Religious and Cultural Resources According to the field survey, various mosques, graveyards and shrines	Due consideration shall be given to minimize the adverse impacts on the religious and community structures and places. The effort will be made	Confirmation of design incorporation. Audits and Checks	CC, Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	are coming under the area of influence. All these structures fall in RoW will be directly affected and demolishing of these structures may cause serious social issues.	by making changes in design (where possible) to avoid the sensitive and religious structures and to minimize the issues at possible extend. If needs demolishing and shifting of graveyards, a mechanism will be developed with the community consultation and proper consultations and coordination's with locals will be carried out to resolve this sensitive issue. Mitigation mentioned in Section 6.7.12 shall be followed.			
Construction Phase					
1	Site Accessibility During Construction The proposed Project can be approachable through major roads such as Rawat Chakbeli road between village Maira Mohra and village Jhatta Hathial, Adiyala road near village Bhattian Nur Din, Chakri Road and finally terminates at Thallian Interchange on Motorway M-2. Apart from above existing road, few accessibility tracks needs be developed which may cause damage to trees and crops, soil erosion, soil contamination, air and noise problems.	• Selection of access roads/tracks should be based upon certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities. • The approach roads should be selected to avoid any soil degradation and erosion impacts. Mitigation mentioned in Section 6.8.1 will be followed.	• Regular observation and photographic record of transportation route, • Road/track repair records, • Compensation records for damages of crop, trees and other infrastructure (if happens)	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
2	Traffic Issue Due to the proposed construction activities and movement of heavy project vehicles for construction material supply; traffic problems may arise for the commuters and transporters travelling to the proposed areas. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions etc.	• Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime • Traffic Management Plan will be implemented to avoid traffic accidents, jams/public inconvenience. Mitigation mentioned in Section 6.8.2 shall be followed	• Vehicle maintenance record • Training record • Implementation of TMP • Regular visual observations	CC	Proponent
3	Resource Conservation Resources involved in the construction of proposed project would include water, fuel and construction materials. Excessive consumption of these resources by the construction staff may stress the resources in the project area and in certain cases may disturb the existing supplies.	• A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels. • Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purpose. Reuse of construction waste materials may be adopted wherever possible. Efficient and well maintained equipment and machinery should be used. • Mitigation mentioned in Section 6.8.3 shall be followed.	• Work site management plan • Resource conservation plan and its implementation. • Regular visual observations	CC	Proponent
4	Community Health and Safety Community health and safety issues during the construction of proposed Rawalpindi Ring Road Project may include dust, noise, and vibration	• The World Bank/IFC EHS Guidelines, 2007, defines community health and safety in terms that guarantee as-built infrastructure conforms to acceptable standards (structural safety, flood and fire risk),	• Implementation of HSE Plan • Use of PPEs • Community concerns record	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor. The proposed project will also have potential of air (dust pollution), noise and vibrational impacts on nearby community. The labor works with different transmittable diseases like HIV/AIDs and COVID-19 etc. may cause spread out of those diseases in the local residents of above mentioned settlements along the proposed Rawalpindi Ring Road Project. The construction areas located near the settlements, may cause accident for the people moving near to these areas.	water supply sources are of suitable potable quality, emergency response planning is in place for built environments, traffic safety provisions are enforced alongside transport hazard assessment and mitigation, and disease prevention measures are taken. The Contractor will prepare the site specific community health and safety plan in compliance with relevant sections of the IFC General Environmental Health and Safety Guidelines (WB/IFC 2007), Pakistan Labor Laws, Punjab Occupational Safety and Health Act (2019). Mitigation mentioned in Section 6.8.4 shall be followed.	• Medical reports of worker		
5	Occupational Health and Safety Occurrence of accidents / incidents and other natural emergencies during the construction stage is a common phenomenon and workers as well as locals will be more prone to serious accidents. Other physical hazards are exposure to weather elements, noise, work in confined spaces, trenching, contact with overhead power lines, falls from	• Safety precautions for the construction workers, Training of workers in construction safety procedures and use of Personnel Protective Equipment (PPE) will mitigate this impact. Mitigations mentioned in section 6.8.5 will be adopted.	• Implementation of OHS Plan • Use of PPEs • Training Records • Work permits • Implementation of Emergency response plan and disaster management plan in case of natural disaster occurrence	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	machinery or structures, and risk of falling objects).				
6	Soil Erosion Construction activities such as clearing of earth, levelling, piling, compaction, carpeting, pavement finishing will affect the existing soil condition in the RoW. The clearing of vegetation can also loosen the soil and make it more susceptible to erosion due to wind and rain. There is also a possibility of silt runoff during rainy season causing soil erosion. Soil erosion may also occur in the workshop areas as a result of improper drainage system of equipment washing-yards and improper management of construction activities.	• Good engineering practices will help to control or minimize the soil erosion both at the construction sites and in peripheral areas. All the disturbed areas need to be protected against soil erosion by stripping and stockpiling of all the available topsoil for later re-vegetation. • Special slope protection measures will be adopted in the sensitive areas and along the shoulders of roads. Site restoration plan for the project will be strictly followed. Mitigations mentioned in section 6.8.6 shall be adopted.	• Visual observation and photographic record • Waste Management plan implementation	CC	Proponent
7	Soil Contamination Land may be contaminated due to the spillage of chemicals, fuels, solvents, oils, paints, concrete, solid waste generated at campsites etc. The possible contamination of soil by oils and chemicals at camp sites, workshop area and equipment washing-yards may limit the future use of land for agricultural purposes.	• The Contractors will be required to instruct and train their workforce in the storage handling and management of materials and chemicals that can potentially cause soil contamination. • Material Safety Data Sheets (MSDS) will be strictly followed during handling and storage of chemicals. • Soil contamination due to concrete transportation and solid waste will be minimized by placing all containers in casings.	• Visual observation and photographic record • Site restoration and rehabilitation plan implementation	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		Mitigations mentioned in section 6.8.7 shall be adopted.			
8	Borrow Pits Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. Borrow/ Open pits may also become potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area.	- Necessary permits will be obtained for any borrow pits from the competent authorities; - In borrow pits, the depth of the pits will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4; - Soil erosion along the borrow pit will be regularly checked to prevent/ mitigate impacts on adjacent lands; - In case borrow pits are filled with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and - Borrow pits will be used for construction waste, but during the excavation, top 20 cm soil cover will be preserved for vegetation after the filling of the pits. This is the best way to restore the flora of that area. Mitigations mentioned in section 6.8.8 shall be adopted.	- Visual observation and photographic record - NOC record of permits - Check and audits	CC	Proponent
9	Construction Camps/Camp Sites Approximately two (02) construction camps are proposed to be established during construction period for the subject Project. Due to the proposed camp sites, loss of vegetation and dissatisfaction of rehabilitation measures during and	- The contractor(s) should provide plan to RDA for removal & rehabilitation of site upon completion. - Photographical and botanical inventory of vegetation before clearing the site. - Compensatory plantation to be scheduled when construction works near end.	- Visual observation and photographic record - sanitation plan for the construction camp implementation	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	after completion of construction phase may occur. These impacts may include waste, soil pollution, groundwater pollution, dust, etc.	Mitigations mentioned in section 6.8.9 shall be adopted.			
10	Wastewater Generation at Construction Camps Wastewater will be generated at the construction camps (total 02 in Nos. and from construction activities. Based on the estimated, 9,600 liters/day wastewater will be generated from camps during the construction phase which may affect water bodies if disposed off without proper treatment.	- To dispose the liquid waste generated from the construction activities, the following steps will be taken by the Contractor: - Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks. Proper monitoring to check the compliance of PEQS will be carried out. - The Contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal. Mitigations mentioned in section 6.8.10 shall be adopted.	- Visual observation - Regular environmental monitoring, sampling and testing reports - Waste Management plan implementation	CC	Proponent
11	Solid Waste Generation at Construction Camps Considering the labourers (about 300 in numbers) residing in the construction camp and the locally available labour, a total of about 135 kg of solid waste will be generated from construction camps on daily basis. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small	All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste;	- Visual observation and photographic record. - Waste Management plan implementation	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	portion of ashes and residues. Other type of wastes may include inorganic construction wastes.	- The Contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site; - Toxic waste will be handled, stored, transported and disposed separately. Mitigations mentioned in section 6.8.11 shall be adopted.			
12	Waste Generation at Construction Site The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials etc.). The handling and storage of oil and other hazardous waste will be a source of environmental pollution during the excavation, founding, levelling, carpeting and pavement activities.	- Waste Management Plan will be developed to implement an efficient and responsive solid waste management system during construction phase. - Reusable material will be used as a filling material during ground levelling. - Contractors are required to prepare a spoil and solid waste disposal plan. Mitigations mentioned in section 6.8.12 shall be adopted.	- Visual observation and photographic record. - Waste Management plan implementation	CC	Proponent
13	Impact on Water Resources (Surface and Groundwater Contamination) The proposed project will traverse through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs at different locations. The bridges are proposed on these water resources these surface water resources may get	As a mandatory step, all the effluents will be disposed as per the requirements of PEQS. Moreover, to reduce the risk of surface and groundwater contamination, good management practices will be adopted to ensure that fuels, chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner.	- Visual observation - Regular environmental monitoring, sampling and testing reports - Waste Management plan implementation	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	contaminated by the fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at the construction camp sites. Moreover, runoff from the chemical storage areas may also contaminate the surface water bodies.	Mitigations mentioned in section 6.8.13 shall be adopted.			
14	Waste Management from Asphalt and Batching Plants Concrete and asphalt have limited usable life, after which they become waste. If not used within the time span, their wastage will have major financial implications. Further, their disposal will become very difficult because of the large quantities involved.	• The contractor will develop specific environmental management plans for asphalt plants and concrete batching plants. These plans will incorporate the general measures as applicable to the entire project, but will also have focused mitigations for solid waste from these plants. • The plan will be reviewed and approved by Supervision Consultants Mitigations mentioned in section 6.8.14 shall be adopted.	• Visual observation • Regular environmental monitoring, sampling and testing reports • Waste Management plan implementation	CC	Proponent
15	Blockage of Water Channels and Natural Drainage The proposed Project alignment will traverse through one (01) Irrigation Channel i.e. Khasala Khurd, Rivers (Soan and Sill) and Nullahs. These water channels and drains may be blocked and the catchment of the downstream may be disturbed during construction phase.	• Unnecessary widening beyond the proposed design of the road shall be avoided at straight portions and on bends; • The natural drainage pattern will not be disturbed, where possible, culverts and bridges will be constructed where required; • Surplus soil and cleared vegetation will be disposed of so as to avoid disturbing the natural drainage; and	• Confirmation of design incorporation • Checks and audits of suitable place	CC, Design Consultant	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		The Proponent in consultation with Irrigation Department finalize the design, where required. Mitigations mentioned in section 6.8.16 shall be adopted.			
16	GHG Emissions The main sources of greenhouse gases (CO ₂ , CH ₄ , NO _x etc.) during the construction activities of the proposed project will include both mobile and stationary sources. The mobile source will be the construction and transportation vehicles while the stationary source will be the batching and asphalt plants. Emission of greenhouse gases cause global warming and other climatic changes on regional and global scale.	- Regular motioning of the vehicles for engine efficiency; - Avoid idling of construction vehicles; - Alternative energy resources shall be considered where possible; and - The Contractor shall ensure the compliance with PEQS, 2016. • - Mitigations mentioned in section 6.8.17 shall be adopted.	Visual observation Regular environmental monitoring, sampling and testing reports.	CC	Proponent
17	Discovery of Heritage Sites and Structures during Excavation During excavation, there is a chance of finding artifacts.	- In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate of Archeology and Museums Punjab to take further suitable action to preserve those antiques or sensitive remains. - RDA or the Contractor should acquire an approval from the concerned department prior to construction Mitigations mentioned in section 6.8.18 shall be adopted.	Chance Find Procedure implementation	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
18	Emergency Preparedness The construction of the proposed project may encounter emergencies. In addition, disasters such as earthquakes and fires may occur. An inefficient response may lead to an accident or critical injury.	An ERP for earthquakes and manmade disasters should be developed by the Contractor in coordination with SC and PMU-RDA should be implemented in close consultation with the RESCUE Services and other concerned departments; Mitigations mentioned in section 6.8.18 and 7.8.19 shall be adopted.	- Visual observation - Emergency Response Plan implementation.	CC	Proponent
19	Ambient Air Quality Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. The sensitive receptors identified within or near the RoW are educational institutions and religious and cultural places etc. which may be affected during construction phase, due to emission of air pollutants. The construction activities will also result in increased air pollution in the area.	- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions. - Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. Diesel operated equipment should be equipped with well-maintained fuel filter and may be replaced timely (if required). - PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works. Regular monitoring of air quality in accordance with PEQS. Mitigations mentioned in section 6.8.22 shall be adopted.	- Visual observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records - Water sprinkling records.	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
20	Noise/Vibration The noise and vibration will be produced due to the operation of construction machinery and equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment's. Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels. Vibration generated by construction activity has the potential to damage structures.	- There are a variety of ways by which construction equipment and worksite noise can be controlled. Quieter Equipment, Barrier Protection, Work Activity Scheduling and noise Perimeter Zones are few control to limit exposure to noisy processes or equipment to as few workers as possible. - Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels to residential properties Mitigations mentioned in section 6.8.23 shall be adopted.	- Physical observation - Regular environmental monitoring, sampling and testing reports - Vehicle maintenance records	CC	Proponent
21	Flora The project will involve destruction of vegetation cover on construction areas particularly along proposed road construction. Approximately 3,700 mature, sub-mature, pole crop and saplings of different tree/plants species may be removed during the construction phase of the project.	- Cutting and / or disturbance of trees shall be avoided, as far as possible and select the alternate site for the proposed project as the impact on local ecosystem (especially trees) is expected as high. So, that negative effects on the process of natural regeneration of species are minimized and possible alternate area must be considered for proposed project, in which minimum ecological and environmental losses are expected - A tree plantation program shall be formulated with the recommendations and technical	- Tree compensation record - Visual observations - Regular monitoring, audit and checks	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		support of Punjab Forest Department. • NOC for tree cutting from Punjab, Forest Department is mandatory; • As a compensation and enhancement measure 37,000 trees must be planted in place/lieu of felling of 3,700 trees in consideration of mortality while following the plantation plan. It is pertinent to mention that trees should be relocated/transplanted/replanted (where possible) instead of cutting and may be replanted within the 500 meters' radius of its original location. Mitigations mentioned in section 6.8.24 shall be adopted.			
22	Fauna During construction phase the existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc.	• Care shall be taken during construction activities for avoiding purposely or chance killing of animals; • If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed; • Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding.	• Departmental consultation record • Visual observations • Regular monitoring, audit and checks	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		Mitigations mentioned in section 6.8.25 shall be adopted.			
23	Agriculture Mostly the alignment of the proposed project fall in the very rich agricultural area and damages of crops are expected during construction activities. The clearance of RoW may affect about 480 acres of agriculture land which may cause loss of income to affectees.	• The budget for the proposed project will include provision for payment of compensation to farmers for the loss of any standing crops, or crops already sowed. Will be applicable for all crops standing on land within the acquisition area at the time of dispossession • As far as possible, land within the RoW (which will be acquired) or otherwise barren land without any crop outside the RoW will be selected for the camp sites and disturbance to the crops and natural vegetation will be avoided as much as possible. Mitigations mentioned in section 6.8.26 shall be adopted.	• Compensation record • Audits and Checks	CC	Proponent
24	Social Impacts • Social and Cultural Conflicts;	• Local labor especially from nearby communities should be given preference for the construction works; • Careful planning and training of work force to minimize disturbance to the local people; • Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and • Adequate training of especially for the transitive workforce of the station	• Record register of all the issues and rational expectations desired by the local public; • Camp established at least 500m away from the nearest community; Local hired workforce;	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	Health Impacts (Communicable Diseases)	(involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure. - Proper check-up of skilled and unskilled workers before their hiring; - Labour camp should be away from the residential area and workers' management plan should be formulated by Contractor to minimize the adverse impacts on local communities and workers; - Trainings, awareness and campaigns should be conducted for workers and surrounding communities on awareness and prevention of HIV/AIDs and COVID-19; - Workers should be educated for personal hygiene and the sanitation concerns, leading to communicable and non-communicable diseases; - Water should not be allowed to stagnate even if clean, and measures should be taken to cover the area; and - Insecticides should be periodically sprayed. Mitigations mentioned in section 6.8.27 to 7.8.29 shall be adopted.	- Any complaint from the local community. - Approved OHS Plan, evidence of OHS trainings conducted. Accident/Incident reported. - Training records Health and safety manual - Contractor will implement the SOPs related to the Construction industry. - Health and safety manual.		
25	Gender Based Violence (GBV)	Awareness should be created among the females at individual and	Grievance redress record	CC	Proponent



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	The project route is passing through the urban and semi urban areas where women are involved in working activities. During construction phase gender based violence might arise due to discrimination made against women by unequal work distribution and unequal pay structure among others. Sexual harassment against women might occur as a consequence of mixing of men and women at the construction site, and moving on the roads, bus stops and markets. Educational institutions near the project alignment are also sensitive regarding gender issues. Inhabitants of the project area have mix economic background and different sources of income. Children of low income groups mostly involve in different earning activities, as their parents prefer to get their children hired in small shops as helpers, and waiters in hotels for earning money, and supporting household livelihoods.	community levels about the constructions sights; • The Contractor should make sure that no discrimination is made on the basis of gender while hiring of workers; • Raise awareness among the communities of the potential risks of GBV, and establish response services in the communities that can respond to instances of GBV (particularly those related to issues of labour influx); • Contractor should take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women. • Awareness should be created among the local communities about the adverse impacts of child labour. • Contractor through contractual agreement should be bound to follow the labor standards, rules and regulations during hiring the labor force and all activities should be monitored by the social and environmental staff of the implementing agency; • Contractor should ensure the presence of all persons at site are adults and have their proper identity cards with them.	• Minutes of meetings of community/ gender consultation		



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		Mitigations mentioned in section 6.8.30 shall be adopted.			
26	Livelihood The construction activity may disturb the business and livelihoods of the shopkeepers and workers doing their businesses along the proposed alignment due to the excavation activities. The main commercial activities in these areas include shops, grocery stores, workshops, restaurants, cattle farm, poultry farms and factory.	• Proper compensation should be provided to all the affectees losing their livelihoods along the route • Proper awareness and training should be conducted among the affectees regarding proposed Project benefits, reasons for acquiring lands and compensations to be provided. Mitigations mentioned in section 6.8.31 shall be adopted.	• Compensation record. • Grievance redress record	CC	Proponent
28	Influx of Labor Social problems and conflicts that are associated with Labor Influx are risk of social conflict, Increased risk of illegitimate behavior and crime, Impacts on community dynamics, Local inflation of prices, accommodations and rents, Increase in traffic and related accidents, etc.	• Labor camp(s) should be established away from residential population; • Preference should be given to the local people to work with contractor, and contractor should hire maximum labour force from the project area because this will reduce the labour influx. Mitigations mentioned in section 6.8.32 shall be adopted.	• Minutes of meetings of community Consultation Dissemination relevant material.	CC	Proponent
Operation and Maintenance Phase					
29	Landscape During the operation stage, new saplings of different plants and trees would be planted to enhance the aesthetics and compensate the loss of affected trees. This will have a positive impact of permanent nature. The presence of adequate flora at	• The saplings planted in the project area against the trees affected should be properly maintained throughout their growth. Mitigations mentioned in section 6.9.1 shall be adopted.	• Monitoring of plant maintenance activities records	Proponent	



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	available spaces along the proposed alignment will help in absorbing flue gases, emitting from a large number of vehicles and public transport passing through the project area, which shall help improve the air quality.				
30	Air Quality It is expected that improvement of serviceability and traffic mobility after project completion shall generate some extra traffic due to local development due to the enhanced mobility. The construction of proposed Project will result into ease of traffic movement and reduction of traffic congestion, particularly in the urban areas which are currently having significant traffic density. However, in the longer run, due to increased traffic levels during the operation of the proposed Project, the ambient air quality can be impacted due to the emission of NO ₂ , CO and Particulate Matter emissions. These emissions are generated due to the combustion of fuel.	PMU RDA with the help of PEPA may set up system to monitor air quality along Project area in accordance with PEQS for a specific period to record the quality of air during the operation phase. Mitigations mentioned in section 6.9.2 shall be adopted.	- Visual observation - Regular environmental monitoring, sampling and testing reports.	Proponent	
31	Noise and Vibration It is expected that improvement of serviceability and traffic mobility after project completion shall generate some extra traffic during the	Provision of adequate noise barriers such as hedges and indigenous tree species will reduce the noise. Further Improvement can be made by enforcing the laws and getting the vehicles tested, regularly after a	- Physical observation. - Regular environmental monitoring,	Proponent	



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	operational phase. The noise levels and vibrations are anticipated to increase due to increase in traffic volumes, vibrations from engines and tires and mainly use of pressure horns especially near the residential areas and sensitive receptors.	specific time period, by some reputable vehicle testing laboratory and obtaining a certificate. A tree plantation plan (as suggested in this EIA report) is strongly recommended to reduce the noise propagation to the receptors as an additional advantage of road aesthetics. Mitigations mentioned in section 6.9.3 shall be adopted.	sampling and testing reports.		
32	Road Safety Enhanced vehicular movement and speed in the long run may result in road safety issues like traffic accidents. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move.	Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic), should be ensured for the smooth flow of traffic moving from major road crossings. Enforcement of penalties for the violators will reduce the significance of this impact. Mitigations mentioned in section 6.9.4 shall be adopted.	- Road safety enforcement record - Challan / penalties record - Accident record - Audits and check regularly	Proponent	
33	Drainage During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travellers and public due to flooding in the existing drainage line. In case of chocking of road drainage, the increased surface	- The impact can be controlled/reduced by timely and continuous maintenance/ cleaning of the drainage system; and - Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain around the bridge and at grade road alignment.	- Maintenance and cleaning record - Audits and check regularly	Proponent	



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	runoff due to heavy rains may accumulate at different locations of the proposed Project and can cause traffic jams.	Mitigations mentioned in section 6.9.5 shall be adopted.			
34	Road Maintenance Works and Heavy Traffic During the operational phase, different maintenance works will be carried out throughout the project life. Laborers or the staff involved in these maintenance works are exposed to health and safety issues.	• Implementation of HSE Plans during the maintenance period; • Strict implementation of personal protective equipment's PPEs; • Understanding and training of staff on Operation and Maintenance Manual; Mitigations mentioned in section 6.9.6 shall be adopted.	• Physical observation • Regular monitoring, audits and check reports during work.	Proponent	
35	Flora During operational stage of the Project, there will be minimal effect on flora or release of any significant pressure detrimental to flora. Low level impact is expected at operational phase on Flora due to the operation and maintenance activities.	• The implementation of plantation plan recommends compensation for cutting of trees and work should be started during operational phase to ensure the ecological balance and to avoid any impact on local environment; • Proper check and balance for above activities is highly recommended. Plantations so raised must be maintained according to the Silvicultural practices which includes proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and trench-opening, etc.; • Maintenance and security of the plantation should be done for at-least four years (in consultation with the Forest department). Measures such	• Physical observation • Regular monitoring, audits and check reports.	Proponent	



Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
		as fencing, watch guards and fire protection should be considered; Mitigations mentioned in section 6.9.7 shall be adopted.			
36	Fauna There is no protected area, game reserve, game sanctuary or national park in the Project area so, no major impact on wildlife and livestock in the area is expected through noise, vibration and any type of normal activity in the project area.	• Strict control must be exercised for stoppage of killing/poaching of available wildlife species (if any) by enhancing protection practices; and • The precautionary measures described (mentioned above) for future shall also be applicable during operation phase as relevant for the conservation of wildlife species in the Study Area. Mitigations mentioned in section 6.9.8 shall be adopted.	• Physical observation • Regular monitoring, audits and check reports.	Proponent	
37	Increase in Land Value The proposed Project is expected to increase the land values, especially in villages where little infrastructure is present land owners will have an opportunity to sell their land on increased prices and start new businesses.	No mitigation required (positive impact)	NA	NA	
38	Decrease in Operating Cost of Vehicles	No mitigation required (positive impact)	NA	NA	
39	Economic Boost and Community Development	No mitigation required (positive impact)	NA	NA	



7.8 ENVIRONMENTAL MONITORING PLAN

Environmental monitoring provides timely and useful information to the project management and implementation agencies. Conceptually, “monitoring” means to check and balance, on a regular basis, the status of the project activities and realization of various developmental targets during construction, operation and maintenance. It helps in timely identification/analysis and removal of the bottlenecks and expedites actions. Certain environmental parameters (physical, ecological and social) are selected and quantitative analysis is carried out. The results of analysis are compared with the guidelines; standards and pre-project condition to investigate whether the EMP and its implementation are effective for the mitigation of impacts or not. The objectives of environmental monitoring plan during the construction and O&M phases will be as follows:

- Monitor the actual project impacts on physical, ecological and socio-economic receptors;
- Recommend mitigation measures for any unforeseen impact or where the impact level exceeds the anticipated level in the EIA;
- Ensure compliance with legal and community obligations including safety during construction and O&M phases;
- Ensure the safe disposal of excess construction materials, solid waste, water and wastewater and gaseous emissions;
- Appraise the adequacy of the EIA with respect to the project's predicted long-term impacts on the area's physical, ecological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements in EMP, if required; and
- Compile periodic incidents/accidents data to support analyses that will help to minimize future risks.

7.8.1 Checklists for Environmental Monitoring

For the purpose of conducting environmental monitoring, the following checklists (for each construction) will be prepared and used at the site:

- Campsite & Nearby Communities Checklist;
- Borrow Area and Quarries Checklist (for each site);
- Waste Material Disposal;
- Construction Site Checklist;
- Road Checklist;
- Ecological Checklist; and
- Sociological Checklist.

7.8.2 Monitoring Strategy

Under the proposed monitoring strategy, it is recommended that RDA should be responsible for all the monitoring activities. Client will engage a competent consultant to conduct environmental monitoring on a periodic basis. The overall objective of the environmental monitoring is to ensure that the key environmental parameters in the project area remain within the acceptable limits specified by the Punjab Environmental Quality Standards (PEQS) (and



other relevant benchmarks) throughout the project execution. For this purpose, the Independent Environmental Monitor (IEM) will carry out the periodic sampling, monitoring, and analysis of the key environmental parameters specified in the EMP and provide their results to the Client. All the findings and results in the form of monitoring report will be finally shared with respective PEPA by the Client.

The monitoring program has been designed carefully considering the identified impacts mentioned in Chapter-7 and some additions or deletions probably in frequency may be taken up in this program after learning lessons from one-year operation of the Project through Change Record Register. Table 7.2 provides environmental monitoring schedule for construction and operations stages of the Proposed Project.

Table 7-2: Environmental Monitoring Plan

Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Duration
1	Water Resources/ Water Quality	Compliance with all parameters as per PEQS, 2016.	- Major receptor i.e. Rivers (Soan and Sill)/, nullahs/ drains, residential areas within the RoW/Col. However, estimated sampling points are four (4) wastewater/surface water and four (4) for Drinking Water /Groundwater which will be verified at construction stage. Other proposed effluent discharge points are: - Contractors camps - Concrete preparation plants - Fuel (Petrol. Oil and Grease) products storages. - Vehicle and machines repairing and servicing yards.	- Visual checks of laboratory activities - Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once before the start of construction by activity monitors and reported On quarterly basis during the construction Bi-annually for at least one year during O&M.	As per PEQS, 2016.
2	Soil Contamination	Soil contamination, uncontrolled solid waste	Sites with severe contamination. Other proposed sampling sites are:	Visual observations and checks of	Once before the start of construction by activity	



Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Duration
		disposal activities at sites.	- Construction Camp. - Equipment washing yards. - Spillage points of fuel, chemicals and lubricants.	laboratory activities Sampling and laboratory testing for soil samples.	monitors and reported On quarterly basis during the construction Bi-annually for at least one year during O&M.	
3	Land Resources	Landuse change from agriculture to residential and commercial.	Sites with significant landuse change.	Random visits and visual observations of landuse change.	Once before the start of construction by activity monitors and reported On Monthly basis during the construction Bi-annually for at least one year during O&M.	
4	Dust Emissions	Compliance with PM ₁₀ PM _{2.5} per PEQS 2016	Sensitive receptors like residential areas within the RoW/Col (near Interchanges, residential community). Estimated sampling points are four (4) which will be verified during construction stage. Other proposed effluent discharge points are: - Contractors camps - Concrete preparation plants.	Visual checks of laboratory activities Onsite Ambient Air Monitoring equipment	Once before the start of construction by activity monitors and reported On quarterly basis during the construction Bi-annually for at least one year during O&M.	
5	Noise Pollution	Compliance with dBA Leq. as per PEQS 2016	Sensitive receptors like residential areas within the RoW/Col (near Interchanges, residential community).	Visual checks of laboratory activities Monitoring of noise level at site.	Once before the start of construction by activity monitors and reported	



Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Duration
			Estimated sampling points are four (4) which will be verified during construction stage. Other proposed sampling sites are: – Construction camps. – Concrete preparing plants. – Equipment yards.		On quarterly basis during the construction Bi-annually for at least one year during O&M.	
6	Fumes and gases	Monitoring of CO, CO ₂ , SO _x , NO _x , HC and PM _{2.5} , PM ₁₀ , Vehicular emissions and compliance with PEQS 2016.	– Major receptors like residential areas within the RoW/Col (near Interchanges, residential community). Estimated sampling points are four (4) which will be verified during construction stage. Emissions from the silencers of heavy machinery, trucks and other vehicles.	Visual checks of laboratory activities Onsite monitoring of ambient air quality will be preferred.	Once before the start of construction by activity monitors and reported On quarterly basis during the construction Bi-annually for at least one year during O&M.	
7	Ecological Resources	Disturbance to natural habitat, uncontrolled floral cutting which can be avoidable.	– Natural habitats along the RoW/Col (i.e. trees, crops etc.).	Visual checks to ensure that only marked trees are cut within the Project corridor. Monitoring of Wildlife / birds hunting.	Once prior to the start of construction Monitoring and reporting on monthly basis during the construction stage. Bi-annual monitoring and reporting during the operation stage.	



Sr. No.	Receptors	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Duration
8	Houses and other related structures	Disturbance and removal avoidable of houses and other related structures which are within the Project corridor.	– Houses, animal and other related structures within the RoW/Col. These structures will be verified prior to the start of construction.	Random visits and consultations with AP's.	Prior to the start of construction.	
9	Public Infrastructure	Disturbance or damage to public infrastructure	– Public infrastructures within the RoW/Col. These structures will be verified prior to the start of construction.	Random visits and consultations with AP's.	Prior to the start of construction.	
10	Community around the Project corridor	Use of common resources. Hindrances to mobility. Community health and safety	• Communities within the RoW/Col.	Community consultations.	Prior to the start of construction and during the construction stage.	



7.9 PLANNING FOR EMP IMPLEMENTATION

7.9.1 NOC and Other Approvals

Provincial Departments of Wildlife, Forest and Archaeology⁹

At the feasibility stage of the Project as per the requirement of EPA guidelines for the Sensitive and Critical Areas, concerned provincial departments are informed through letters for the proposed project.

During the construction stage, if the implementation of the proposed Project involves the clearing of vegetation and trees which belongs to the forest or wildlife department, the Project Contractor will be responsible for acquiring a No Objection Certificate (NOC) from the provincial forest department. The application for an NOC will need to be endorsed by PMU-RDA. Similarly, if any Archaeological monument or site is crossed by or near to the Proposed Project concerned provincial department needs to be contacted for NOC. The Contractor is also required to contact with concerned department before the start of the construction work.

7.9.2 Stakeholder Coordination

Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the Project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the proposed Project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information to the affected male population through Friday prayers. Local business community, especially the affected one, should also be brought into the process of awareness and participation.

The related institutional arrangements should also be in place for continuous consultation throughout the process of planning and implementation. During construction, PMU-RDA will have to implement EMP.

The construction schedule will be updated before the commencement of construction work considering the activities specifically suggested in EMP for its implementation.

⁹ The contractor is also required to obtain NOC from other concerned departments (which may affect during the construction stage) prior to start of construction to avoid any delay.



7.10 TRAINING AND CAPACITY BUILDING

To enhance the capacity of the Proponent as well as the Contractor, training will be imparted related to the environmental and social issues of the proposed Project, implementation of mitigation measures and the monitoring protocols and reporting mechanism will also be carried out.

In-house training for the project staff including contractor, consultant and the supervisory staff of the Proponent will be ensured through the provision of one-day basic training and one-day advanced training, covering environmental and social aspects of the development projects in general, and implementation requirements with emphasis on the roles and responsibilities of the proponent and the contractor staff while executing the environmental management and monitoring plan in particular. The training protocols will include the following aspects:

- Procedures for monitoring the air quality parameters and measures to be adopted for avoiding or minimizing air pollution, particularly from the concrete batching plant, haul-trucks, etc.;
- Procedures for monitoring water quality parameters and measures to be adopted for avoiding or minimizing water pollution, particularly from the wastewater effluent generated from the workshops, machinery washing yards, and other obnoxious chemicals;
- Safe waste management and disposal practices;
- Safe noise levels from the construction machinery etc.;
- General housekeeping and cleanliness;
- Social and cultural values of the area;
- Natural resource conservation;
- Communicable diseases especially COVID-19;
- Safety measures against hazards for workforce and the local communities arising from the construction activities;
- Use of safety gadgets by the workforce; and
- Restoration requirements.

A comprehensive training manual will be developed and implemented by the Contractor with prior consent of SC environmental staff.

7.11 COMMUNICATION AND DOCUMENTATION

Communication and documentation is an essential feature of EMP. The key features of such mechanism are:

7.11.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.



7.11.2 Database

The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliances;
- Corrective actions
- List of environmental data; and
- List of environmental data to be maintained:
 - Soil and land pollution;
 - Disposal of waste;
 - Water resources;
 - Fuel oil and chemical spills;
 - Vegetation record;
 - Noise pollution;
 - Air and dust pollution;
 - Socio-economic data; and
 - Ecological sensitivities.

7.11.3 Meetings and Reporting

Monthly meetings will be held at site during the construction phase. The purpose of these meetings will be to discuss the routine activities, non-compliances and their remedial measures. Various reports will also be produced at periodic time intervals, as provided in Table 7.3 along with information regarding persons responsible for report preparation and review process. Additionally, minutes of meeting will also be submitted as part of routine environmental reports. The progress reports will also be submitted to EPA, Punjab as per conditions of NOC.

Table 7-3: Periodic Reporting Mechanism

Sr. No.	Report Category	Prepared by	Reviewed by
1	Monthly	Contractors' environmental staff	PMU-RDA / SC
2	Quarterly	Contractors' environmental staff	PMU-RDA / SC
4	Annual Report	Contractors' environmental staff	PMU-RDA / SC
5	Completion Report	Contractors' environmental staff	PMU-RDA / SC

7.11.4 Social Complaint Register

The Contractor will maintain a register of complaints record from local communities and measures taken to mitigate these concerns.

7.11.5 Photographic Records

Contractors will maintain photographic records during the implementation of the proposed Project. As a minimum, the photographic records will include the site photographs, all the roads, camp sites and monitoring activities, etc.



7.11.6 Non-Compliance of the EMP

The implementation of the proposed EMP involves inputs from various functionaries. The Contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of Project, for which the Contractor will be paid on the basis of monthly compliance reports. However, if the Contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Contractor claimed under the heads of environmental components.

7.11.7 Review of Recorded Data

All the data and communication recorded and maintained by the Contractor will be periodically reviewed and checked by SC and PMU-RDA and necessary action will be recommended to Contractor to improve the recording and documentation.

7.12 MANAGEMENT PLANS

Various management plans have been prepared as a part of EMP for the better management and implementation of EMP during all phases of the proposed Project. However, these plans will be used by the Contractor as guidelines and updated prior to start of construction activities along with approval from PMU-RDA should be sought. These plans are listed below:

- 1) Tree Plantation / Reforestation Plan;
- 2) Health, Safety and Environment (HSE) Management Plan;
- 3) Emergency Preparedness and Response Plan;
- 4) Restoration and Rehabilitation Plan;
- 5) Waste Management Plan;
- 6) Disaster Management Plan;
- 7) Drinking Water Supply and Sanitation Plan
- 8) Traffic Management Plan;
- 9) Change Management Plan
- 10) Quarry Management Plan; and
- 11) Resource Conservation Plan.

7.12.1 Tree Plantation / Reforestation Plan

The basic purpose of reforestation/afforestation/plantation of suitable species in the project area is to reduce the risk been made due to cutting of trees for the proposed project and to enhance green cover and improve the overall environment of the area. Reforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Afforestation will be done in those areas in which there is low forest cover or in areas which have been clearly felled and leave barren. Afforestation is highly important to maintain the biodiversity and ecological balances. It is also important to prevent global warming, soil



erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of proposed project to the local communities, the afforestation activity will further help in enhancing the socio-economic condition of the local communities. The spacing of the plantings should be wide enough to prevent competition for soil moisture, or when part of management, to accommodate machinery used for irrigation. The details are attached as Annex-XII.

7.12.2 HSE Management Plan

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavourable working environment due to storage, handling and transport of hazardous construction material. Workers should be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in Project Area. During construction phase, Contractor will be responsible for all HSE related issues and to comply with national laws and international standards for occupational health and safety. Guideline for contractor's Occupational Health and Safety Plan is attached as Annex-VI for the preparation of detailed HSE Management Plan by the Contractor. The ultimate goal of the plan is to eliminate any injury to human and damage to facilities, materials and the environment.

The following measures are identified for health, safety, and environment protection during all activities of the proposed Project to minimize risk of accidents, which could endanger the life of personnel, cause damage to properties and environment:

- All contractor staff shall be well informed and trained on the HSE policies and guidelines;
- Contractor shall provide adequate health services as well as site first aid services for its workforce;
- The main priority of the contractor shall be to prevent accidents during mobilization, construction phase of the proposed Project. Prevention of workplace accidents during the construction activities will be achieved using approved work plan/instructions by the supervisors;
- Work safety measures and good workmanship practices shall be followed by the contractor to ensure no health risks for workers;
- Provision of adequate sanitation, washing, cooking and dormitory facilities;
- Proper maintenance of facilities for workers shall be monitored;
- Provision of protective clothing for labourers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, etc. and contractor will ensure strict use of wearing these protective clothing during work activities;
- Elaboration of a contingency planning by the contractor at work site in case of major accidents shall be carried out. A comprehensive emergency preparedness and response plan should be developed and implemented at site;
- A site-specific fire-fighting plan also needs to be developed and implemented by Contractor during construction phase;
- Accidents shall be reported to and investigated by the Contractor. All personnel shall be encouraged to report all accidents/incidents and to cooperate in the investigation



- of such occurrence. A comprehensive accident/incident report should be produced to PMU-RDA for its review and necessary action;
- Adequate signage, lightning devices, barriers, and persons with flags during construction to manage traffic at haulage and access roads shall be conducted;
 - The communicable disease of most concern during construction phase, like sexually-transmitted diseases such as HIV/AIDS, COVID-19 should be prevented by successful initiative typically involving health awareness, education initiatives, training health workers in disease treatment, immunization program and providing health service;
 - Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease;
 - All construction activities shall be properly managed through careful planning and the applicable and relevant HSE policies; and
 - Prior approval from PMU-RDA environment and social team should be sought before starting any construction related activity.

7.12.3 Emergency Preparedness and Response Plan

Emergency Preparedness and Response Plan provides an overview of the procedures to mitigate and control the impacts on community, on occupational health and safety, on the environment and on the Project in the event of emergency situations and to respond in life threatening situations usually occurring suddenly and unexpectedly during the construction and operational phases of the proposed project. The contractor will be responsible for the preparation of plan and implemented at site after prior review and approval from the supervisory consultant and proponent. Guideline for contractor's EPRP is attached as Annex-X.

7.12.4 Restoration and Rehabilitation Plan

The implementation of the proposed Project would involve construction workers' camp for staff and laborers, establishment of fences around construction site, over usage of access roads for movement of heavy machinery/motor vehicles linking to various components of project, offices, borrow/quarry areas, etc. During construction, these activities could also result in accumulation of large amount of unused or spoil material at various sites such as at access roads, muck dumping sites, quarry sites, colonies, offices, etc. which will change the existing land cover in the project area. After completion of the construction work, it is required to restore the disturbed area to its original conditions wherever it is possible that is the sole responsibility of the Contractor. Various engineering and biological measures have been suggested for the restoration of these areas:

- Top-soil should be stored at designated areas before performing excavation activities at quarry sites (if these are agriculture land) and after the completion of all the construction activities, quarry sites (if applicable) and construction sites should be covered with the top-soil to support the growth of plant species;
- The area should be planted with indigenous vegetation that would require the initial establishment of fast-growing grasses along with annuals and perennials, nitrogen



- fixing herbaceous legumes and non-legume shrubs to increase the soil conditioning and to stabilize the project site;
- Material stockpiles shall be removed as soon as the construction work will be completed;
- All the construction, toxic and hazardous chemicals/materials shall be completely removed from the site;
- All fencing and gates shall be removed and pits shall be backfilled;
- The reconstruction of interrupted drainage channels and pipes shall be carried out;
- Rehabilitation of affected roads should be carried out to avoid any inconvenience to the road commuters; and
- A clearance certificate from the RDA has to be taken by the Contractor in this regard.

7.12.5 Waste Management Plan

Management of solid and hazardous waste is one of the most important issues during construction phase of the Project. It is estimated that around 300 workers will be accommodated at construction camps (total of about 02 camp sites) during construction phase. As a general rule the water consumption will be about 40 liter/capita/day and will subsequently generate about 70 to 80% of this water as sewage. Based on this water consumption, around 12 m³/day of water will be utilized for washing, cooking and bathing purposes at each camp site which will generate approximately 9.6 m³/day sewage at each the construction camp sites. In addition to that each construction camp site will generate about 135 kg/day of solid waste at site @ 0.5 kg/capita/day.

The major components of the workers' camp waste are garbage, putrescible waste, rubbish and small portion of ashes and residues, wastewater from camps toilets and washing yards, etc. The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials, etc.). Insecure and unhygienic disposal of the wastes may cause degradation of soil, land and water resources. However, a criterion has been developed for the solid and hazardous waste management at site. The criterion for plan is as follows:

- All the anticipated solid wastes should be collected through a properly designed solid waste management system. Enough number of containers should be placed inside the camps and within the construction area for the collection of various types of waste;
- These containers will help the component separation of various types of waste at source. Classification will be based on organic waste, recyclable waste, reusable waste (for resource and recovery) and waste for disposal site. Based on the conditions of the region, organic waste should be frequently collected to avoid odour problems;
- Recyclable, reusable and waste for disposal site should be collected twice a week and on alternate days and should be transferred to a properly designed disposal site;
- The special strategy for safe handling, storage and use of hazardous substances/material should be developed and ensured at site;
- The sewage system for camps shall be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Lined wash areas shall be constructed within the camp site or at site, for the receipt of wash waters from construction machinery;



- Medical waste and construction waste should be handled with care;
- The pesticide use shall not be allowed at site and for clearance of RoW;
- Construction waste i.e. waste concrete, bricks, cement, etc. should be disposed of at the designated areas; and
- Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste for disposal.

Based on the above guidelines, Contractor(s) will be responsible for the preparation of Waste Management Plan before the commencement of construction activities and its implementation at site after the prior review and approval from SC and proponent.

7.12.6 Disaster Management Plan

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community 's or society 's ability to cope using its own resources. Disasters are of two types i.e., Natural and Manmade.

The flooding, earthquake, wind storms are the major disastrous phenomena in the region. The mountainous terrain makes the community as well as worker more vulnerable to disasters. The development of poor infrastructural measures, poses greater vulnerability risk in relation to the onset of potential disasters. In such cases, even a moderate disaster could bring devastating effects on communities.

The Provincial Disaster Management Authorities (PDMAs) of Government of Punjab are mandated for planning, implementing and coordinating all activities in case of the onset of a disaster. Therefore, there is a specific requirement for developing a plan that effectively responds to any Monsoon induced emergency. PDMA specialize in mitigation, preparedness and an organized response to a disaster. The most important role of PDMA lie in providing a platform to come together and strategize management and response to disasters and calamities.

7.12.7 Drinking Water Supply and Sanitation Plan

Separate water supply and sanitation provisions will be needed for the temporary facilities including offices, labour camps and workshops in order not to cause shortages and/or contamination. A Plan will be prepared by the Contractor on basis of the mitigation plans. The Plan will be submitted to the SC for their review and approval before contractor mobilization.

7.12.8 Traffic Management Plan

A comprehensive Traffic Management Plan (TMP) will be developed by Contractor mentioning routes to be followed for transportation of construction machinery and materials e.g. cement, steel, gravels, sand, etc. Traffic Management Plan will comprise following contents necessarily:



- Goals and objectives of plan;
- Purpose & Scope;
- Project specific traffic;
- Roles & responsibilities of contractors' environmental personnel;
- Routes to be followed along with necessary maps;
- Transportation timing; and
- Mechanism to address road accidents (if occurs).

Guidelines for contractor's TMP are attached as Annex-V.

7.13 CHANCE FIND PROCEDURE

The purpose of these guidelines is to address the possibility of archaeological deposits, finds and features becoming exposed during earth removing and ground altering activities associated with the construction and to provide procedures to follow in the event of a chance archaeological find. The chance find procedure of archaeological deposits is attached as Annex- IX.

7.14 QUARRY MANAGEMENT PLAN

The Contractor is responsible for extraction of resources (if required) for the construction aggregate from quarry area i required to prepare and implement a Quarry Management Plan (QMP) based on the Guidelines for QMP are attached as Annex-VII. The overall objective of the QMP is to manage the extraction and processing of a valuable aggregate resource while avoiding, remedying or mitigating adverse effects on the environment and enhancing environmental performance wherever practicable. The activities conducted in quarry areas are carried out under license or a mining lease under the Punjab Mining Concession, Rule 2002.

7.15 RESOURCE CONSERVATION PLAN

Most of the resources in this world are finite and non-renewable in nature. We are completely dependent on these resources to fulfill all our daily requirements. Therefore, sustainable development calls for the need to conserve resources in a way that meet our needs of present generation as well as future generation, especially the non-renewable resources. Guidelines for the preparation of Resource Conservation Plan by the Contractor are attached as Annex-XIII.

7.16 CODES OF PRACTICE

The Contractor should seek to develop codes of practice for its staff and employees in order to ensure that the intrusion of workers in the Project Area does not result in any social and environmental and social issues between the workers and locals which can harm the Project by causing unnecessary delays.

These codes should be based on the principles of environmental protection, occupational health and safety, good engineering practices, respect, integrity and sound ethical values.



Each code should include, at minimum, the purpose and objectives, a policy statement from the incharge explaining the importance of this code for the success of the Project, and examples of such conduct. Guidelines for the code of practices are discussed below.

7.16.1 General

General code of conduct should be developed for the Project and should include, at minimum, the following practices:

- Rules and guidelines will be given to the workers regarding the use of common resources such as wood, plants, water sources etc. to ensure their sustainable use;
- The code should also include provisions of the solid waste management plan to address solid waste collection and disposal in order to prevent unhygienic conditions and contamination of soil and water;
- The Contractor will be made arrangements to avoid accidental risks such as traffic signs board and speed control measures for the safety of locals;
- In construction camps, amenities of life including clean food, water and sanitation facilities must be provided to these camps, and the workers should be provided with guidelines on how to dispose of their waste and maintain a sense of hygiene;
- The training of workers in the construction safety procedures, equipping all construction workers with PPEs i.e. safety boots, helmets, gloves, ear plugs, and protective masks also and monitoring their proper and sustained usage;
- The Contractor should ensure that the construction labor is trained in safety procedures for all relevant aspects of construction;
- Formal emergency procedures should be developed for construction site in case of an accident. First Aid Kits and other necessary equipment should be kept available at site along with the list of emergency phone numbers at the construction site to be contacted in case of any accident; and
- The safety of the public at all stages of the construction and operation will be ensured by appropriate public education and safety measures such as use of sign boards, barriers and flags and use of proper illumination at night.

7.16.2 Good Engineering Practices

Good engineering practices should be developed for the Project and should include, at minimum, the following practices;

- Standard Operating Procedures (SOP) for handling, storage and transportation of oil leakages, chemicals and other toxic materials should be strictly followed;
- Workers must be familiar with the MSDS of each chemical used at site. MSDS are provided with each chemical drum. Chemicals will be stored as per their MSDS. Utmost care should be taken during the handling of these chemicals;
- Precautions should be taken to prevent spills and all workers should be trained in proper handling, storage and disposal of hazardous or toxic materials; and
- Proper disposal plans of excavated material.

7.16.3 Cultural Norms

Cultural Code of Practice should be developed for the Project and should include, at minimum, the following practices:



- Self-respect and sensitivity to insult is an important trait of the locals. The poorest among them has his own sense of dignity and honour and he vehemently refuses to submit to any insult. In fact, every inhabitant considers himself equal if not better than his fellow tribesmen and an insult is, therefore, taken as scurrilous reflection on his character. So the contractor should be careful to avoid any uncereceremonious interaction with the locals and inform their staff to be humble and polite.
- The Contractor should also take care of the norms of local community and their sensitivity towards local customs and traditions;
- The Contractor should brief the staff about local culture and norms;
- As per local culture wearing of pant shirt, half shirts, and short trouser are considered inappropriate attire, therefore the contractor inform the staff to avoid wearing short trousers and short shirt;
- Contractor will strictly warn the staff not to involve in any unethical activities and to obey the local norms and cultural restrictions particularly with reference to women;
- The Contractor will be required to maintain close liaison with the local elders and religious scholars of nearby local community to ensure that any potential conflicts related to common resource utilization for the Project are resolved easily;
- Privacy of women is a major cause of concern for the communities of the Project Area. Due to the Project activities local women may not be able to perform their daily outdoor chores. Women in the Project are participate in other outdoor activities such as livestock rearing, bringing of potable water, collection of fire wood etc. that may be affected by the Project activities;
- The Contractor will have to select the specific timings for the construction activities so as to cause least disturbance to the local population particularly women considering their peak movement hours; and
- The Contractor will warn the staff strictly not to indulge in any un-ethical activities and to obey the local norms and cultural restrictions particularly with reference to women.

If privacy of the nearby households is to be affected, the Contractor will inform the house owner in advance to make some alternative arrangements. Similarly, the Contractor will have to take great care that the construction activities should not affect the privacy particularly with reference to women.

7.17 PUBLIC DISCLOSURE

PMU-RDA will disclose this EIA to all the stakeholders prior to the start of the construction. This report will be made available to all stakeholders. In addition, executive summary of the Report will be translated into Urdu language and made available to the affected communities and locals. The copies will also be kept at construction site for ease in accessibility of the locals. This will ensure the locals to be aware of the Project impacts, its mitigation, responsible staff and mode of implementation. In addition, the executive summary will also be published on PMU-RDA website.

7.18 EMP COST

The cost for EMP will be a part of the contract document with the Contractor. The same may also be included in the total project cost for the implementation of EMP. The cost required for



PPEs for three hundred (300) staff including skilled and unskilled during the whole construction stage for twenty four (24) months is given in the Table 7.4

Table 7-4: Break-up for Personal Protective Equipment cost

Items	Quantity	Cost / Item (Rs.)	Total Cost (Rs.)
Dust masks	14,400	20	288,000
Safety Shoes	600	2,000	1,200,000
Gloves	72,00	300	2,160,000
First Aid Box	2	5,000	10,000
Ear Plugs	600	30	18,000
Safety Helmets	300	1,500	450,000
Safety Jackets (Hi Vis)	600	600	360,000
Total			4,486,000

The total estimated cost for the environmental and social management, monitoring and auditing during pre-construction, construction and O&M (annual cost and will be updated for next upcoming years accordingly) comes to about PKRs. 107.3 Million and given in Table 7.5.

Table 7-5: Environmental Management and Monitoring Cost Estimate

Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
A	PRE- CONSTRUCTION PHASE						
A-1	Environmental Monitoring Cost						
1	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once	20,000	8	160,000	One-time monitoring shall be carried out before the mobilization of Contractor. • Groundwater Samples=4 • Wastewater / Surface water Samples=4
2	Noise Levels	dBA Leq. as per PEQS 2016	Once	2,000	4	8,000	
3	Ambient Air Monitoring	Monitoring of parameters as PEQS 2016 (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory	Once	30,000	4	120,000	
	Sub-Total (A-1)					288,000	



Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
A-2	Tree Plantation Cost						
1	Tree Plantation Cost	Total cost for 37,000 plants and their maintenance for 4 years (two on each side)	Lump Sum			71,484,000	
Sub-Total (A-2)						71,484,000	
Sub-Total A ((A-1)+(A-2))						71,772,000	
B	CONSTRUCTION PHASE						
B-1	Environmental Monitoring Cost						
1	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once	20,000	8*4	640,000	Quarterly monitoring cost for the one (01) years construction period and will be updated each year based on latest rates during construction timeline of the proposed Project. • Drinking Water/Ground water Samples=4 • Wastewater / Surface water Samples=4
2	Noise Levels	dBA Leq. as per PEQS 2016	Once	2,000	4*4	32,000	
3	Ambient Air Monitoring	Monitoring of parameters as PEQS (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory	Once	30,000	4*4	480,000	
Sub-Total (B-1)						1,152,000	Environmental Monitoring Cost for one (01) year
						2,304,000	Environmental Monitoring Cost for two (02) year



Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
B-2	Environmental and Social Management Cost						
1	Environmental Officer	Environment Personnel will monitor / conduct all environment and HSE related activities e.g. monitoring, PPEs, housekeeping, safety signage, emergency preparedness, etc.	Monthly	150,000		3,600,000	This is the tentative monthly cost for two (02) years period for one senior and one junior expert along with their monthly logistics.
			Lump sum (1,500,000)			1,500,000	Cost for PPEs, extinguishers, emergency lights, housekeeping equipment, safety signage and barricade, emergency preparedness kit, first aid kit, etc.
2	Social Officer	Monitoring of social related issues, carry out consultations with locals, Assess the resettlement implementation efficiency, effectiveness, impact and its sustainability, Status of redressal of community complaints and time spent to resolve the community grievances etc.	Monthly	150,000		3,600,000	This is the tentative monthly cost for two years period for one senior and one junior expert along with their monthly logistics.
5	Training Cost	Environment and social related trainings including COVID-19 referred in Training and Capacity Building. Literature preparation, printed material such as posters & pamphlets trainer(s), and venue, etc.	Monthly	100,000		2,400,000	This is the tentative monthly cost for two years period.



Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
7	Communicable Diseases	Tests should be performed by approved laboratory	Yearly	500,000		1,000,000	This is the tentative cost for two (02) years period for medical tests of kitchen staff at each camp site.
8	Personal Protective Equipment (Face masks, gloves, sanitizers, safety helmet etc.)	Ensure the provision of PPEs to combat with Covid-19 and health and safety issues.	yearly	2,243,000		4,486,000	This is the tentative cost for two years period.
Sub-Total (B-2)						16,586,000	
Sub-Total B ((B-1)+(B-2))						18,890,000	Tentative for two (02) years project construction period. The cost shall be updated based on the current market prices during construction phase.
C	OPERATION & MAINTENANCE PHASE (One Year Cost)						
C-1	Environmental Monitoring Cost						
1	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once	20,000	8	160,000	Biannually monitoring cost for the one year O&M Phase and will be reproduced for next years of O&M based on updated rates. • Groundwater Samples=2 • Wastewater / Surface water Samples=2 • Noise Samples=2 • Ambient Air Samples=2
2	Noise Levels	dBA Leq. as per PEQS 2016	Once	2,000	4	8,000	
3	Ambient Air Monitoring	Monitoring of parameters as PEQS (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory	Once	30,000	4	120,000	



Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
							Biannual monitoring cost for the one-year of operational period will be updated based on latest rates.
Sub-Total (C-1)						288,000	
C-2	Environmental and Social Management Cost (Optional)						
1	Environmental Officer	Environment Personnel will monitor / conduct all environment and HSE related activities e.g. monitoring, PPEs, housekeeping, safety signage, emergency preparedness, etc.	Monthly	300,000		3,600,000	This is the tentative monthly cost for one-year period for one senior and one junior expert along with their monthly logistics.
2	Social Officer	Monitoring of social related issues, carry out consultations with locals, Assess the resettlement implementation efficiency, effectiveness, impact and its sustainability, Status of redressal of community complaints and time spent to resolve the community grievances etc.	Monthly	250,000		3,000,000	This is the tentative monthly cost for one-year period for one senior and one junior expert along with their monthly logistics.
Sub-Total (C-2)						6,600,000	
Sub-Total C ((C-1)+(C-2))						6,888,000	Tentative for one (01) year project O&M phase, if required. The cost shall be reproduced for next years of O&M Phase and updated based on the current market prices during O&M



Sr. No.	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKRs)	Remarks
							phase, if required.
	Grand Total (A+B+C)					97,550,000	
	Contingency Charges		10% of Grand Total			9,755,000	
	Grand Total with Contingencies					107,305,000	



8 CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSIONS

Rawalpindi Development Authority (RDA) intends to construct Rawalpindi Ring Road (38.3) with reference to expansion of Rawalpindi City towards south-western site/Motorway which is spreading without any control with respect to accessibility network. The is an initiative of the Punjab Government to provide an integral service forming a transport network linking twin cities and Punjab province through the existing national highways.

This report has been prepared in accordance with the requirements of the Punjab Environmental Protection (Amendment) Act, 2017 Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, Pakistan EIA procedures and sectoral guidelines for environmental reports: Major Roads. Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provides screening categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the Category 'D' of "Transport" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval. Thus, to fulfill the EPA, Punjab requirements, an EIA Study has been prepared for the proposed Project.

RDA's main objective is to provide a safe and congestion free high speed corridor for the commuters. It will facilitate both the locals and visitors travelling towards Islamabad and Rawalpindi. This facility will ease the traffic issues which will have a direct impact that is reduction in travel time as well as indirect impact, that is, peace and reduced psychological pressure on the lives of commuters.

Significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed road. Various stakeholders including government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents. After the construction of the proposed project, people living in the project area and the road users / travelers will get the following major benefits:

- The proposed Project shall provide an efficient / intelligent transport corridor. Main objective of this road is to provide a safe, congestion free and high speed facility to the commuters of project area and heavy traffic;
- The corridor will largely contribute to the economic and social development of the region;
- Apart from the usual benefits of saving in time this link will transform the entire pattern of transportation in the surrounding areas resulting in uplift of economic condition of local community;
- This link will bring about further revolution in road transport and time saving journey for passengers. It will also contribute to ensure smooth and efficient movement of trade, goods and traffic in relatively shorter time;
- Development of businesses during the construction stage will cause socio-economic uplift of the locals along the project corridor. The socio-economic impacts like



- employment, education, living standards and cultural uplift during the interaction with locals are the indirect benefits due to the Project implementation;
- Raising of new trees on either side of the proposed road shall render a positive impact on the flora of the area and will also cause a positive impact on the landscape of the area, which shall be of permanent in nature;
 - Presence of adequate flora will absorb CO₂ gas, through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles;
 - During the operation of the proposed project, it will result in lesser fuel consumption and decrease in operating cost;
 - Improved communication infrastructure will promote new business opportunities. In addition, such an activity will also increase the land value that will benefit the local residents; and
 - The proposed project is expected to increase the land values, especially in nearby villages. Land owners will have an opportunity to sell their land at increased prices and start new businesses.

During the preconstruction and construction phases, following is the list of main issues and concerns:

- Land acquisition and resettlement issues;
- Clearance of proposed RoW;
- Cutting of trees/bushes falling within the proposed ROW;
- Disturbance to infrastructure and public utilities;
- Disturbance to the public movement and cultural norms during construction;
- Reduction in the daily routine activities of local residents during construction;
- Noise and air pollution due to the working of construction machinery during construction and traffic operation phases of the Project;
- Solid waste and wastewater generation during construction;
- Oil spillages from construction machinery, resulting in soil and groundwater contamination;
- Surface water bodies contamination due to soil erosion and construction activities; and
- Occupational and community health and safety issues.

Project is socio-economically viable and environment friendly if the EIA including EMP is implemented in true letter and spirit. Results of the EIA Study have shown that the impacts of the project activity on the physical environment will be negligible. However, there will be significant impacts on the ecological and social environment. These impacts could be reduced by proper and judicious compensation to the affectees and well-planned meticulous design of the facility and by implementing an appropriate tree plantation plan. The plantation will enhance the aesthetics; improve the landscape as well as the environmental conditions along the project area. In fact, in times of diminishing economic and natural resources, using sustainable approaches in transportation infrastructure will help us to enhance quality of life and serve the transportation needs of the present leaving provision for future generations to meet their needs.

An Environmental Management Plan (EMP) has been developed as part of the report which provides a detailed mitigation matrix that covers impacts, mitigation measures roles and



responsibilities and timings to avoid, minimize or mitigate the adverse impacts of the proposed Project.

8.2 RECOMMENDATIONS

The EIA including EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. The Bidding documents will ensure that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SSEMP which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

The EMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. The Contractor will then prepare a SSEMP which will be approved and monitored by the Engineer. The Engineer will note any non-conformance with the SSEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SSEMP the Contractor should employ Environmental and Social experts to monitor and report Project activities throughout the Project Construction Phase.

ANNEXES

ANNEX-I: ENVIRONMENTAL MONITORING REPORT

NESPAK National Engineering Services Pakistan

Construction of Rawalpindi Ring Road (Bannth N-5 to
Tahllian M-2 38.3 Km) ENVIRONMENTAL
MONITORING REPORTS
DECEMBER-2021

Prepared By:

PAK GREEN ENVIRO-ENGINEERING (PVT.) LTD.

(EPA Certified & ISO 14001:2015, ISO 9001:2015, OHSAS 45001:2018 Certified, ISO/IEC 17025:2017 PNAC Accredited)

Head Office: 46 M, Gulberg III, Lahore, Pakistan

Ph: +92-3034442335, +92-42-35441444



Web: www.pakgreen.pk

Table of Contents

Table of Contents	2
1 INTRODUCTION	3
2 OBJECTIVE OF THE ENVIRONMENTAL MONITORING.....	3
3 METHODOLOGY FOR MONITORING.....	4
Data Acquisition Plan	4
LIST OF ANALYSIS PERFORMED.....	5
3.1 Ambient Air Quality Monitoring.....	5
3.2 Noise Level Monitoring	5
3.3 Surface Water Analysis	6
3.4 Drinking Water Analysis	6
3.5 LOCATION COORDINATES	7
3.6 Pictorial Evidence of Monitoring.....	8



1 INTRODUCTION

NESPAK (Pvt.) Limited is Pakistan's premier consultancy organization. NESPAK enjoys the reputation of being one of the top engineering consultancy organizations in Asia and Africa. NESPAK was established in 1973 as a private limited company by the Government of Pakistan. The objective of its creation was to create a pool of talented engineers, attain self-reliance in engineering consultancy and replace foreign consultants. Currently NESPAK has total strength of over 4500 employees. NESPAK is providing following services:

- Prefeasibility & Feasibility studies
- Survey & Ground investigations
- Planning & Design
- Tender & Contract documents
- Construction Supervision & contract management
- Post-construction service

2 OBJECTIVE OF THE ENVIRONMENTAL MONITORING

The main objective of the Environmental Monitoring is to ensure that all the necessary corrective actions are carried out to counter any adverse environmental impacts, and that enhancement measures are used where feasible and practical. One of the goals of the monitoring program is to regularly monitor those factors which may affect the safety of the environment under a systematic monitoring approach. The emissions and discharges from any project concern need to be constantly measured and monitored in order to understand their impact on environment. This growing awareness is developing a sense of responsibility among the industries to play a pivotal role in improvement of the environment according to Provincial/ National/ International Standards.

NESPAK established a speciality group with a handful of architects in 1973, for offering services in the Architecture & Planning (AP) Sector. The group has to date emerged as a single most reliable and reputed consultancy service in the country. Under the umbrella of above objective and Project **Construction of Rawalpindi Ring Road (Bannth N-5 to Tahllian M-2 38.3 Km)**, Environmental Monitoring at Rawalpindi Ring Road Site was conducted to ensure that all the air emission quality is either environment friendly and sustainable for the ecology as well for sustainable development of the community. Pak Green Enviro-Engineering Pvt. Ltd. monitored parameters of Ambient Air particulate matter, and Noise Level monitoring, surface water analysis and drinking water analysis. This environmental monitoring report has been prepared by Pak Green Enviro-Engineering Pvt. Ltd according to the guidelines of Pakistan Environment Protection Agency (Pak EPA), Punjab Environmental Protection Department (EPD, Punjab) &



Construction of Rawalpindi Ring Road

IES Footcandle Recommendation. A detailed monitoring of noise level, Ambient air Quality was carried out in order to assess current level of environmental pollution, surface and drinking water samples were collected for lab testing.

3 METHODOLOGY FOR MONITORING

M/S Pak-green Laboratories (EPA Certified) team visited the site to Ambient Air quality monitoring, Noise level monitoring, surface water and drinking water sampling. All the monitoring at Rawalpindi Ring Road (Bannth N-5 to Tahllian M-2 38.3 Km) site was monitored by using USEPA designated monitoring equipment / instruments/ samplers.

Data Acquisition Plan

Day of monitoring:	10-Dec-21
Starting Time:	9:00 A.M
Nature of Monitoring:	Ambient Air Quality Monitoring, Noise Level Monitoring, Surface water sampling & Drinking water sampling
Completion Date :	14-Dec-21
Completion Time :	9:00 AM
Sampling Duration :	Real Time



LIST OF ANALYSIS PERFORMED

3.1 Ambient Air Quality Monitoring

It was conducted at following points:

- Bannth Near Railway Station
- Near Mandhaal Mosque
- Near PTCL Exchange Khasala Khurd
- Thallian Motorway Toll Plaza

Detail of Ambient Air Quality Station (AQMS) and monitoring methods

Pollutants	Analyzer	Monitoring Technique	Detection Limit
Respirable Particulate Matter PM ₁₀	Zetian BPM-6000	High Volume Sampling	1 ug/m ³
Respirable Particulate Matter PM _{2.5}	Zetian BPM-6000	BAM	5 ug/m ³
Oxides of Nitrogen (NO) / (NO ₂) / NOX	NOx Analyzer Kimoto NA-623	BAM	5 ug/m ³
Sulphur Oxides (SO ₂)	Sulphur Dioxide Analyzer Zetian AM-5100	Chemiluminescence Detection	0.2 ppb
Carbon Monoxide (CO)	Zetian AM-5300	UV Fluorescence	0.4 ppb
Suspended Particulate Matter (SPM)	Low Volume Sampler Instrumex	High Volume Sampling	1 ug/m ³
Ozone (O ₃)	UV Absorption	Thermo Scientific 49C	0.2 ppb
Lead	AAS after sampling by HVS	AAS -240AA Agilent	0.01ug/m ³

3.2 Noise Level Monitoring

Noise level was conducted at following points

- Bannth Near Railway Station
- Near Mandhaal Mosque
- Near PTCL Exchange Khasala Khurd
- Thallian Motorway Toll Plaza

Detail of Digital Noise Meter and monitoring methods

Parameter	Analyzer	Monitoring Technique	Measuring Range	Frequency Range	Digit & Resolution
Noise Level	Noise Meter AR824	1/2 inch Condenser Microphone	30~130 dBA 35~130 dBC	31.5HZ~8.5KHZ	5 digits & 0.1 dB

3.3 Surface Water Analysis

Surface water samples were collected from following sampling points:

- Wadala Kas Drain
- Sawan River
- River Sil

APHA standard methods have been used for physical and chemical parameters of surface water analysis.

3.4 Drinking Water Analysis

Drinking water samples were collected from following sampling points:

- Water Pump 100 feet depth at Bananth
- Water Pump Masjid Mandhaal
- Tube Well Near PTCL Exchange Khasala Khurd
- Water Pump Thallian Motorway Toll Plaza

APHA standard methods have been used for physical, chemical and microbiological parameters of drinking water analysis.

3.5 LOCATION COORDINATES

Project Name: Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Thallian M-2 (38.3 Km)

AMBIENT AIR & NOISE LEVEL MONITORING LOCATIONS

Point-1: Bannth Near Railway Station

33.411266 N 73.216355 E

Point-2: Near Mandhaal Mosque

33.412692 N 73.122960 E

Point-3: Near PTCL Exchange Khasala Khurd

31.434723 N 72.970171 E

Point-4: Thallian Motorway Toll Plaza

33.534912 N 72.901882 E

DRINKING WATER SAMPLING LOCATION

Point-1: Bannth

33.412544 N 73.217685 E

Point-2: Mandhaal Mosque

33.412574 N 73.113137 E

Point-3: Near PTCL Exchange Khasala Khurd

33.434681 N 72.970529 E

Point-4: Thallian Motorway Toll Plaza

33.534755 N 72.901741 E

SURFACE WATER SAMPLING LOCATION

Point-1: Wardala Kas

33.418185 N 73.194061 E

Point-2: Charhaki Kas

33.411766 N 73.062460 E

Point-3: Sawan River

33.429254 N 72.971453 E

Point-4: River Sil

33.542424 N 72.914762 E



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4403/AA

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Tahllian M-2 38.3 Km)

Nature of Monitoring:

Ambient Air

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Bannth Near Railway Station

Location Coordinates:

33.411266 N 73.216355 E (Point-1)

Monitoring Instrument:

Air Quality Monitoring Station

Monitoring Duration:

24 hours

Monitoring Date:

10-Dec-21 to 11-Dec-21

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	O ₃	PM ₁₀	PM _{2.5}	Lead (Pb)	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	9:00 AM	0.8079	13.20	18.47	13.11	5.7	69.7	59.1	0.52	273.6
2.	10:00 AM	0.9150	14.52	18.07	25.89	61.4	64.9	51.8		
3.	11:00 AM	0.9242	14.52	17.86	34.26	94.1	99.6	55.5		
4.	12:00 PM	0.9996	11.88	17.46	43.37	84.0	106.9	101.7		
5.	1:00 PM	0.5296	11.88	17.66	35.67	69.0	78.5	73.4		
6.	2:00 PM	0.6236	10.56	16.65	58.04	59.7	84.0	58.9		
7.	3:00 PM	0.3384	9.24	15.43	66.81	33.1	87.8	50.1		
8.	4:00 PM	0.2927	7.92	14.82	54.12	28.9	76.1	61.4		
9.	5:00 PM	0.7316	14.52	16.04	43.46	21.3	150.4	54.4		
10.	6:00 PM	0.7951	18.48	19.08	33.53	17.5	108.0	117.0		
11.	7:00 PM	0.9594	19.80	19.49	24.48	26.8	123.1	70.0		
12.	8:00 PM	1.0488	19.80	20.10	16.13	23.6	170.0	144.0		
13.	9:00 PM	1.0104	19.80	20.30	9.31	21.3	275.7	157.8		
14.	10:00 PM	0.9927	22.44	20.30	3.02	20.5	169.9	139.5		
15.	11:00 PM	0.9605	22.44	22.33	5.92	19.2	200.9	125.1		
16.	12:00 AM	0.9239	23.76	26.39	5.92	18.1	118.8	96.7		
17.	1:00 AM	0.8979	23.76	30.45	4.91	12.7	101.6	104.3		
18.	2:00 AM	0.5106	23.76	34.51	3.38	8.7	104.8	136.0		
19.	3:00 AM	0.2656	25.08	38.57	2.51	8.0	108.7	80.3		
20.	4:00 AM	0.4287	26.40	42.63	1.80	6.8	73.5	61.8		
21.	5:00 AM	0.7275	19.80	40.60	2.26	5.3	71.3	71.3		
22.	6:00 AM	0.7550	18.48	34.51	0.48	6.1	112.9	62.3		
23.	7:00 AM	1.0903	14.52	32.48	1.07	7.8	75.0	63.2		
24.	8:00 AM	1.1851	13.20	24.36	2.68	18.8	92.7	66.6		
Average (24 Hours)		0.7798	17.49	24.11	20.50	28.27	115.44	85.93 ^a		
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	130 24hours	150 24 hours	35 24hours	1.5 24 hours	500 24 hours

PEQS: Punjab Environmental Quality Standard

End of Report



LAB 180
17025





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

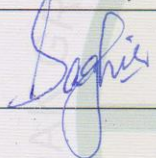
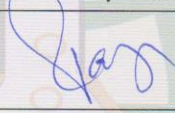
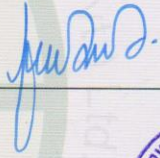
Ref. #: PGG/LAB/2021-4403/AA

Issue date: 22-Dec-21

Remarks: $PM_{2.5}$ is exceeding PEQS Limits so during construction activities there will increase the concentration of particulate matter which will worsen the ambient environment. It is recommended to take special environmental management measures to reduce the concentration of particulate matter.

Terms & Conditions:

- Analysis was conducted on the request of the client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instrument was used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2



LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4404/AA

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Tahlilian M-2 38.3 Km)

Nature of Monitoring:

Ambient Air

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Near Mandhaal Mosque

Location Coordinates:

33.412692 N 73.122960 E (Point-2)

Monitoring Instrument:

Air Quality Monitoring Station

Monitoring Duration:

24 hours

Monitoring Date:

11-Dec-21 to 12-Dec-21

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	O ₃	PM ₁₀	PM _{2.5}	Lead (Pb)	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	9:30 AM	0.7680	15.84	18.07	8.18	25.5	80.3	46.5	0.47	256.8
2.	10:30 AM	0.7958	17.16	17.66	13.42	32.1	87.9	49.9		
3.	11:30 AM	0.8111	17.16	17.46	18.02	36.9	93.6	54.4		
4.	12:30 PM	0.8309	14.52	17.05	22.98	50.9	78.3	58.5		
5.	1:30 PM	0.9671	14.52	17.26	24.70	40.5	29.8	64.0		
6.	2:30 PM	0.6553	13.20	16.24	25.44	45.8	112.6	64.2		
7.	3:30 PM	0.7829	11.88	15.02	26.71	48.1	121.3	69.0		
8.	4:30 PM	0.8218	10.56	14.41	27.81	31.7	104.1	57.9		
9.	5:30 PM	0.8577	17.16	15.63	28.23	28.9	160.7	112.5		
10.	6:30 PM	0.8889	21.12	18.68	26.31	24.3	139.8	77.9		
11.	7:30 PM	0.9595	22.44	19.08	25.52	19.4	215.6	101.3		
12.	8:30 PM	1.0006	22.44	19.69	24.68	18.1	168.3	116.9		
13.	9:30 PM	0.9849	22.44	19.89	23.01	16.9	152.7	108.7		
14.	10:30 PM	0.9765	25.08	19.89	18.70	13.1	145.3	103.9		
15.	11:30 PM	0.9385	25.08	21.92	15.74	11.2	141.8	100.2		
16.	12:30 AM	0.9204	26.40	25.98	8.91	8.4	106.9	78.4		
17.	1:30 AM	0.8802	26.40	30.04	6.63	8.9	112.5	81.2		
18.	2:30 AM	0.7646	26.40	34.10	5.81	8.0	108.1	71.8		
19.	3:30 AM	0.6576	27.72	38.16	5.22	7.2	101.7	66.3		
20.	4:30 AM	0.2646	29.04	42.22	3.95	6.3	109.6	69.0		
21.	5:30 AM	0.2236	22.44	40.19	2.74	5.9	119.2	72.9		
22.	6:30 AM	0.4518	21.12	34.10	2.48	7.0	95.6	55.1		
23.	7:30 AM	0.6346	17.16	32.07	2.68	10.8	98.9	52.2		
24.	8:30 AM	0.7384	15.84	23.95	5.16	15.8	91.2	46.4		
Average (24 Hours)		0.7798	17.49	24.11	20.50	28.27	115.66	74.13*		
PEQS		5 8 hours	40 24 hours	80 24 hours	120 24 hours	130 24 hours	150 24 hours	35 24 hours	1.5 24 hours	500 24 hours

End of Report

PEQS: Punjab Environmental Quality Standard



LAB 180
17025



Page 1 of 2



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc #: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

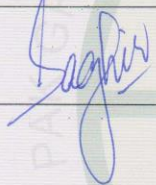
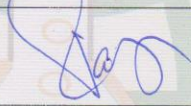
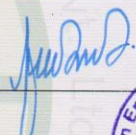
Ref. #: PGG/LAB/2021-4404/AA

Issue date: 22-Dec-21

Remarks: PM_{2.5} is exceeding PEQS Limits so during construction activities there will increase the concentration of particulate matter which will worsen the ambient environment. It is recommended to take special environmental management measures to reduce the concentration of particulate matter.

Terms & Conditions:

- Analysis was conducted on the request of the client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instrument was used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4405/AA

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Tahlilian M-2 38.3 Km)

Nature of Monitoring:
Monitoring By:

Ambient Air
Pak Green Laboratories

Monitoring Location:

Near PTCL Exchange Khasala Khurd

Location Coordinates:

31.434723 N 72.970171 E (Point-3)

Monitoring Instrument:

Air Quality Monitoring Station

Monitoring Duration:

24 hours

Monitoring Date:

12-Dec-21 to 13-Dec-21

Results:

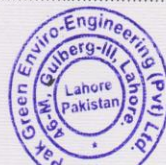
Sr. No.	Time	CO	NO	NO ₂	SO ₂	O ₃	PM ₁₀	PM _{2.5}	Lead (Pb)	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	9:45 AM	1.4612	18.48	19.89	12.04	24.3	91.7	80.2	0.66	297.5
2.	10:45 AM	1.4949	19.80	19.49	14.41	32.3	101.0	89.5		
3.	11:45 AM	1.3986	19.80	19.29	14.66	48.7	120.9	98.1		
4.	12:45 PM	1.8092	17.16	18.88	13.85	59.3	154.8	100.8		
5.	1:45 PM	1.9750	17.16	19.08	10.63	55.1	184.2	96.9		
6.	2:45 PM	1.6391	15.84	18.07	24.93	56.3	120.1	116.6		
7.	3:45 PM	1.2278	14.52	16.85	32.37	44.9	127.7	94.5		
8.	4:45 PM	1.3826	13.20	16.24	25.86	36.3	157.3	114.0		
9.	5:45 PM	1.3321	19.80	17.46	18.58	23.6	157.8	108.4		
10.	6:45 PM	1.4203	23.76	22.33	3.69	12.2	184.2	127.2		
11.	7:45 PM	1.4932	25.08	26.39	10.43	11.8	177.1	135.5		
12.	8:45 PM	1.5472	25.08	32.48	7.36	10.6	214.1	147.0		
13.	9:45 PM	1.6491	25.08	34.51	4.71	10.3	219.8	180.1		
14.	10:45 PM	1.7270	27.72	34.51	9.05	9.9	179.5	153.9		
15.	11:45 PM	1.8059	27.72	38.57	9.08	9.3	150.0	140.5		
16.	12:45 AM	1.9004	29.04	40.60	7.47	8.7	130.9	120.0		
17.	1:45 AM	1.9944	29.04	40.60	1.89	8.2	123.0	100.4		
18.	2:45 AM	2.0555	29.04	42.63	2.74	7.6	102.7	82.0		
19.	3:45 AM	2.2146	30.36	46.69	0.56	6.5	93.4	79.2		
20.	4:45 AM	2.1539	31.68	42.63	0.59	6.1	87.1	86.0		
21.	5:45 AM	2.1035	25.08	38.57	1.97	7.6	87.2	88.6		
22.	6:45 AM	2.0072	23.76	36.54	3.21	12.9	82.5	74.3		
23.	7:45 AM	1.9359	19.80	34.51	5.36	18.4	87.3	78.6		
24.	8:45 AM	1.7176	18.48	28.42	8.01	18.1	89.6	81.5		
Average (24 Hours)		1.7269	22.77	29.38	10.14	22.46	134.33	107.24*		
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	130 24hours	150 24 hours	35 24hours	1.5 24 hours	500 24 hours

End of Report

PEQS: Punjab Environmental Quality Standard



LAB 180
17025



Page 1 of 2



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

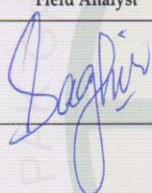
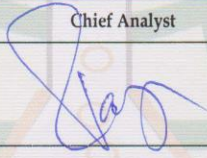
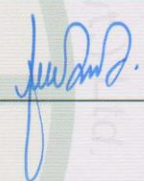
Ref. #: PGG/LAB/2021-4405/AA

Issue date: 22-Dec-21

Remarks: PM_{2.5} is exceeding PEQS Limits so during construction activities there will increase the concentration of particulate matter which will worsen the ambient environment. It is recommended to take special environmental management measures to reduce the concentration of particulate matter.

Terms & Conditions:

- Analysis was conducted on the request of the client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instrument was used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2021-4406/AA

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Tahllian M-2 38.3 Km)

Nature of Monitoring:

Ambient Air

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Thallian Motorway Toll Plaza

Location Coordinates:

33.534912 N 72.901882 E (Point-4)

Monitoring Instrument:

Air Quality Monitoring Station

Monitoring Duration:

24 hours

Monitoring Date:

13-Dec-21 to 14-Dec-21

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	O ₃	PM ₁₀	PM _{2.5}	Lead (Pb)	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	10:00 AM	0.6483	10.56	17.66	12.04	20.0	91.7	71.9	0.37	232.6
2.	11:00 AM	0.6061	11.88	17.26	14.41	21.5	101.0	68.3		
3.	12:00 PM	0.6366	11.88	17.05	12.18	30.2	120.9	74.2		
4.	1:00 PM	0.6189	9.24	16.65	11.51	39.5	44.6	67.6		
5.	2:00 PM	0.6235	9.24	16.85	29.86	54.2	22.9	65.7		
6.	3:00 PM	0.3958	7.92	15.83	23.49	41.6	75.3	45.1		
7.	4:00 PM	0.2756	6.60	14.62	16.75	26.6	91.2	44.9		
8.	5:00 PM	0.2476	5.28	14.01	18.36	25.1	74.8	61.1		
9.	6:00 PM	0.4394	11.88	15.23	16.53	22.2	102.0	79.6		
10.	7:00 PM	1.4969	15.84	20.10	14.02	18.4	134.4	102.5		
11.	8:00 PM	1.5819	17.16	24.16	16.41	12.9	177.1	107.4		
12.	9:00 PM	1.6359	17.16	30.25	19.01	10.6	214.1	111.6		
13.	10:00 PM	1.7377	17.16	32.28	20.33	9.7	219.8	100.9		
14.	11:00 PM	1.8157	19.80	32.28	26.40	8.4	179.5	108.4		
15.	12:00 AM	1.8946	19.80	36.34	35.19	8.2	150.0	112.6		
16.	1:00 AM	1.9890	21.12	38.37	46.59	8.0	130.9	120.0		
17.	2:00 AM	2.0831	21.12	38.37	51.01	7.0	123.0	116.5		
18.	3:00 AM	2.1441	21.12	40.40	64.13	8.2	102.7	113.7		
19.	4:00 AM	2.1803	22.44	44.46	54.23	8.4	93.4	122.1		
20.	5:00 AM	1.9965	23.76	40.40	44.44	9.1	87.1	107.4		
21.	6:00 AM	1.7002	17.16	36.34	35.11	9.9	87.2	102.6		
22.	7:00 AM	1.2809	15.84	34.31	32.12	12.4	82.5	98.5		
23.	8:00 AM	0.9751	11.88	32.28	24.51	17.5	87.3	92.7		
24.	9:00 AM	0.7799	10.56	26.19	14.78	18.6	89.6	84.3		
Average (24 Hours)		1.2410	14.85	27.15	27.22	18.67	111.79	90.82*		
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	130 24hours	150 24hours	35 24hours	1.5 24 hours	500 24 hours

End of Report

PEQS: Punjab Environmental Quality Standard



LAB 180
17025



Page 1 of 2



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

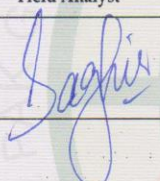
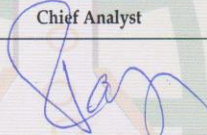
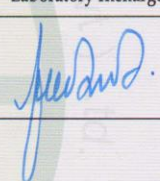
Ref. #: PGG/LAB/2021-4406/AA

Issue date: 22-Dec-21

Remarks: PM_{2.5} is exceeding PEQS Limits so during construction activities there will increase the concentration of particulate matter which will worsen the ambient environment. It is recommended to take special environmental management measures to reduce the concentration of particulate matter.

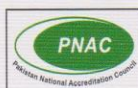
Terms & Conditions:

- Analysis was conducted on the request of the client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instrument was used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2

LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc #: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4407/NL

Issue date: 22-Dec-21

Name of Industry/Client: NESPAK
 Project Name: Feasibility Study of Rawalpindi Ring Road
 (Bannth N-5 to Tahlilian M-2 38.3 Km)
 Nature of Monitoring: Noise Level (Point-1)
 Monitoring By: Pak Green Laboratories
 Monitoring Location: Bannth Near Railway Station
 Location Coordinates: 33.411266 N 73.216355 E (Point-1)
 Monitoring Time: Real Time
 Monitoring Instrument: Digital Noise Meter AR824
 Monitoring Date: 10-Dec-21 to 11-Dec-21
 Results:

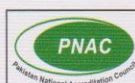
Results.

Sr. No.	Time	Equivalent Noise
		dB (A)
DAY TIME		
1.	9:00 AM	52.5
2.	10:00 AM	51.4
3.	11:00 AM	50.6
4.	12:00 PM	56.2
5.	1:00 PM	58.1
6.	2:00 PM	60.4
7.	3:00 PM	71.7
8.	4:00 PM	51.4
9.	5:00 PM	55.8
10.	6:00 PM	51.3
11.	7:00 PM	51.1
12.	8:00 PM	49.2
13.	9:00 PM	54.3
14.	10:00 PM	50.1
NIGHT TIME		
15.	11:00 PM	49.8
16.	12:00 AM	49.2
17.	1:00 AM	50.9
18.	2:00 AM	53.7
19.	3:00 AM	51.5
20.	4:00 AM	49.5
21.	5:00 AM	52.9
22.	6:00 AM	58.2
DAY TIME		
23.	7:00 AM	72.4
24.	8:00 AM	67.9
Average (Day Time)		56.5
Average (Night Time)		52.0

End of Report



Page 1 of 2



LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc. #: PGG/IMS/FF/063 | Issue Date: 13-Oct-17 | Issue # 01 | Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4407/NL

Issue date: 22-Dec-21

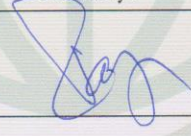
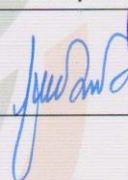
PEQS: Punjab Environmental Quality Standards

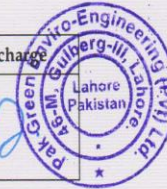
Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (A)	dB (A) Leq	55	45
2.	Commercial Area (B)	dB (A) Leq	65	55
3.	Industrial Area (C)	dB (A) Leq	75	65
4.	Silence Zone	dB (A) Leq	50	45

Remarks: Noise levels during day and night times are in compliance with PEQS limits.

Terms & Conditions:

- Analysis was conducted on the request of client for IEE/ EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4408/NL

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Tahlilian M-2 38.3 Km)

Monitoring By:
Monitoring Location:
Location Coordinates:
Monitoring Time:
Monitoring Instrument:
Monitoring Date:

Pak Green Laboratories
Near Mandhaal Mosque
33.412692 N 73.122960 E (Point-2)
Real Time
Digital Noise Meter AR824
11-Dec-21 to 12-Dec-21

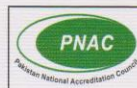
Results:

Sr. No.	Time	Equivalent Noise
		dB (A)
DAY TIME		
1.	9:30 AM	57.2
2.	10:30 AM	55.8
3.	11:30 AM	68.3
4.	12:30 PM	84.7
5.	1:30 PM	62.9
6.	2:30 PM	64.3
7.	3:30 PM	58.6
8.	4:30 PM	64.8
9.	5:30 PM	57.1
10.	6:30 PM	59.2
11.	7:30 PM	74.7
12.	8:30 PM	68.3
13.	9:30 PM	59.2
NIGHT TIME		
14.	10:30 PM	54.7
15.	11:30 PM	52.9
16.	12:30 AM	51.8
17.	1:30 AM	54.6
18.	2:30 AM	49.2
19.	3:30 AM	52.9
20.	4:30 AM	58.3
21.	5:30 AM	54.8
DAY TIME		
22.	6:30 AM	72.7
23.	7:30 AM	82.3
24.	8:30 AM	76.8
Average (Day Time)		66.7
Average (Night Time)		53.7

.....End of Report.....



Page 1 of 2

LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4408/NL

Issue date: 22-Dec-21

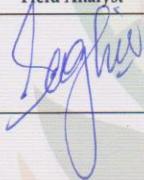
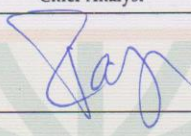
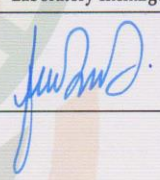
PEQS: Punjab Environmental Quality Standards

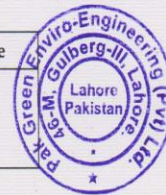
Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (A)	dB (A) Leq	55	45
2.	Commercial Area (B)	dB (A) Leq	65	55
3.	Industrial Area (C)	dB (A) Leq	75	65
4.	Silence Zone	dB (A) Leq	50	45

Remarks: Noise levels during day and night times are in compliance with PEQS limits.

Terms & Conditions:

- Analysis was conducted on the request of client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4409/NL

Issue date: 22-Dec-21

Name of Industry/Client: NESPAK
 Project Name: Feasibility Study of Rawalpindi Ring Road
 (Bannth N-5 to Tahlilan M-2 38.3 Km)
 Nature of Monitoring: Noise Level (Point-3)
 Monitoring By: Pak Green Laboratories
 Monitoring Location: Near PTCL Exchange Khasala Khurd
 Location Coordinates: 31.434723 N 72.970171 E (Point-3)
 Monitoring Time: Real Time
 Monitoring Instrument: Digital Noise Meter AR824
 Monitoring Date: 12-Dec-21 to 13-Dec-21

Results:

Sr. No.	Time	Equivalent Noise
		dB (A)
DAY TIME		
1.	9:45 AM	62.7
2.	10:45 AM	63.8
3.	11:45 AM	74.3
4.	12:45 PM	64.2
5.	1:45 PM	58.5
6.	2:45 PM	63.7
7.	3:45 PM	74.1
8.	4:45 PM	62.9
9.	5:45 PM	53.8
10.	6:45 PM	57.0
11.	7:45 PM	52.7
12.	8:45 PM	51.3
13.	9:45 PM	54.6
NIGHT TIME		
14.	10:45 PM	63.5
15.	11:45 PM	53.9
16.	12:45 AM	52.7
17.	1:45 AM	49.4
18.	2:45 AM	53.9
19.	3:45 AM	51.8
20.	4:45 AM	54.1
21.	5:45 AM	53.0
DAY TIME		
22.	6:45 AM	62.5
23.	7:45 AM	65.7
24.	8:45 AM	62.9
Average (Day Time)		61.5
Average (Night Time)		54.0

End of Report



Page 1 of 2





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4409/NL

Issue date: 22-Dec-21

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (A)	dB (A) Leq	55	45
2.	Commercial Area (B)	dB (A) Leq	65	55
3.	Industrial Area (C)	dB (A) Leq	75	65
4.	Silence Zone	dB (A) Leq	50	45

Remarks: Noise levels during day and night times are in compliance with PEQS limits.

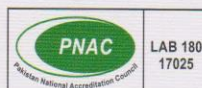
Terms & Conditions:

- Analysis was conducted on the request of client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge



Page 2 of 2





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4410/NL

Issue date: 22-Dec-21

Name of Industry/Client:
Project Name:

NESPAK
Feasibility Study of Rawalpindi Ring Road
(Bannth N-5 to Thallian M-2 38.3 Km)

Nature of Monitoring:

Noise Level (Point-4)

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Thallian Motorway Toll Plaza

Location Coordinates:

33.534912 N 72.901882 E (Point-4)

Monitoring Time:

Real Time

Monitoring Instrument:

Digital Noise Meter AR824

Monitoring Date:

13-Dec-21 to 14-Dec-21

Results:

Sr. No.	Time	Equivalent Noise
		dB (A)
DAY TIME		
1.	10:00 AM	53.7
2.	11:00 AM	59.2
3.	12:00 PM	58.1
4.	1:00 PM	56.9
5.	2:00 PM	71.3
6.	3:00 PM	54.8
7.	4:00 PM	58.0
8.	5:00 PM	59.7
9.	6:00 PM	54.2
10.	7:00 PM	58.9
11.	8:00 PM	54.3
12.	9:00 PM	60.7
13.	10:00 PM	55.9
NIGHT TIME		
14.	11:00 PM	52.1
15.	12:00 AM	51.8
16.	1:00 AM	54.9
17.	2:00 AM	58.2
18.	3:00 AM	59.5
19.	4:00 AM	52.7
20.	5:00 AM	54.1
21.	6:00 AM	57.9
DAY TIME		
22.	7:00 AM	59.1
23.	8:00 AM	58.2
24.	9:00 AM	60.7
Average (Day Time)		58.4
Average (Night Time)		55.2

.....End of Report.....



Page 1 of 2





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 | Issue Date: 13-Oct-17 | Issue # 01 | Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4410/NL

Issue date: 22-Dec-21

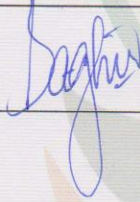
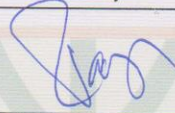
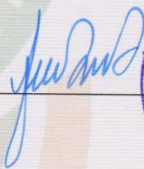
PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (A)	dB (A) Leq	55	45
2.	Commercial Area (B)	dB (A) Leq	65	55
3.	Industrial Area (C)	dB (A) Leq	75	65
4.	Silence Zone	dB (A) Leq	50	45

Remarks: Noise levels during day and night times are in compliance with PEQS limits.

Terms & Conditions:

- Analysis was conducted on the request of client for IEE/EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge
		



Page 2 of 2

LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4411/DW

Date: 23-Dec-21

Name of Client	NESPAK
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahllian M-2 38.3 Km)

Sample Description:

Nature of sample	Drinking water
Sampling By	Pak Green Laboratories
Sample source	Water Pump 100 feet depth
Sample Type	Grab
Sample Code	DW-1097
Sampling Location:	Bannth
Location Coordinates	33.412544 N 73.217685 E
Date of sampling	11-Dec-21

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Non-Compliance

Remarks:

Value of phenol is exceeding PEQS limit.

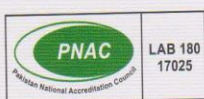
Terms & Conditions:

- Analysis was conducted on the request of proponent for his own use/baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge



Page 1 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4411/DW

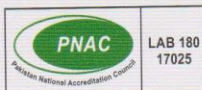
Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	E Coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	Total Coli-form	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	Fecal Coliform	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	0.0
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	1.24
8.	Total Hardness [^]	mg/L	-	< 500	APHA-2340 C	116
9.	Total Dissolved Solids [^]	mg/L	< 1000	< 1000	APHA-2540 C	935
10.	pH [^]	-	6.5-8.5	6.5-8.5	APHA-4500-H ⁺ B	7.125 at 22.8°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤ 0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
16.	Cadmium (Cd) [^]	mg/L	0.003	0.01	APHA-3111 B	0.0022
17.	Chloride (Cl ⁻) [^]	mg/L	250	< 250	APHA-4500-Cl B	45
18.	Chromium (Cr) [^]	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL



Page 2 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4411/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	0.0047
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	1.3
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	0.0017
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	0.0034
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickle	mg/L	0.02	≤ 0.02	APHA-3111 B	BDL
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO ₃ ⁻¹ -E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO ₂ ⁻¹ -B	BDL
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	APHA-Cl-B	BDL
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.0219
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	0.021*
31.	Cyanide (CN)	mg/L	0.07	≤ 0.05	APHA-4500-CN ⁻¹ -F	BDL

End of Report.....

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^ PNAC Accredited

BDL: Below Detection Limit





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc. #: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4412/DW

Date: 23-Dec-21

Name of Client	NESPAK
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahlilian M-2 38.3 Km)

Sample Description:

Nature of sample	Drinking water
Sampling By	Pak Green Laboratories
Sample source	Water Pump Masjid Mandhaal
Sample Type	Grab
Sample Code	DW-1099
Sampling Location:	Mandhaal Mosque (Point-2)
Location Coordinates	33.412574 N 73.113137 E
Date of sampling	12-Dec-21

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Non-Compliance

Remarks:

Value of phenol is exceeding PEQS limit.

Terms & Conditions:

- Analysis was conducted on the request of proponent for his own use/baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge



Page 1 of 3

LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4412/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	E Coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	Total Coli-form	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	Fecal Coliform	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	BDL
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	0.62
8.	Total Hardness [^]	mg/L	-	<500	APHA-2340 C	240
9.	Total Dissolved Solids [^]	mg/L	< 1000	< 1000	APHA-2540 C	862
10.	pH [^]	-	6.5-8.5	6.5-8.5	APHA-4500-H ⁺ B	7.297 at 23.8°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
16.	Cadmium (Cd) [^]	mg/L	0.003	0.01	APHA-3111 B	0.0045
17.	Chloride (Cl ⁻) [^]	mg/L	250	< 250	APHA-4500-Cl B	37
18.	Chromium (Cr) [^]	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL



Page 2 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4412/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	0.0047
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	1.2
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	0.0009
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	BDL
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickle	mg/L	0.02	≤ 0.02	APHA-3111 B	BDL
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO ₃ ⁻¹ -E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO ₂ ⁻¹ -B	0.096
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	APHA-Cl-B	0.01
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.0171
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	0.041*
31.	Cyanide (CN)	mg/L	0.07	≤ 0.05	APHA-4500-CN ⁻¹ -F	BDL

.....End of Report.....

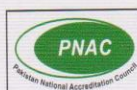
PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^ PNAC Accredited

BDL: Below Detection Limit



LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc #: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4413/DW

Date: 23-Dec-21

Name of Client	NESPAK
Project Name	Feasibility Study of Rawalpindi Ring Road (Banrth N-5 to Tahlilian M-2 38.3 Km)

Sample Description:

Nature of sample	Drinking water
Sampling By	Pak Green Laboratories
Sample source	Tubewell
Sample Type	Grab
Sample Code	DW-1101
Sampling Location:	Near PTCL Exchange Khasala Khurd (Point-3)
Location Coordinates	33.434681 N 72.970529 E
Date of sampling	13-Dec-21

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Non-compliance

Remarks:

Value of phenol is exceeding PEQS limit.

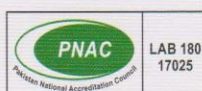
Terms & Conditions:

- Analysis was conducted on the request of proponent for his own use/baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge



Page 1 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4413/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	E Coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	Total Coli-form	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	Fecal Coliform	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	BDL
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	0.35
8.	Total Hardness [^]	mg/L	-	<500	APHA-2340 C	416
9.	Total Dissolved Solids [^]	mg/L	< 1000	< 1000	APHA-2540 C	900
10.	pH [^]	-	6.5-8.5	6.5-8.5	APHA-4500-H ⁺ B	6.990 at 18.6°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤ 0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
16.	Cadmium (Cd) [^]	mg/L	0.003	0.01	APHA-3111 B	0.0037
17.	Chloride (Cl ⁻) [^]	mg/L	250	< 250	APHA-4500-Cl B	05
18.	Chromium (Cr) [^]	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL



Page 2 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334
EPA Certified

Ref. #: PGG/LAB/2021-4413/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	0.0009
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	0.9
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	0.0013
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	BDL
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickle	mg/L	0.02	≤ 0.02	APHA-3111 B	0.0004
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO ₃ ⁻ -E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO ₂ ⁻ -B	0.003
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	APHA-Cl-B	BDL
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.0071
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	0.010*
31.	Cyanide (CN)	mg/L	0.07	≤ 0.05	APHA-4500-CN ⁻ -F	BDL

End of Report.....

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^ PNAC Accredited

BDL: Below Detection Limit



LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4414/DW

Date: 23-Dec-21

Name of Client	NESPAK
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahlilian M-2 38.3 Km)

Sample Description:

Nature of sample	Drinking water
Sampling By	Pak Green Laboratories
Sample source	Water Pump
Sample Type	Grab
Sample Code	DW-1103
Sampling Location:	Thallian Motorway Toll Plaza (Point-4)
Location Coordinates	33.534755 N 72.901741 E
Date of sampling	14-Dec-21

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Non-compliance
Remarks:	Value of phenol is exceeding PEQS limit.

Terms & Conditions:

- Analysis was conducted on the request of proponent for his own use/baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge

Page 1 of 3





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4414/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	E Coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	Total Coli-form	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	Fecal Coliform	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	BDL
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	0.30
8.	Total Hardness [^]	mg/L	-	<500	APHA-2340 C	272
9.	Total Dissolved Solids [^]	mg/L	< 1000	< 1000	APHA-2540 C	546
10.	pH [^]	-	6.5-8.5	6.5-8.5	APHA-4500-H ⁺ B	7.192 at 19.3°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
16.	Cadmium (Cd) [^]	mg/L	0.003	0.01	APHA-3111 B	BDL
17.	Chloride (Cl ⁻) [^]	mg/L	250	< 250	APHA-4500-Cl B	05
18.	Chromium (Cr) [^]	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL



Page 2 of 3



LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4414/DW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	0.0173
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	1.2
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	0.0039
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	0.0071
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickle	mg/L	0.02	≤ 0.02	APHA-3111 B	BDL
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO ₃ ⁻¹ -E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO ₂ ⁻¹ -B	BDL
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	APHA-Cl-B	BDL
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.0174
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	0.0035*
31.	Cyanide (CN)	mg/L	0.07	≤ 0.05	APHA-4500-CN ⁻¹ -F	BDL

End of Report.....

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^ PNAC Accredited

BDL: Below Detection Limit



Page 3 of 3





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4415/SW

Date: 23-Dec-21

Name of Client	NESPAK
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahllian M-2 38.3 Km)

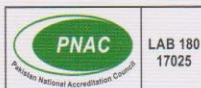
Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Laboratories
Sample source	Wadala Kas Drain
Sample Type	Grab
Sample Code	SW-1098
Sampling Location:	Wadala Kas (Point-1)
Location Coordinates	33.418185 N 73.194061 E
Date of sampling	11-Dec-21

Terms & Conditions:

- Analysis was conducted on the request of client for EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc #: PGG/IMS/FF/063 | Issue Date: 13-Oct-17 | Issue # 01 | Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4415/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
1.	Temperature	°C	APHA-2550 B	40	14.6
2.	pH ^	---	APHA-4500-H+ B	6-9	7.011 at 14.6°C
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) ^	mg/L	APHA-5210 D	80	39.6
4.	Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	150	64
5.	Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	200	20
6.	Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	3500	1200
7.	Greases & Oil	mg/L	APHA-5520 B	10	0.2
8.	Phenolic Compound (As Phenol)	mg/L	APHA-5530 D	0.1	0.019
9.	Chloride (as Cl ⁻) ^	mg/L	APHA-4500-Cl B	1000	62
10.	Fluoride (F ⁻)	mg/L	APHA-4500-FD	10	3.9
11.	An Ionic detergent as MBAs	mg/L	APHA 5540 C	20	0.064
12.	Sulphate (SO ₄ ²⁻) ^	mg/L	APHA-4500-SO ₄ C	600	114
13.	Sulphide (S ²⁻)	mg/L	APHA-4500-S ²⁻ F	1.0	BDL
14.	Ammonia (NH ₃) ^	mg/L	APHA-4500NH ₃ C	40	3.8
15.	Cadmium (Cd) ^	mg/L	APHA-3111 B	0.1	0.0132
16.	Chromium (Trivalent & Hexavalent) ^	mg/L	APHA-3111 B	1.0	0.0079
17.	Copper (Cu) ^	mg/L	APHA-3111 B	1.0	0.0312
18.	Lead (Pb) ^	mg/L	APHA-3111 B	0.5	0.0109
19.	Mercury (Hg)	mg/L	APHA-3112 B	0.01	BDL
20.	Selenium (Se)	mg/L	APHA-3114 C	0.5	BDL
21.	Nickel (Ni)	mg/L	APHA-3111 B	1.0	0.0039
22.	Silver (Ag)	mg/L	APHA-3111 B	1.0	BDL
23.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	-	2.0	0.0705



Page 2 of 3



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref #: PGG/LAB/2021-4415/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method/ Technique	PEQS	Results
24.	Zinc (Zn)^	mg/L	APHA-3111 B	5.0	0.0097
25.	Arsenic (As)	mg/L	APHA-3114 C	1.0	0.0034
26.	Barium (Ba)	mg/L	APHA-3111 D	1.5	BDL
27.	Iron (Fe)^	mg/L	APHA-3111 B	8.0	0.0474
28.	Manganese (Mn)^	mg/L	APHA-3111 B	1.5	0.0179
29.	Boron (B)	mg/L	APHA-3111 D	6.0	BDL
30.	Chlorine (Cl ₂)	mg/L	APHA-4500 Cl B	1.0	0.02
31.	Cyanide (as CN ⁻) Total	mg/L	APHA-4500-CN F	1.0	BDL

.....End of Report.....

^ PNAC Accredited

BDL: Below Detection Limit

Remarks: All the parameters are in compliance with PEQS limits so it is recommended to conserve the surface water resources of the area.





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4416/SW

Date: 23-Dec-21

Name of Client	NESPAK, Lahore
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahlilan M-2 38.3 Km)

Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Laboratories
Sample source	Charhaki Kas Drain
Sample Type	Grab
Sample Code	SW-1100
Sampling Location:	Charhaki Kas (Point-2)
Location Coordinates	33.411766 N 73.062460 E
Date of sampling	12-Dec-21

Terms & Conditions:

- Analysis was conducted on the request of client for EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge



Page 1 of 3

LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

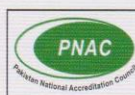
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4416/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
1.	Temperature	°C	APHA-2550 B	40	13.9
2.	pH ^	---	APHA-4500-H+ B	6-9	7.109 at 13.9°C
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) ^	mg/L	APHA-5210 D	80	13.4
4.	Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	150	20
5.	Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	200	06
6.	Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	3500	180
7.	Greases & Oil	mg/L	APHA-5520 B	10	0.1
8.	Phenolic Compound (As Phenol)	mg/L	APHA-5530 D	0.1	0.022
9.	Chloride (as Cl ⁻) ^	mg/L	APHA-4500-Cl B	1000	42
10.	Fluoride (F ⁻)	mg/L	APHA-4500-FD	10	0.4
11.	An Ionic detergent as MBAs	mg/L	APHA 5540 C	20	0.036
12.	Sulphate (SO ₄ ²⁻) ^	mg/L	APHA-4500-SO ₄ C	600	19
13.	Sulphide (S ²⁻)	mg/L	APHA-4500-S ²⁻ F	1.0	BDL
14.	Ammonia (NH ₃) ^	mg/L	APHA-4500NH ₃ C	40	0.4
15.	Cadmium (Cd) ^	mg/L	APHA-3111 B	0.1	BDL
16.	Chromium (Trivalent & Hexavalent) ^	mg/L	APHA-3111 B	1.0	BDL
17.	Copper (Cu) ^	mg/L	APHA-3111 B	1.0	0.0017
18.	Lead (Pb) ^	mg/L	APHA-3111 B	0.5	BDL
19.	Mercury (Hg)	mg/L	APHA-3112 B	0.01	BDL
20.	Selenium (Se)	mg/L	APHA-3114 C	0.5	BDL
21.	Nickel (Ni)	mg/L	APHA-3111 B	1.0	BDL
22.	Silver (Ag)	mg/L	APHA-3111 B	1.0	BDL
23.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	-	2.0	0.0017



LAB 180

17025



Page 2 of 3



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2021-4416/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
24.	Zinc (Zn)^	mg/L	APHA-3111 B	5.0	0.0039
25.	Arsenic (As)	mg/L	APHA-3114 C	1.0	BDL
26.	Barium (Ba)	mg/L	APHA-3111 D	1.5	BDL
27.	Iron (Fe)^	mg/L	APHA-3111 B	8.0	0.0011
28.	Manganese (Mn)^	mg/L	APHA-3111 B	1.5	BDL
29.	Boron (B)	mg/L	APHA-3111 D	6.0	BDL
30.	Chlorine (Cl ₂)	mg/L	APHA-4500 Cl B	1.0	0.01
31.	Cyanide (as CN ⁻) Total	mg/L	APHA-4500-CN F	1.0	BDL

End of Report.

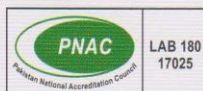
^ PNAC Accredited

BDL: Below Detection Limit

Remarks: All the parameters are in compliance with PEQS limits so it is recommended to conserve the surface water resources of the area.



Page 3 of 3





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4417/SW

Date: 23-Dec-21

Name of Client	NESPAK, Lahore
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannth N-5 to Tahllian M-2 38.3 Km)

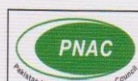
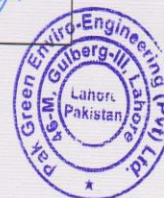
Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Laboratories
Sample source	Sawan River
Sample Type	Grab
Sample Code	SW-1102
Sampling Location:	Sawan River (Point-3)
Location Coordinates	33.429254 N 72.971453 E
Date of sampling	13-Dec-21

Terms & Conditions:

- Analysis was conducted on the request of client for EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge

LAB 180
17025



EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc. #: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2021-4417/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
1.	Temperature	°C	APHA-2550 B	40	11.5
2.	pH ^	---	APHA-4500-H ⁺ B	6-9	6.99 at 11.5°C
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) ^	mg/L	APHA-5210 D	80	84.5
4.	Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	150	140
5.	Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	200	18
6.	Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	3500	980
7.	Greases & Oil	mg/L	APHA-5520 B	10	0.1
8.	Phenolic Compound (As Phenol)	mg/L	APHA-5530 D	0.1	0.039
9.	Chloride (as Cl ⁻) ^	mg/L	APHA-4500-Cl B	1000	45
10.	Fluoride (F ⁻)	mg/L	APHA-4500-FD	10	2.6
11.	An Ionic detergent as MBAs	mg/L	APHA 5540 C	20	0.019
12.	Sulphate (SO ₄ ²⁻) ^	mg/L	APHA-4500-SO ₄ C	600	95
13.	Sulphide (S ²⁻)	mg/L	APHA-4500-S ²⁻ F	1.0	BDL
14.	Ammonia (NH ₃) ^	mg/L	APHA-4500NH ₃ C	40	6.1
15.	Cadmium (Cd) ^	mg/L	APHA-3111 B	0.1	0.0041
16.	Chromium (Trivalent & Hexavalent) ^	mg/L	APHA-3111 B	1.0	BDL
17.	Copper (Cu) ^	mg/L	APHA-3111 B	1.0	0.0096
18.	Lead (Pb) ^	mg/L	APHA-3111 B	0.5	0.0007
19.	Mercury (Hg)	mg/L	APHA-3112 B	0.01	BDL
20.	Selenium (Se)	mg/L	APHA-3114 C	0.5	BDL
21.	Nickel (Ni)	mg/L	APHA-3111 B	1.0	0.0001
22.	Silver (Ag)	mg/L	APHA-3111 B	1.0	BDL
23.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	-	2.0	0.0145





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2021-4417/SW

Date: 23-Dec-21

Results:

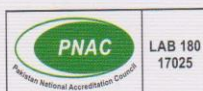
Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
24.	Zinc (Zn)^	mg/L	APHA-3111 B	5.0	0.0077
25.	Arsenic (As)	mg/L	APHA-3114 C	1.0	BDL
26.	Barium (Ba)	mg/L	APHA-3111 D	1.5	BDL
27.	Iron (Fe)^	mg/L	APHA-3111 B	8.0	0.0174
28.	Manganese (Mn)^	mg/L	APHA-3111 B	1.5	0.0014
29.	Boron (B)	mg/L	APHA-3111 D	6.0	BDL
30.	Chlorine (Cl ₂)	mg/L	APHA-4500 Cl B	1.0	0.02
31.	Cyanide (as CN ⁻) Total	mg/L	APHA-4500-CN F	1.0	BDL

.....End of Report.....

^ PNAC Accredited

BDL: Below Detection Limit

Remarks: All the parameters are in compliance with PEQS limits so it is recommended to conserve the surface water resources of the area.





EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc #: PGG/IMS/FF/063 | Issue Date: 13-Oct-17 | Issue # 01 | Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2021-4418/SW

Date: 23-Dec-21

Name of Client	NESPAK, Lahore
Project Name	Feasibility Study of Rawalpindi Ring Road (Bannt N-5 to Tahlilan M-2 38.3 Km)

Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Laboratories
Sample source	River Sil
Sample Type	Grab
Sample Code	SW-1104
Sampling Location:	River Sil (Point-4)
Location Coordinates	33.542424 N 72.914762 E
Date of sampling	14-Dec-21

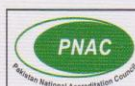
Terms & Conditions:

- Analysis was conducted on the request of client for EIA baseline study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Lab. Analyst	Chief Analyst	Laboratory Incharge



Page 1 of 3

LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref. #: PGG/LAB/2021-4418/SW

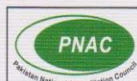
Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method/Technique	PEQS	Results
1.	Temperature	°C	APHA-2550 B	40	12.3
2.	pH ^	---	APHA-4500-H+ B	6-9	6.989 at 12.3°C
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) ^	mg/L	APHA-5210 D	80	85.8*
4.	Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	150	132
5.	Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	200	24
6.	Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	3500	990
7.	Greases & Oil	mg/L	APHA-5520 B	10	0.2
8.	Phenolic Compound (As Phenol)	mg/L	APHA-5530 D	0.1	0.036
9.	Chloride (as Cl ⁻) ^	mg/L	APHA-4500-Cl B	1000	40
10.	Fluoride (F ⁻)	mg/L	APHA-4500-FD	10	2.9
11.	An Ionic detergent as MBAs	mg/L	APHA 5540 C	20	0.064
12.	Sulphate (SO ₄ ²⁻) ^	mg/L	APHA-4500-SO ₄ C	600	112
13.	Sulphide (S ²⁻)	mg/L	APHA-4500-S ²⁻ F	1.0	BDL
14.	Ammonia (NH ₃) ^	mg/L	APHA-4500NH ₃ C	40	5.2
15.	Cadmium (Cd) ^	mg/L	APHA-3111 B	0.1	0.0047
16.	Chromium (Trivalent & Hexavalent) ^	mg/L	APHA-3111 B	1.0	BDL
17.	Copper (Cu) ^	mg/L	APHA-3111 B	1.0	0.0129
18.	Lead (Pb) ^	mg/L	APHA-3111 B	0.5	BDL
19.	Mercury (Hg)	mg/L	APHA-3112 B	0.01	BDL
20.	Selenium (Se)	mg/L	APHA-3114 C	0.5	BDL
21.	Nickel (Ni)	mg/L	APHA-3111 B	1.0	0.0037
22.	Silver (Ag)	mg/L	APHA-3111 B	1.0	BDL
23.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	-	2.0	0.0213



Page 2 of 3



LAB 180
17025



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025 : 2017 Accredited Lab, ISO 9001:2015, 14001:2015, OHSAS 18001:2007

Doc.#: PGG/IMS/FF/063 Issue Date: 13-Oct-17 Issue # 01 Rev. # 00

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2021-4418/SW

Date: 23-Dec-21

Results:

Sr. No.	Parameters	Unit	Method / Technique	PEQS	Results
24.	Zinc (Zn)^	mg/L	APHA-3111 B	5.0	0.0271
25.	Arsenic (As)	mg/L	APHA-3114 C	1.0	BDL
26.	Barium (Ba)	mg/L	APHA-3111 D	1.5	BDL
27.	Iron (Fe)^	mg/L	APHA-3111 B	8.0	0.0079
28.	Manganese (Mn)^	mg/L	APHA-3111 B	1.5	0.0103
29.	Boron (B)	mg/L	APHA-3111 D	6.0	BDL
30.	Chlorine (Cl ₂)	mg/L	APHA-4500 Cl B	1.0	0.01
31.	Cyanide (as CN ⁻) Total	mg/L	APHA-4500-CN F	1.0	BDL

.....End of Report.....

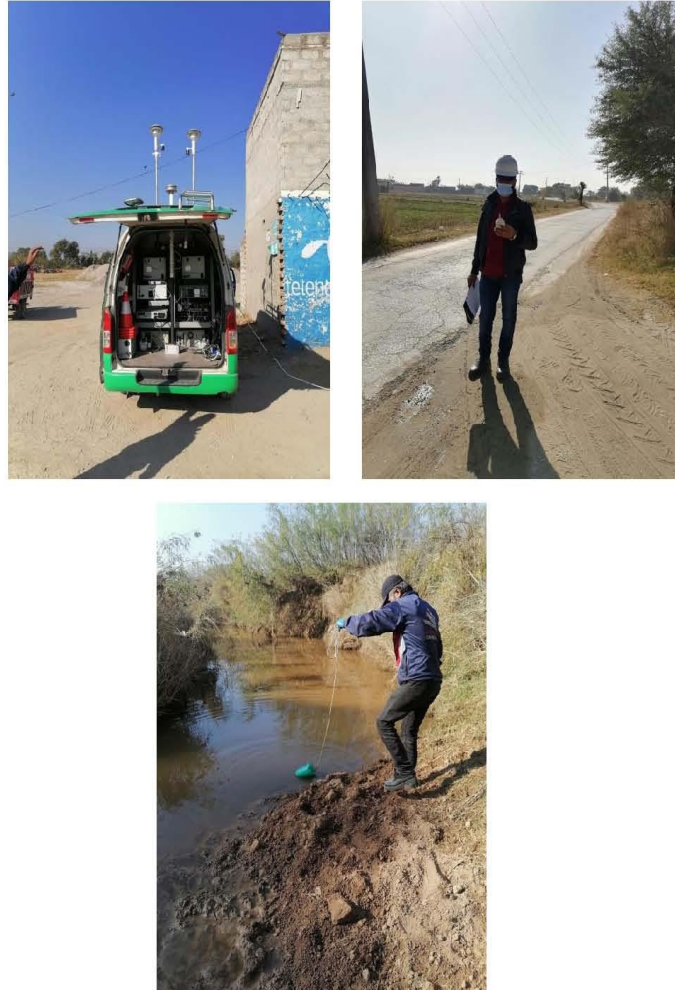
^ PNAC Accredited

BDL: Below Detection Limit

Remarks: Value of BOD is exceeding PEQS limits while all other parameters are in compliance so it is recommended to conserve the surface water resources of the area.



3.6 Pictorial Evidence of Monitoring



Point # 1 Bannth near Railway Station and Surface Water Analysis at Wardala Kas

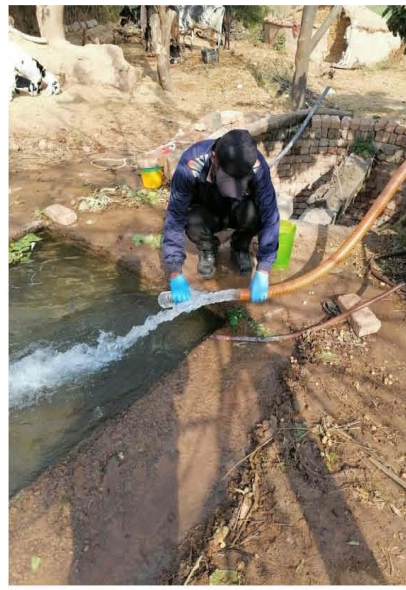
Construction of Rawalpindi Ring Road



Point # 2 Near Mandhaal Mosque and Surface Water Analysis at Charhaki Kas



Construction of Rawalpindi Ring Road



Point # 3 Near PTCL Exchange Khasala Khurd and Surface Water Analysis at Sawan River



Construction of Rawalpindi Ring Road

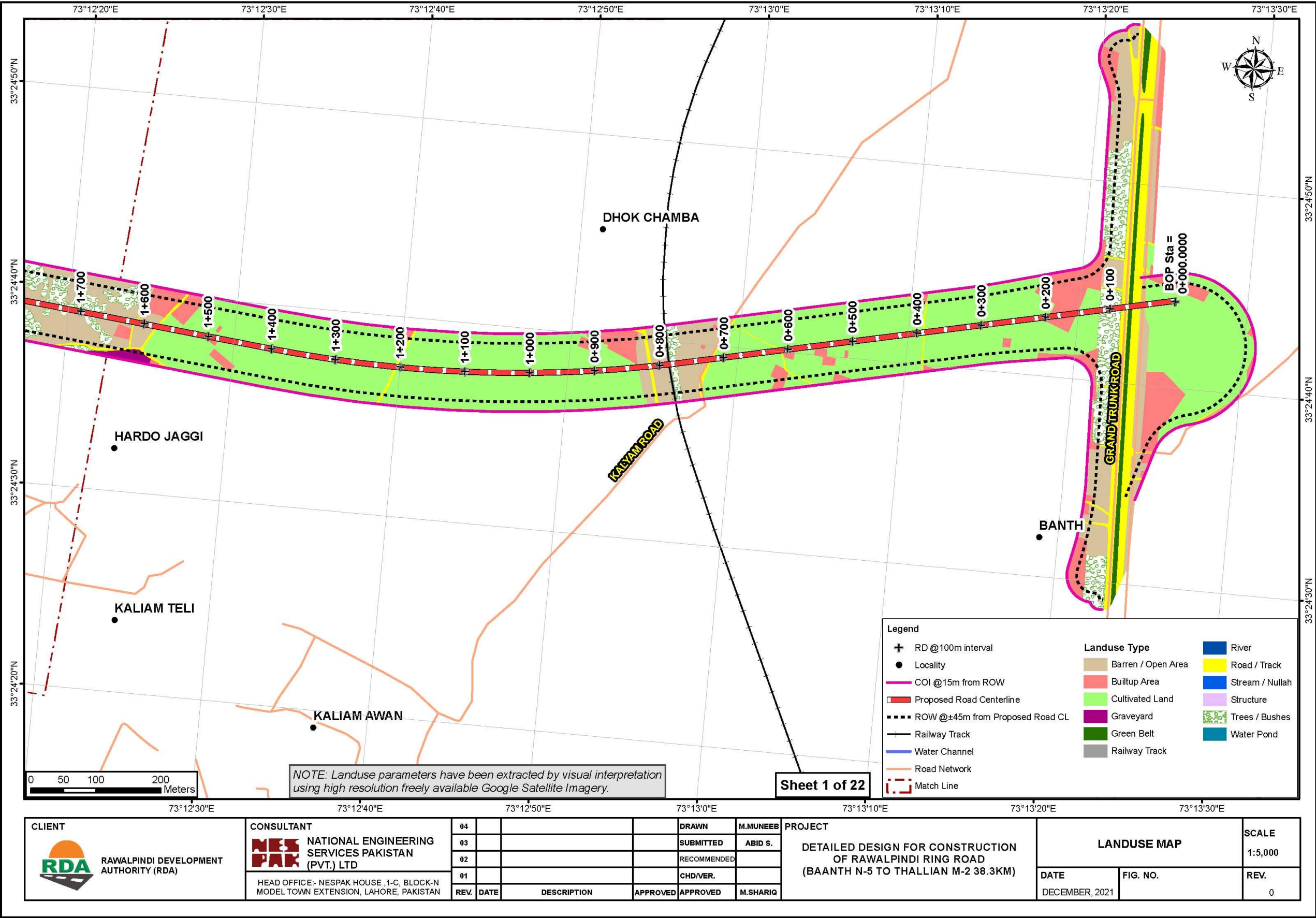


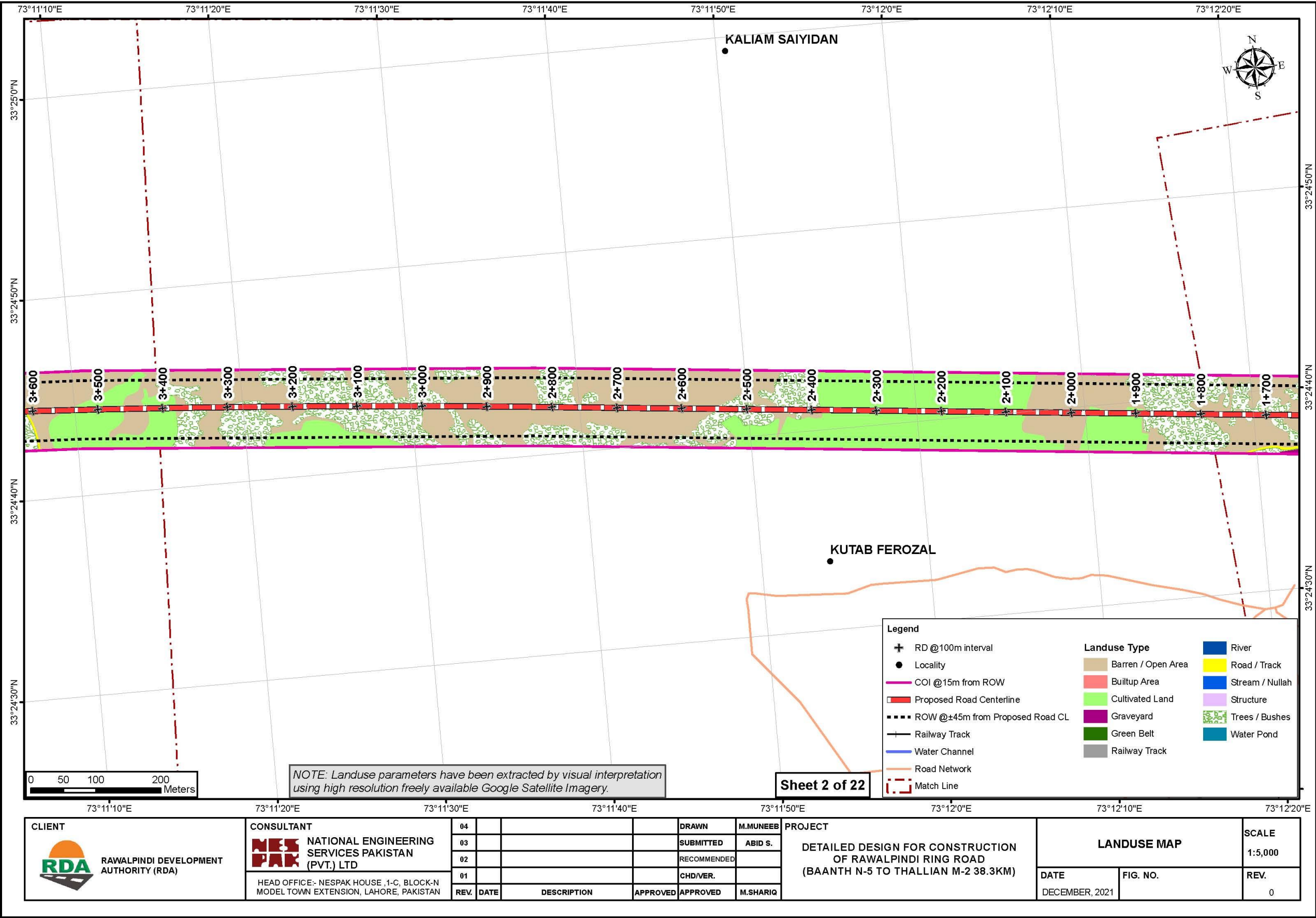
Point # 4 Thallian Motorway Toll Plaza and Surface Water Analysis at River Sil

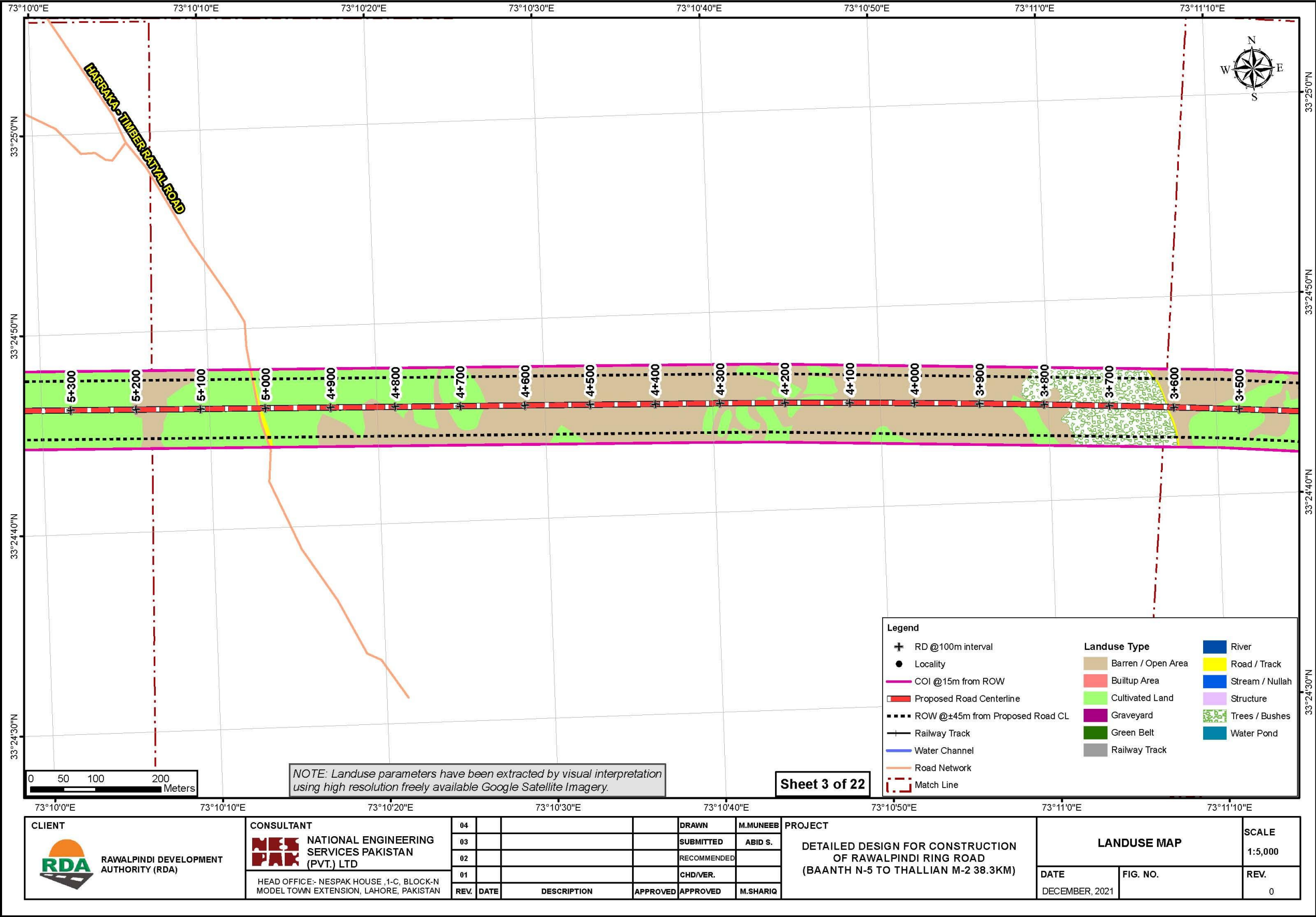
.....End of Report.....

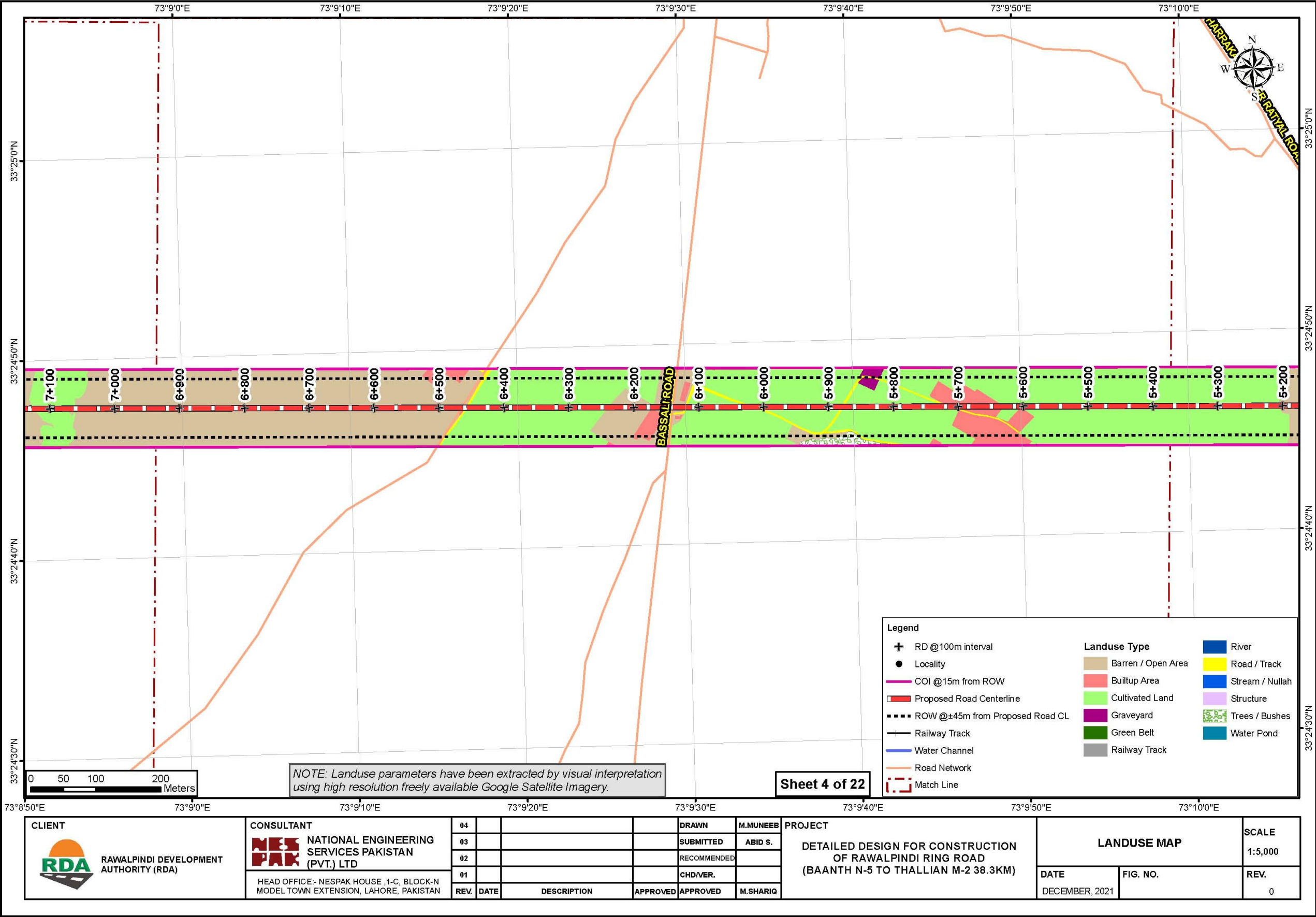


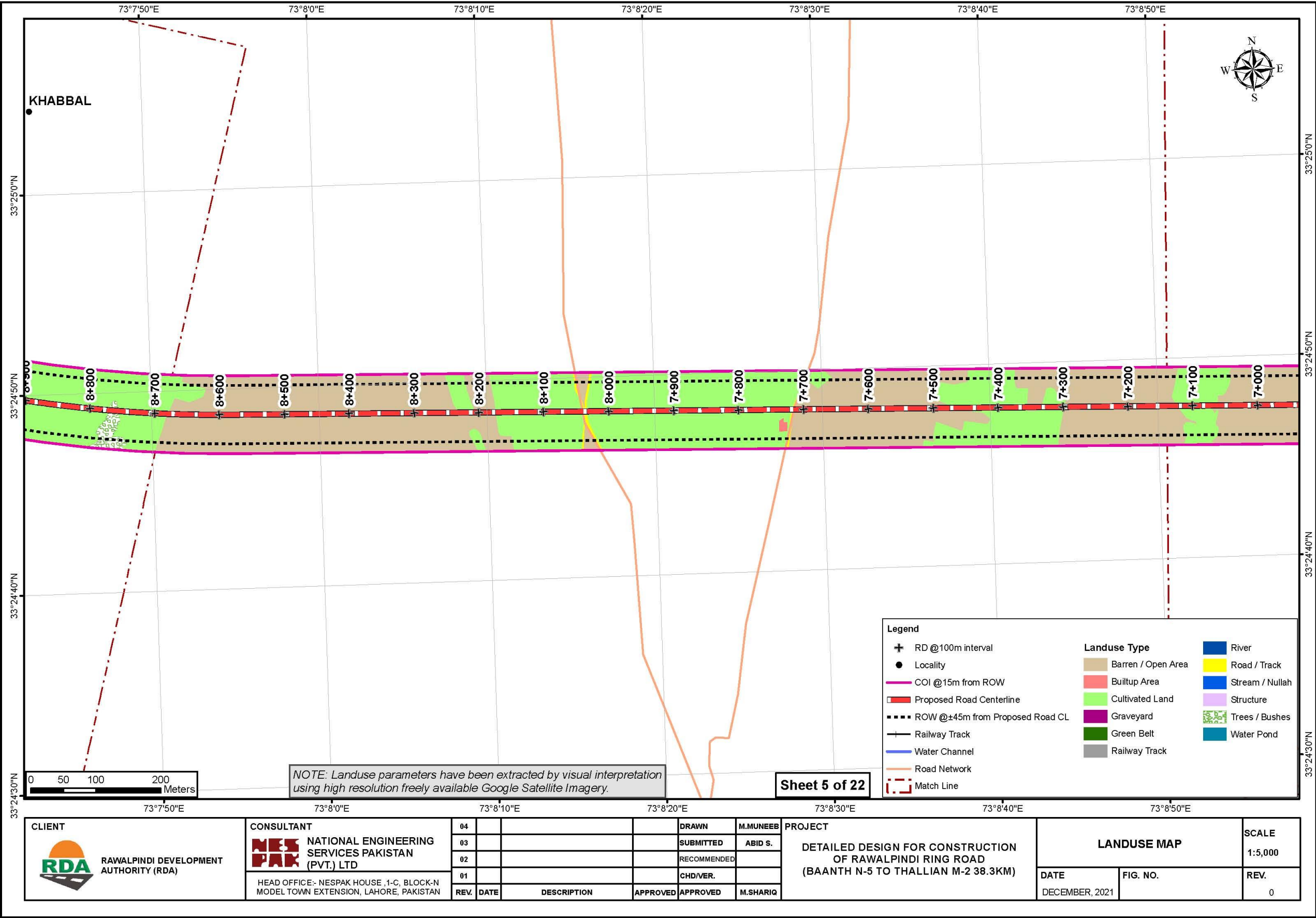
ANNEX-II: LANDUSE MAP IN THE COI AND ROW

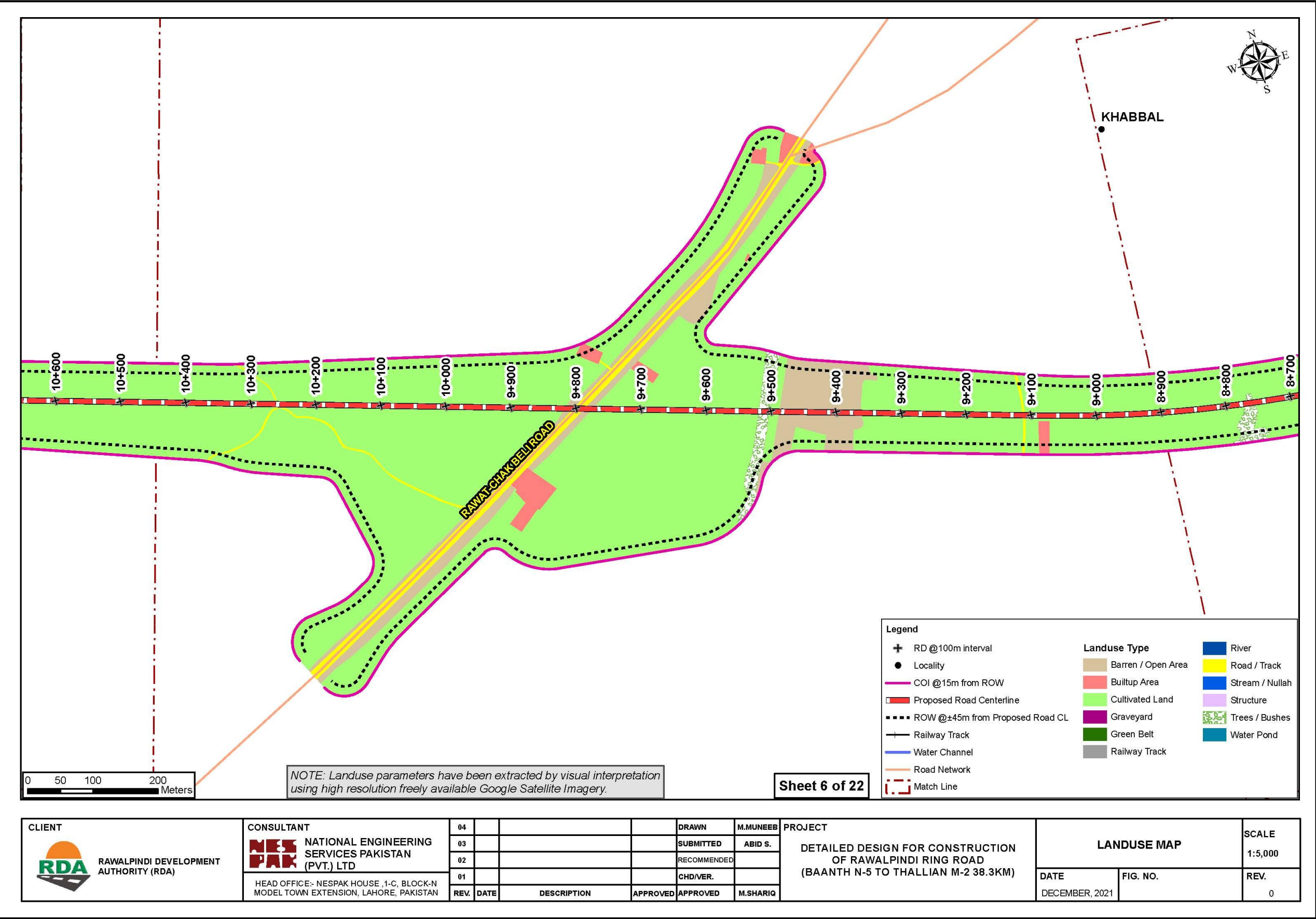


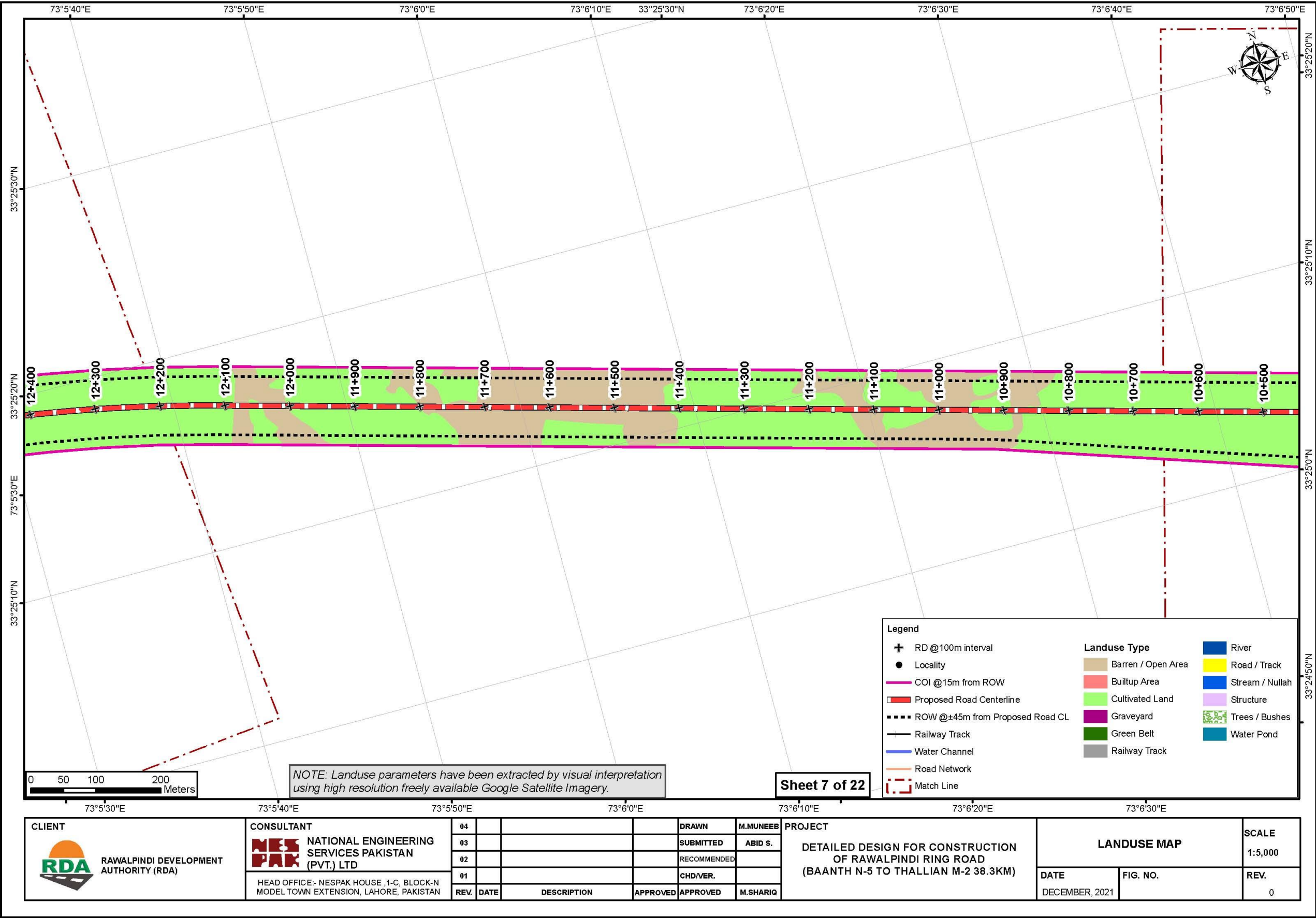


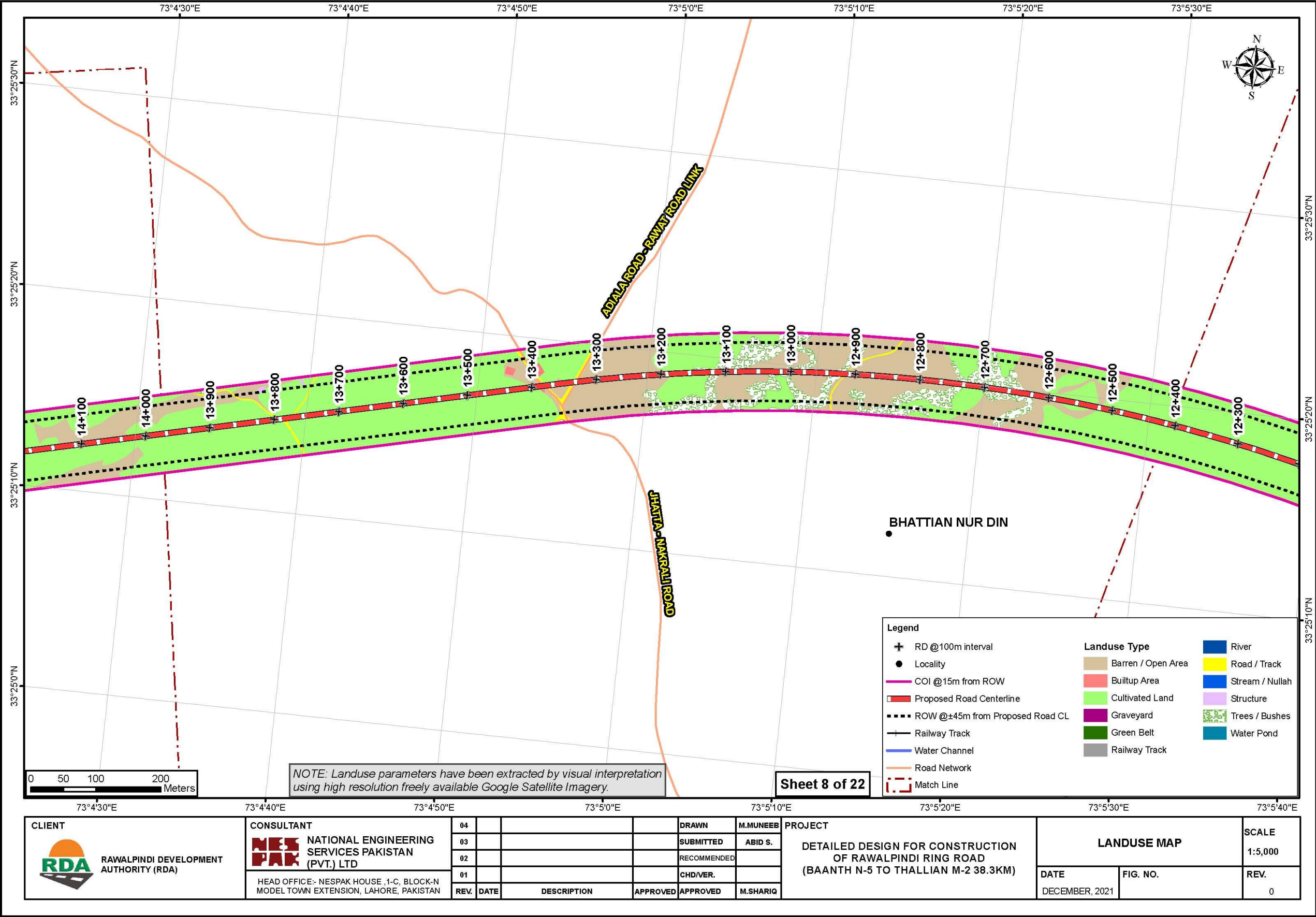


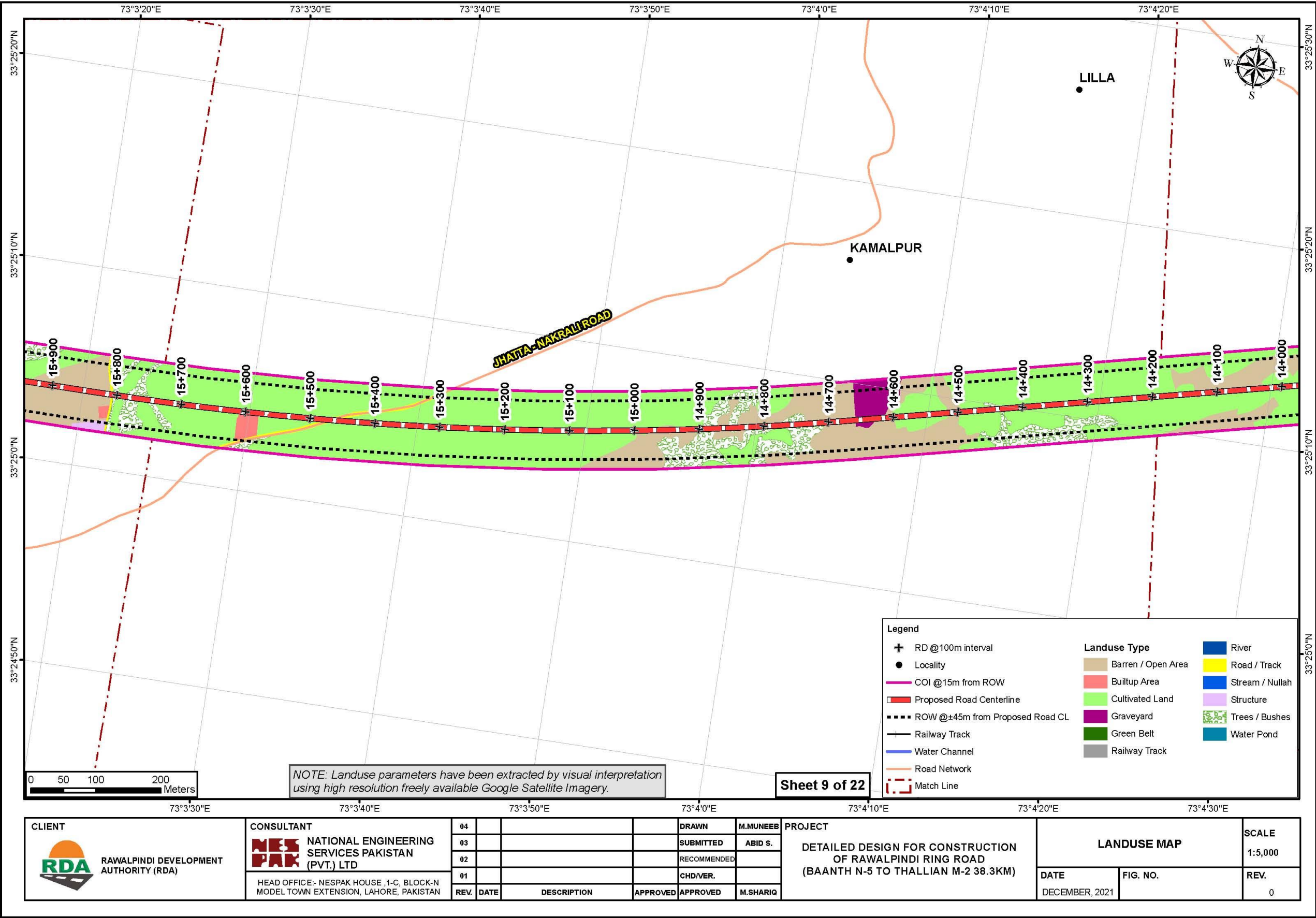


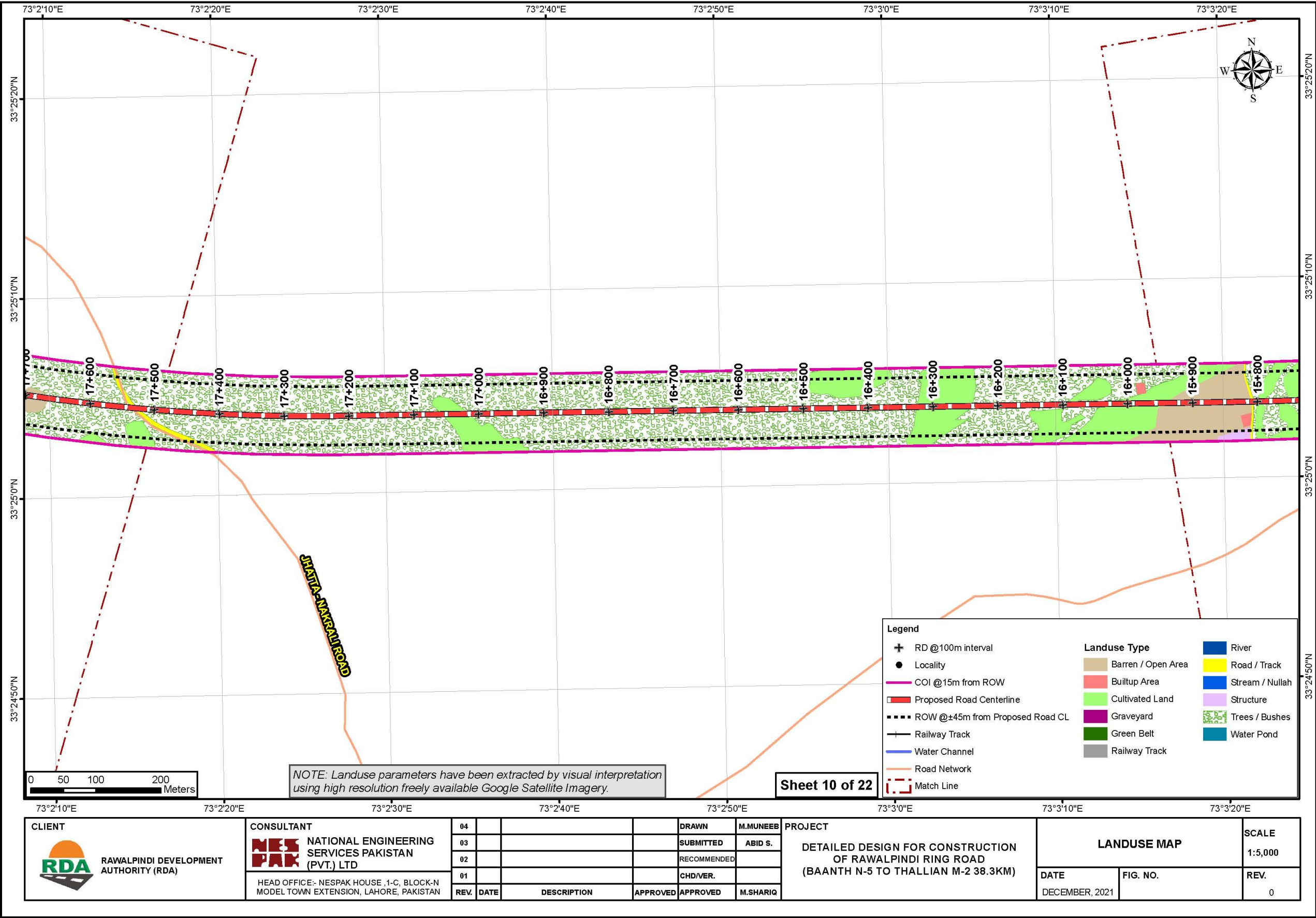












CLIENT

 **RAWALPINDI DEVELOPMENT AUTHORITY (RDA)**

CONSULTANT

 **NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD**

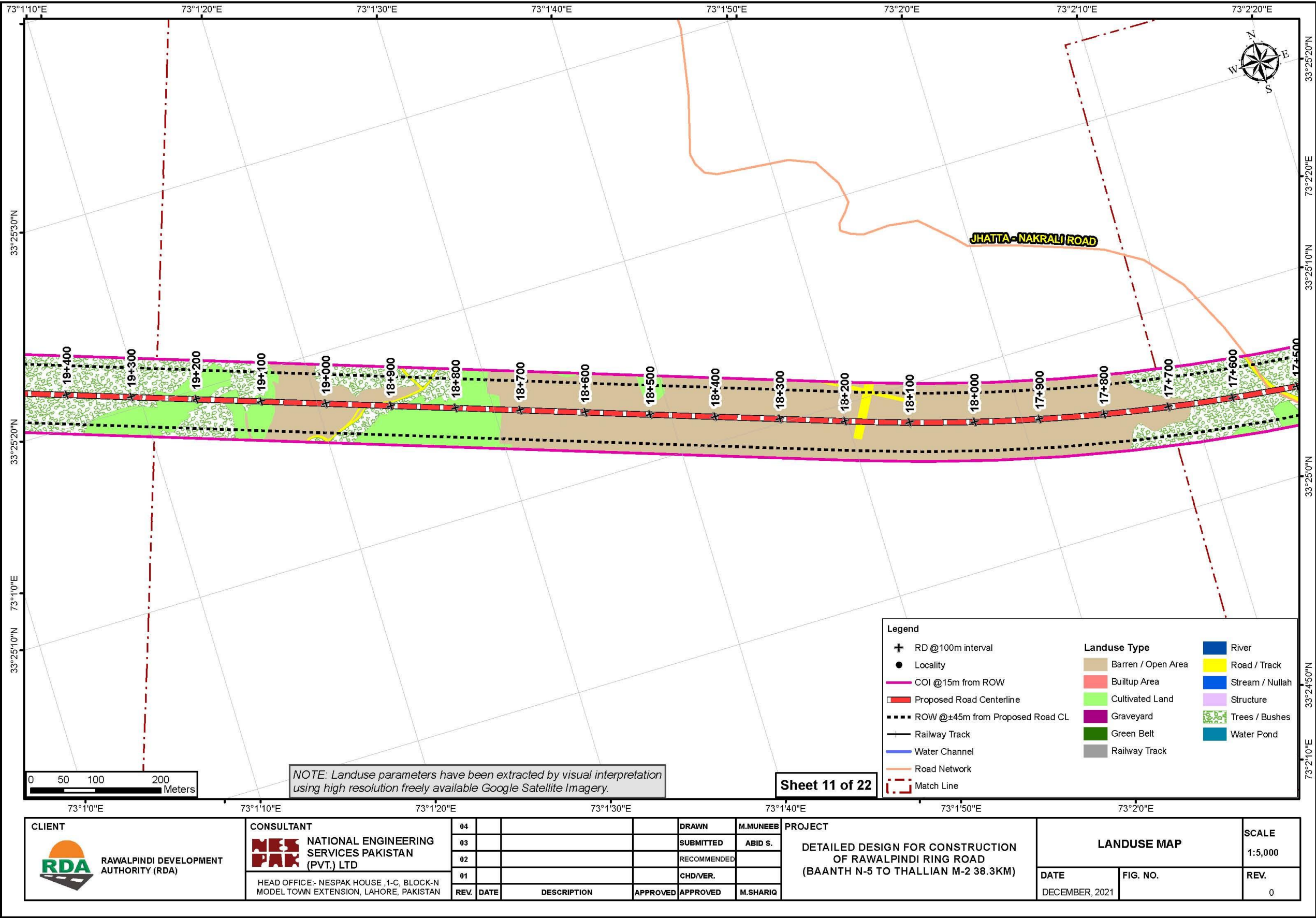
HEAD OFFICE:- NESPAK HOUSE, 1-C, BLOCK-N, MODEL TOWN EXTENSION, LAHORE, PAKISTAN

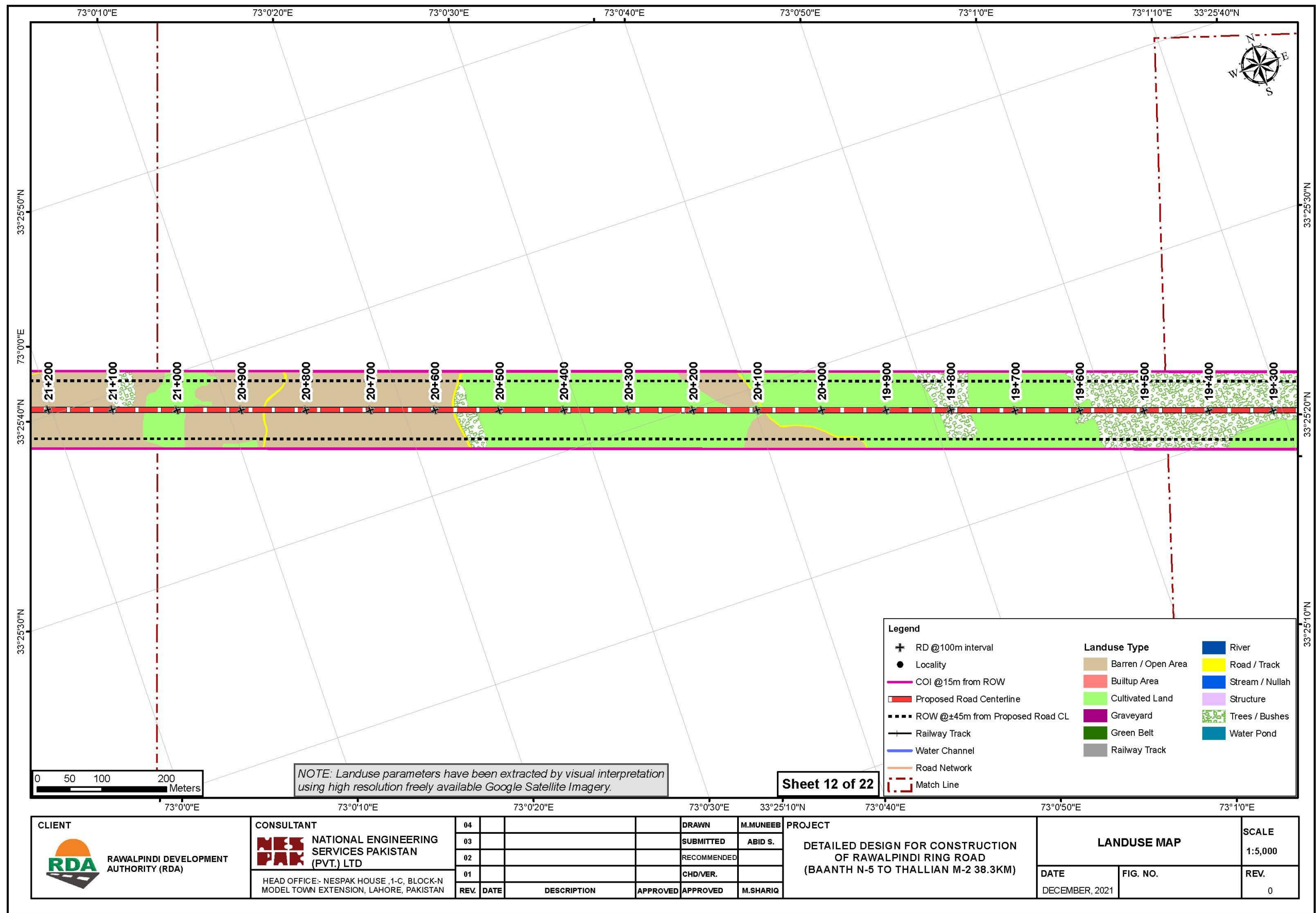
04				DRAWN	M.MUNEEB
03				SUBMITTED	ABID S.
02				RECOMMENDED	
01				CHD/VER.	
REV.	DATE	DESCRIPTION	APPROVED	APPROVED	M.SHARIQ

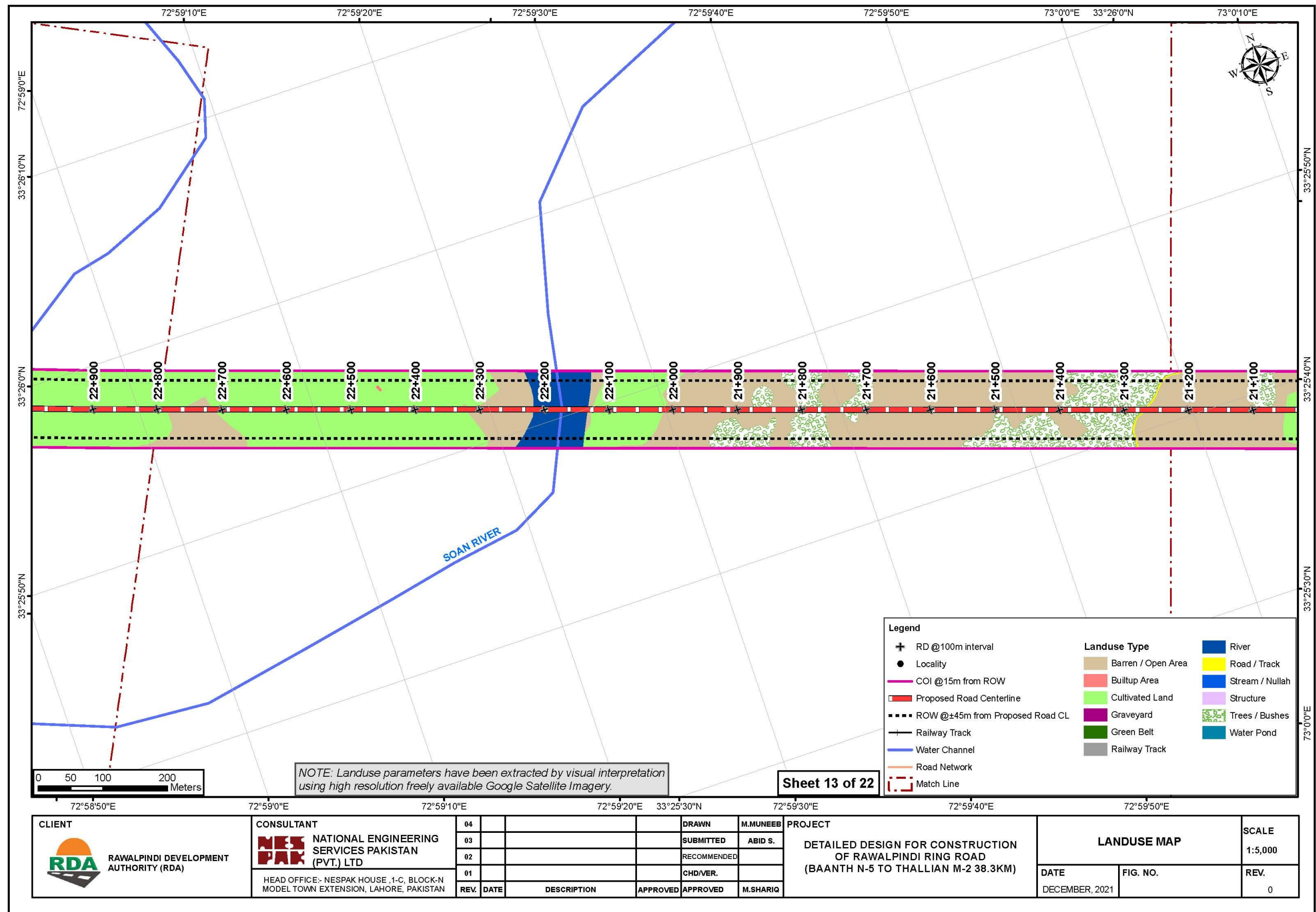
PROJECT

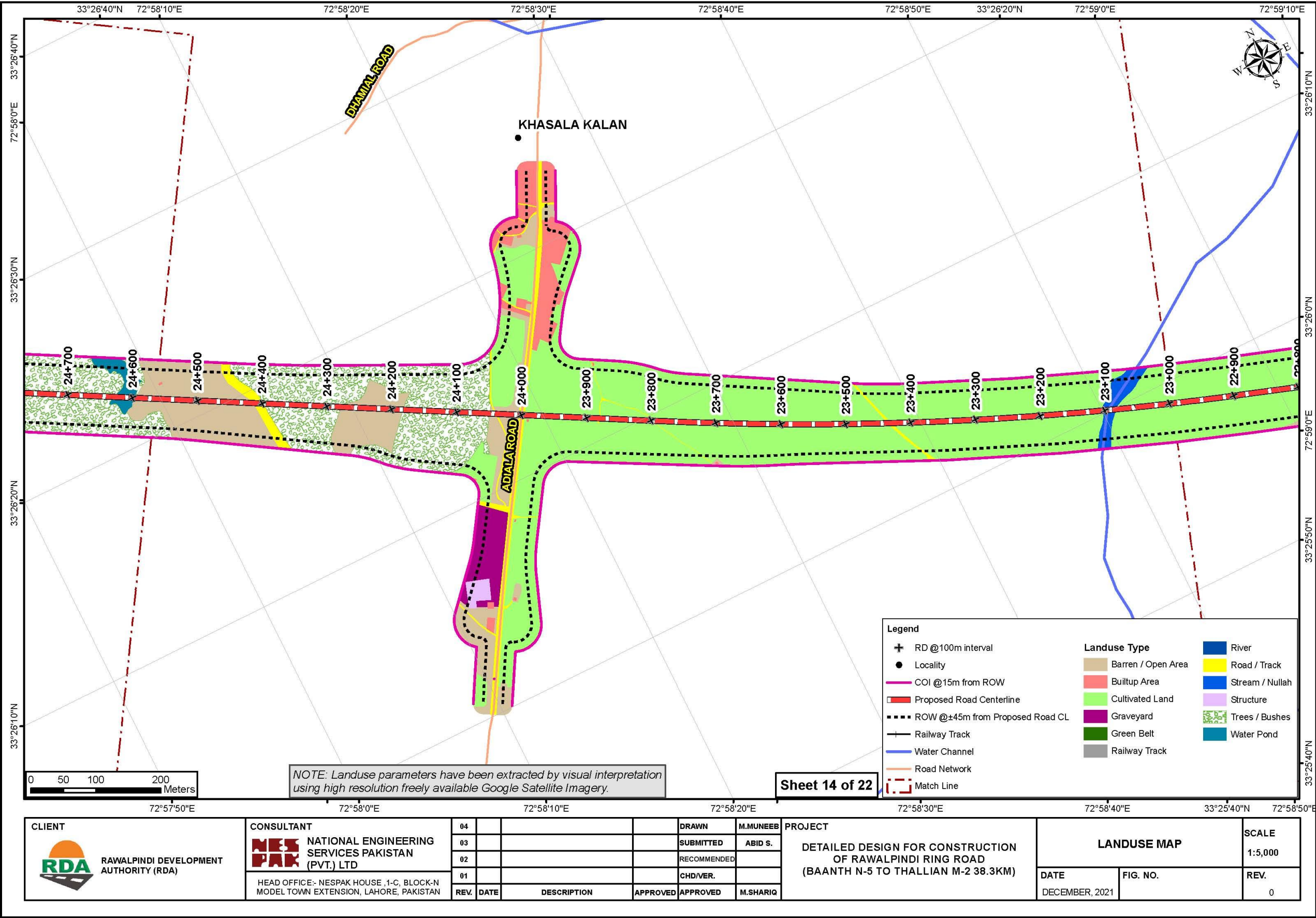
DETAILED DESIGN FOR CONSTRUCTION OF RAWALPINDI RING ROAD (BAANTH N-5 TO THALLIAN M-2 38.3KM)

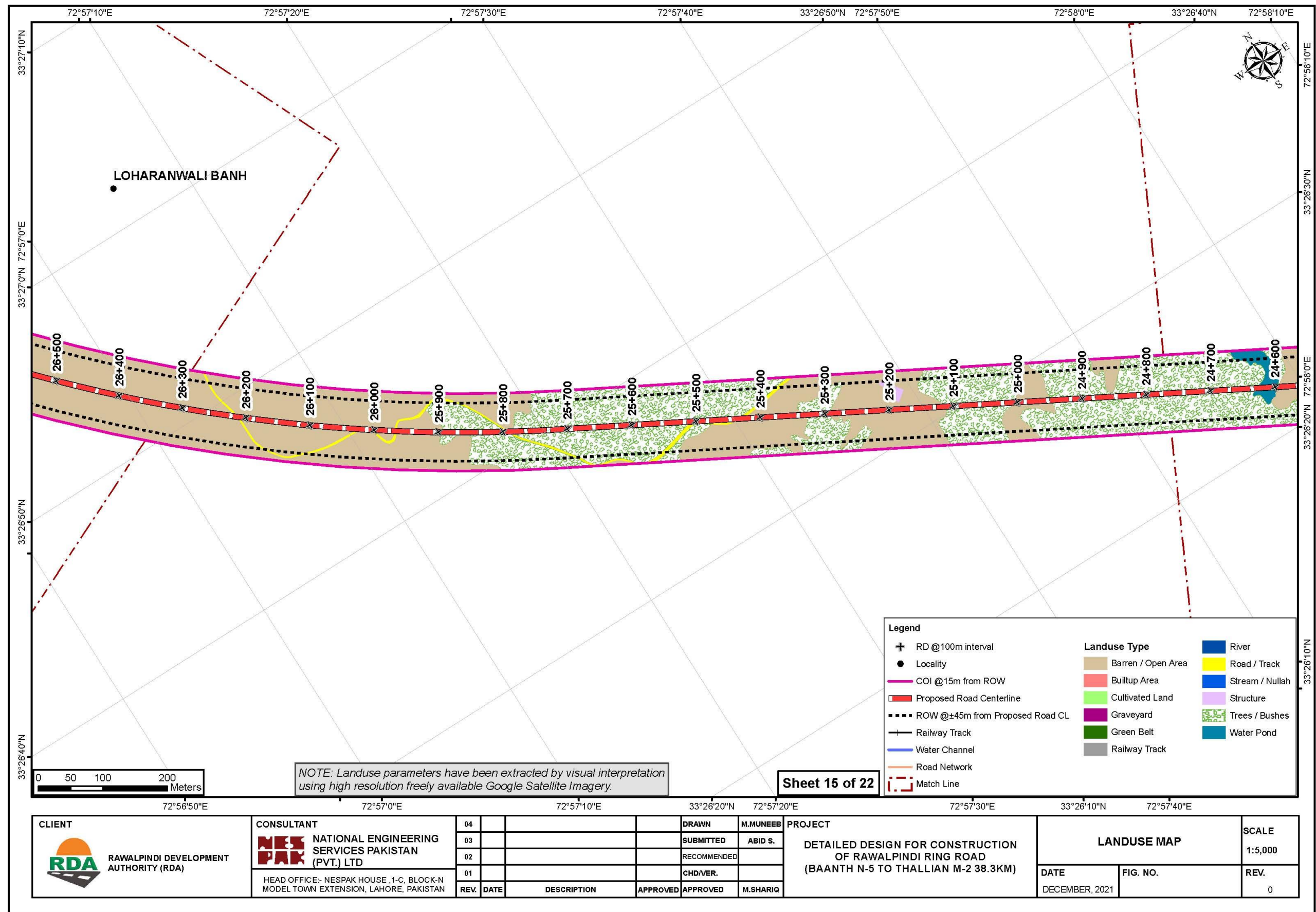
LANDUSE MAP		SCALE
DATE	FIG. NO.	REV.
DECEMBER, 2021		0

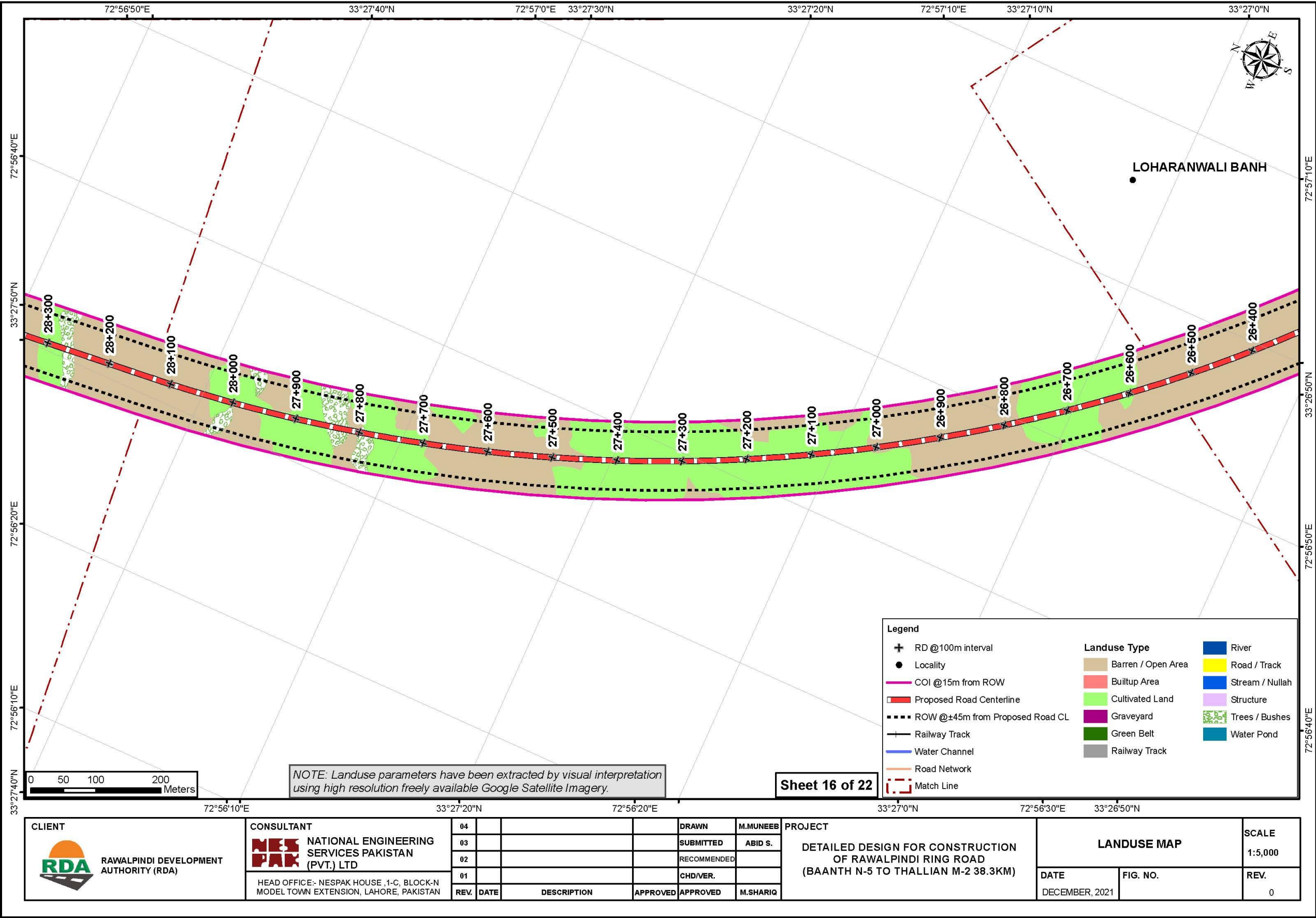


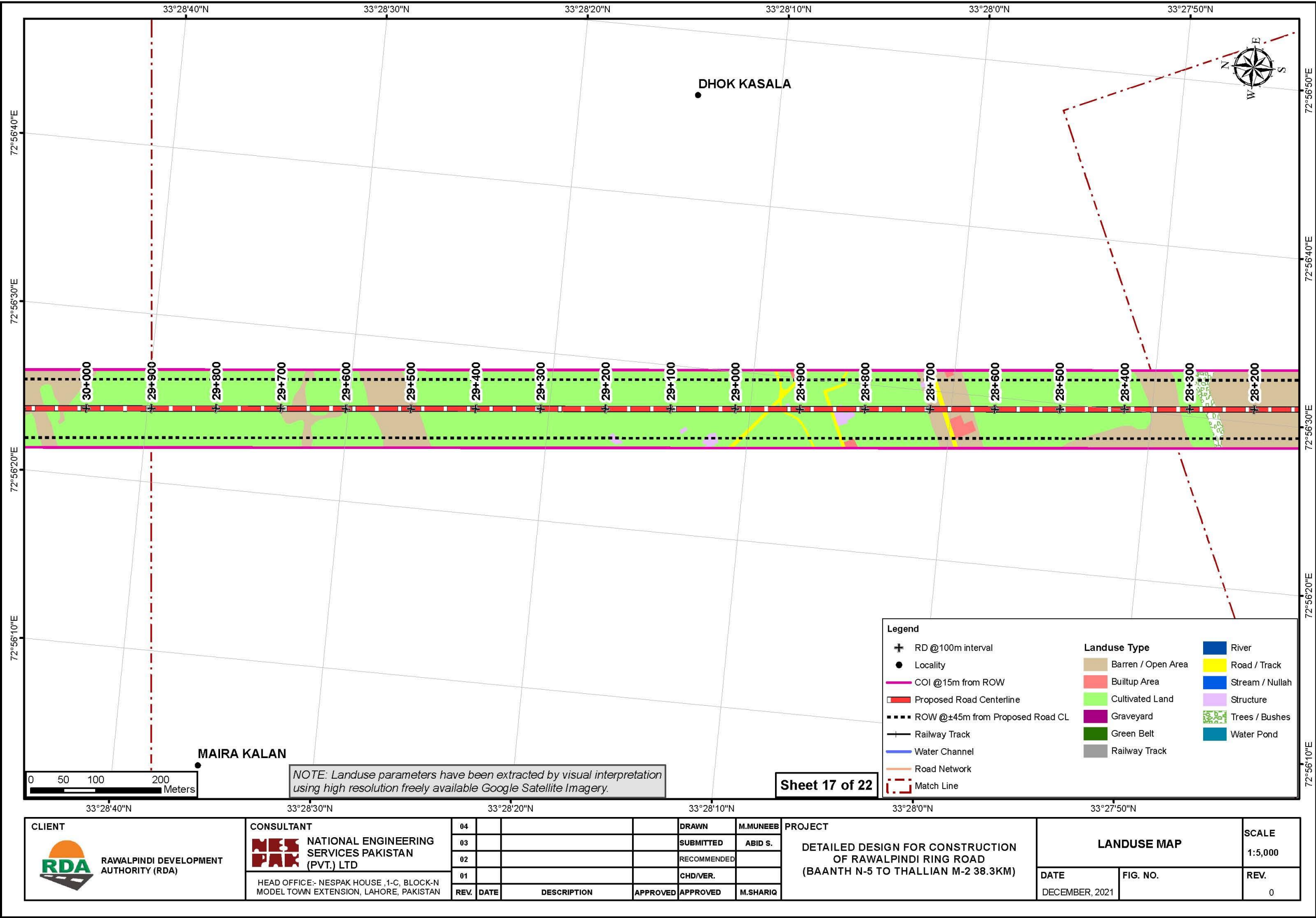




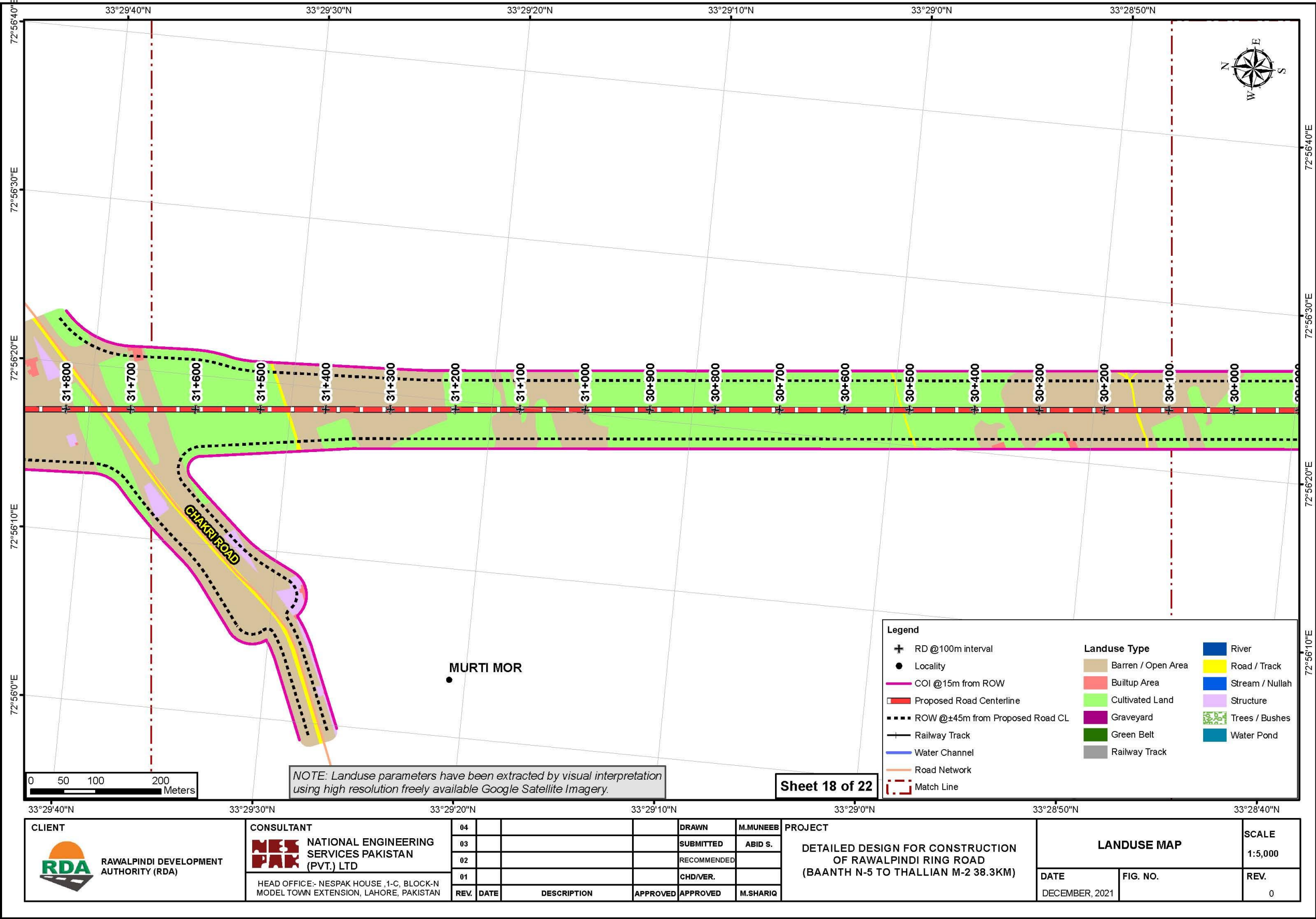


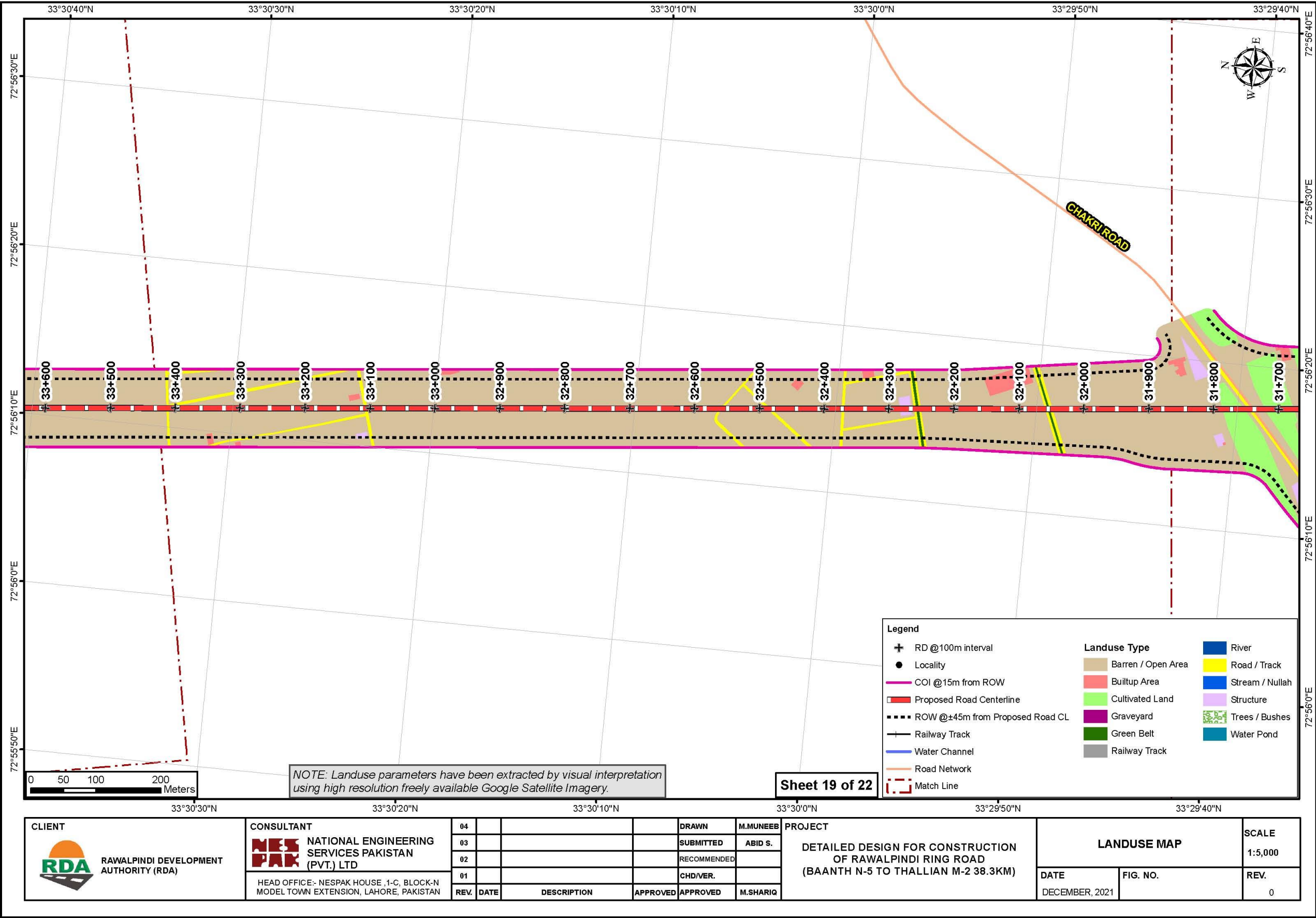


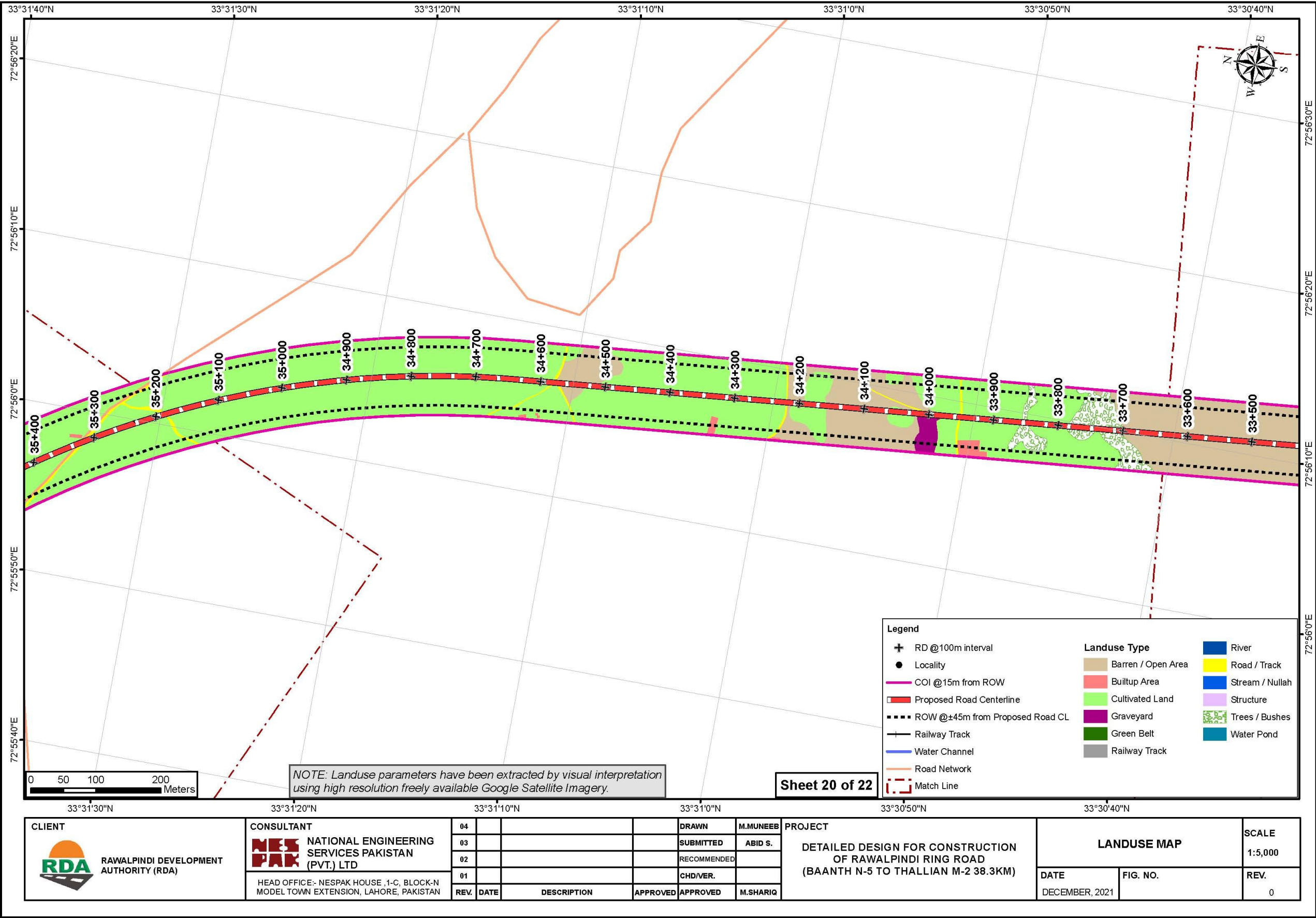


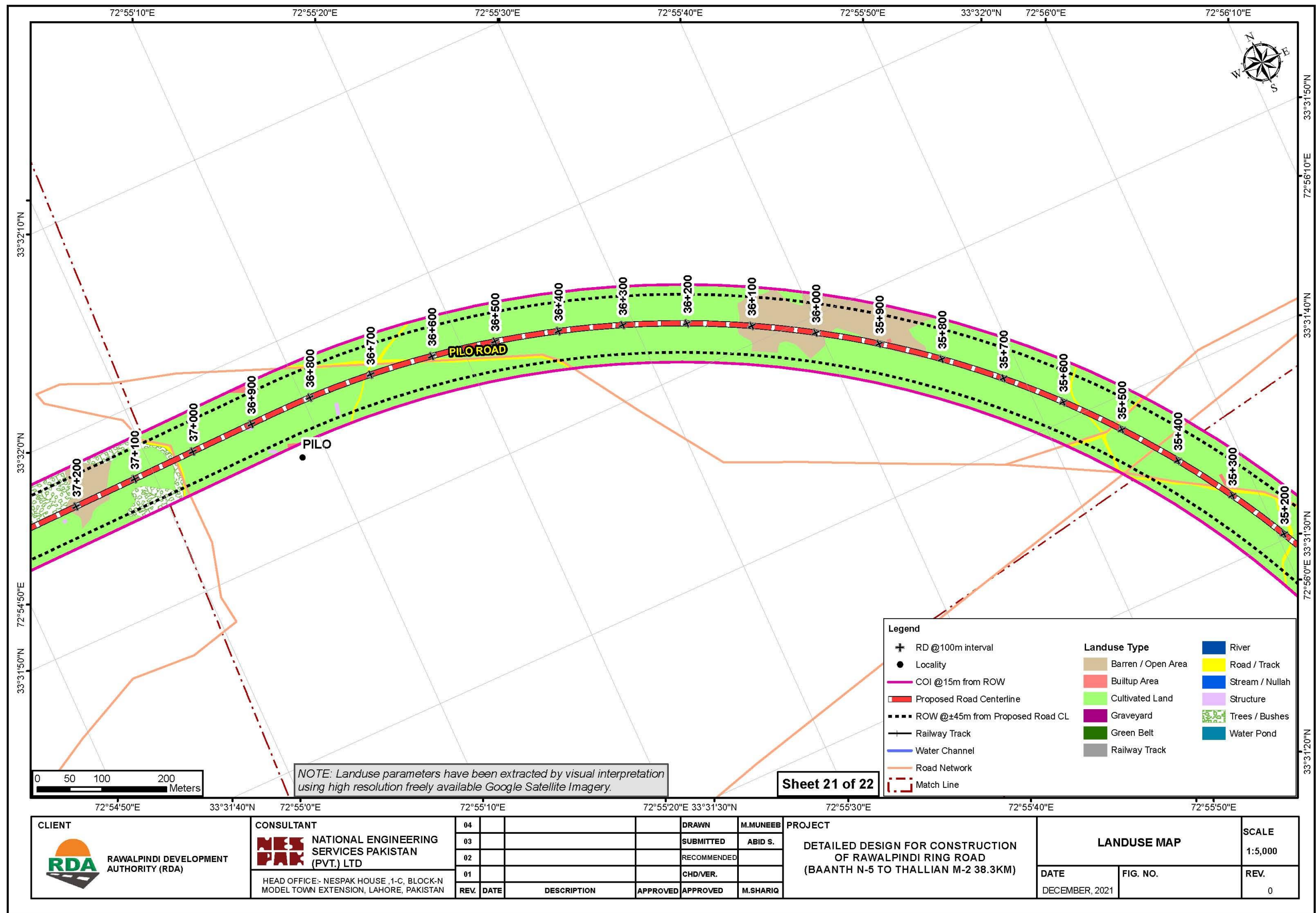


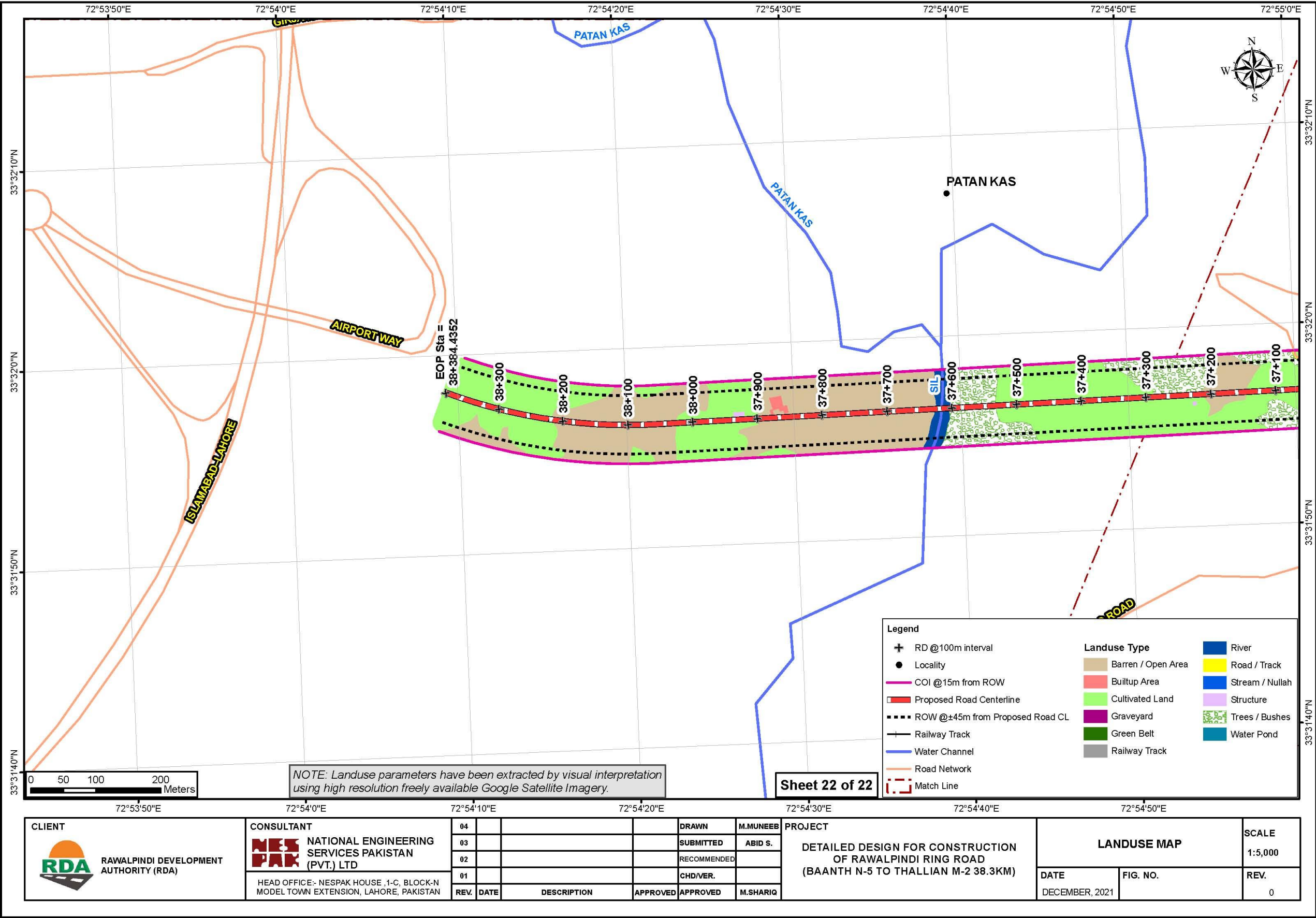
 RAWALPINDI DEVELOPMENT AUTHORITY (RDA)	 NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD		04				DRAWN	M.MUNEEB	PROJECT DETAILED DESIGN FOR CONSTRUCTION OF RAWALPINDI RING ROAD (BAANTH N-5 TO THALLIAN M-2 38.3KM)	LANDUSE MAP		SCALE 1:5,000
			03				SUBMITTED	ABID S.				
			02				RECOMMENDED					
			01				CHD/VER.					
			HEAD OFFICE:- NESPAK HOUSE, 1-C, BLOCK-N MODEL TOWN EXTENSION, LAHORE, PAKISTAN									
	REV.	DATE	DESCRIPTION			APPROVED	APPROVED	M.SHARIQ	DATE DECEMBER, 2021	FIG. NO.	REV. 0	



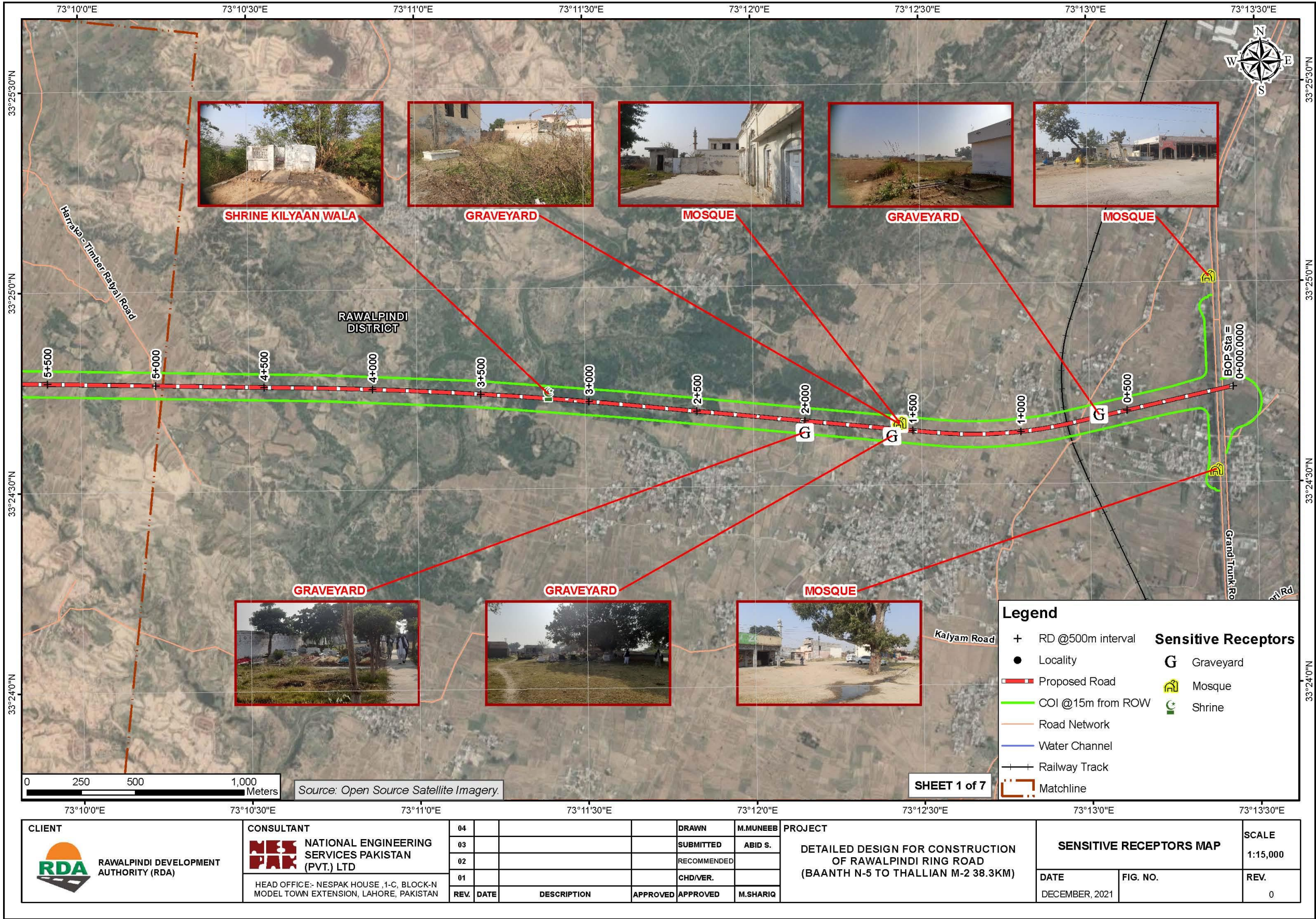


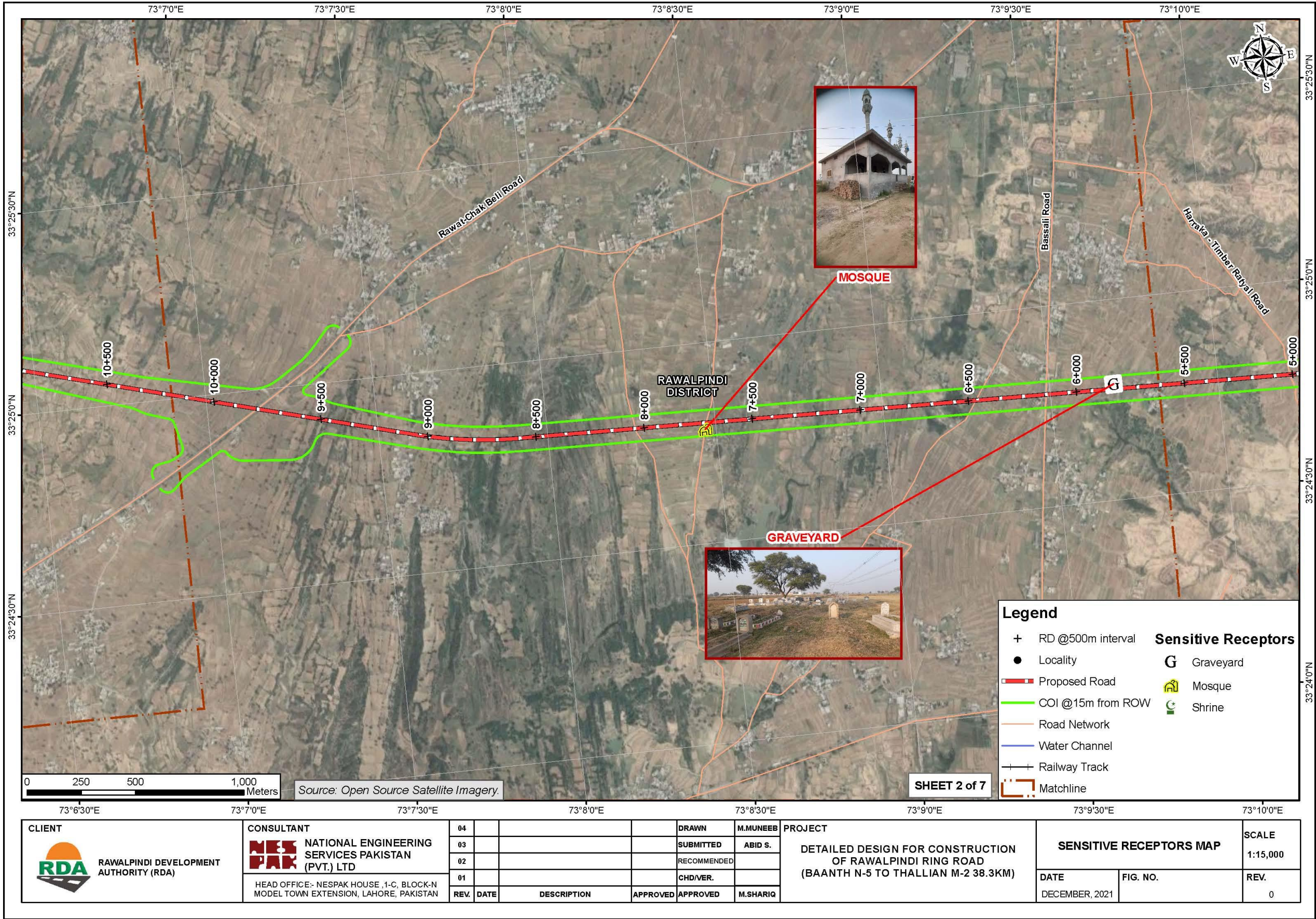


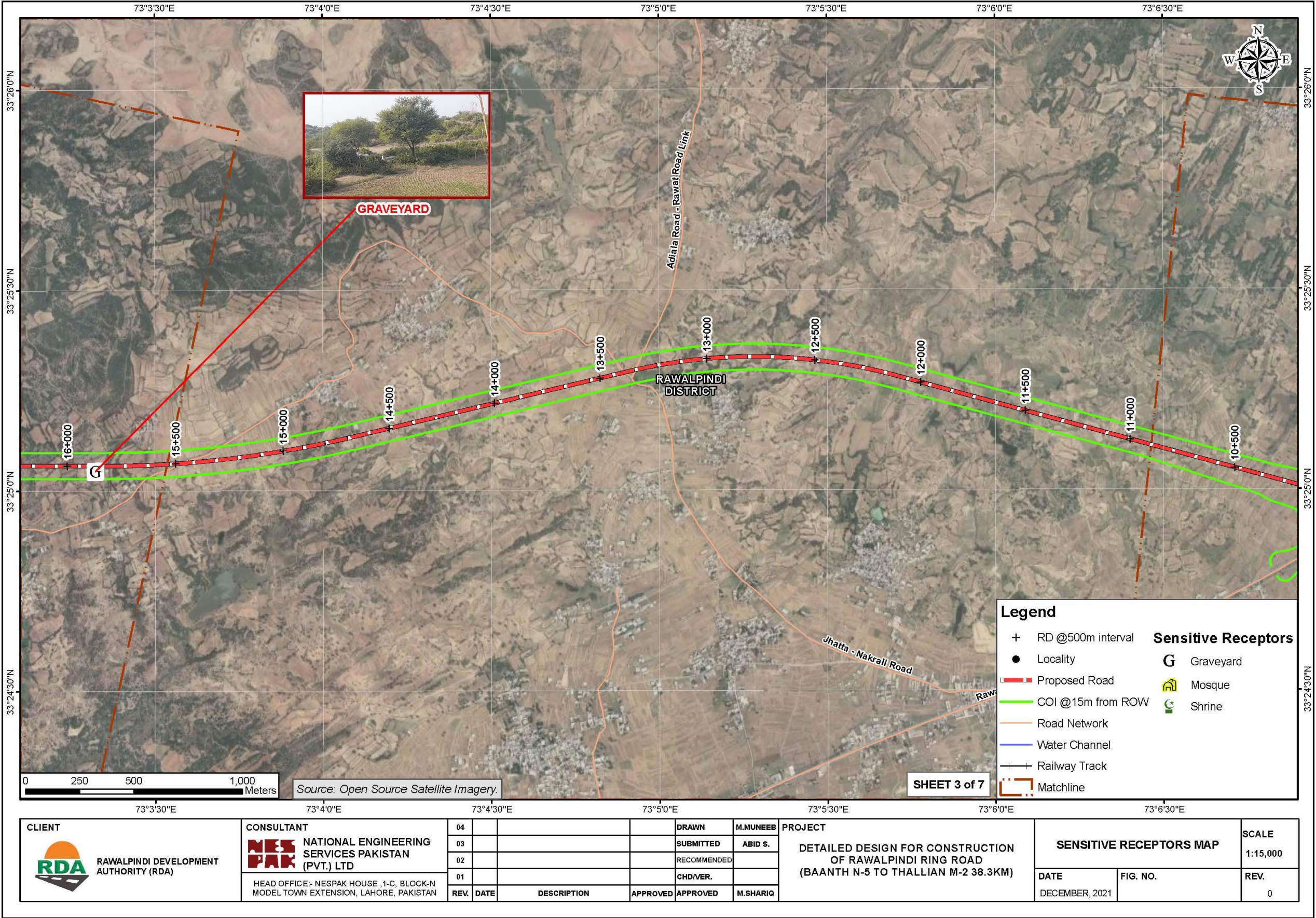


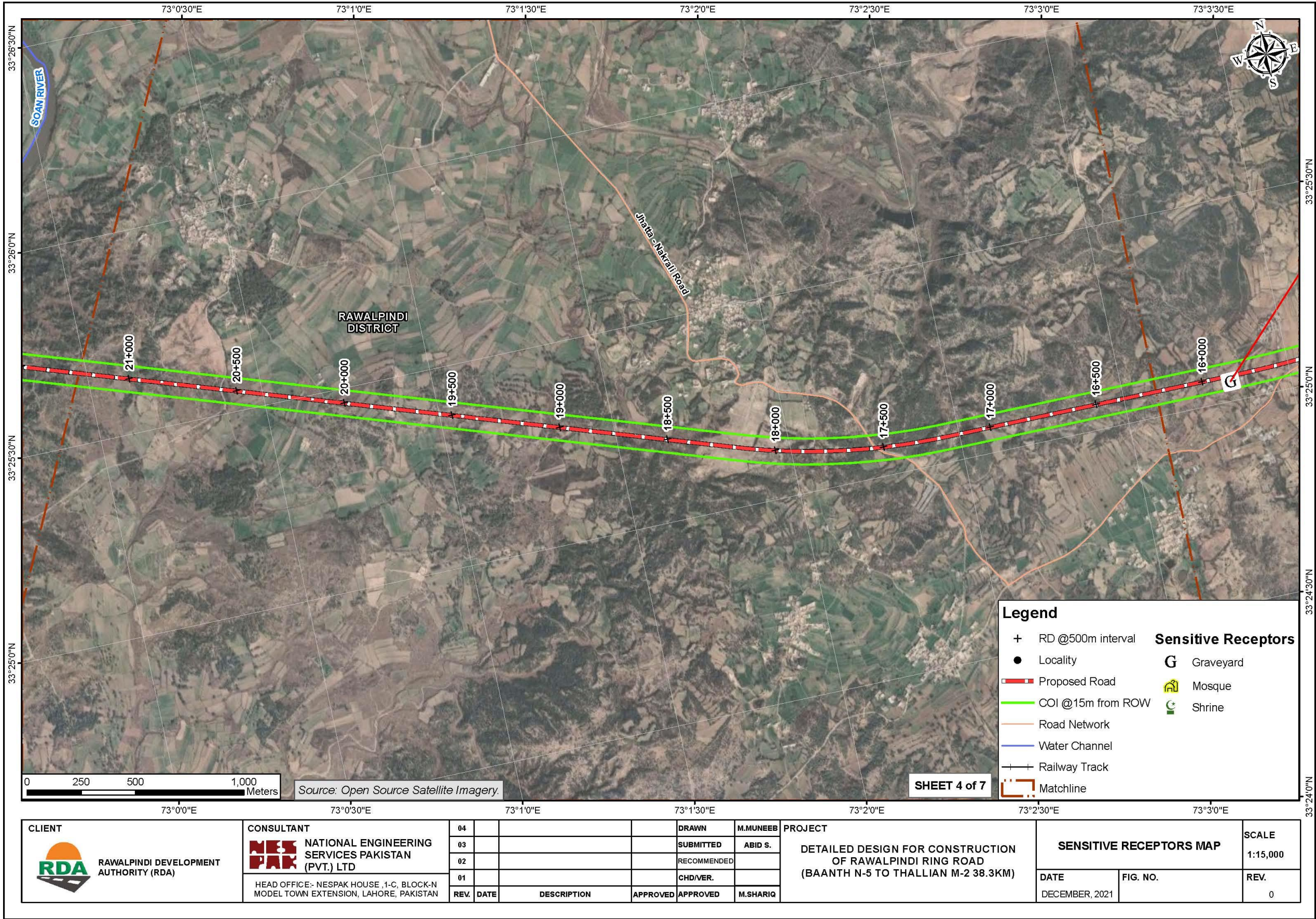


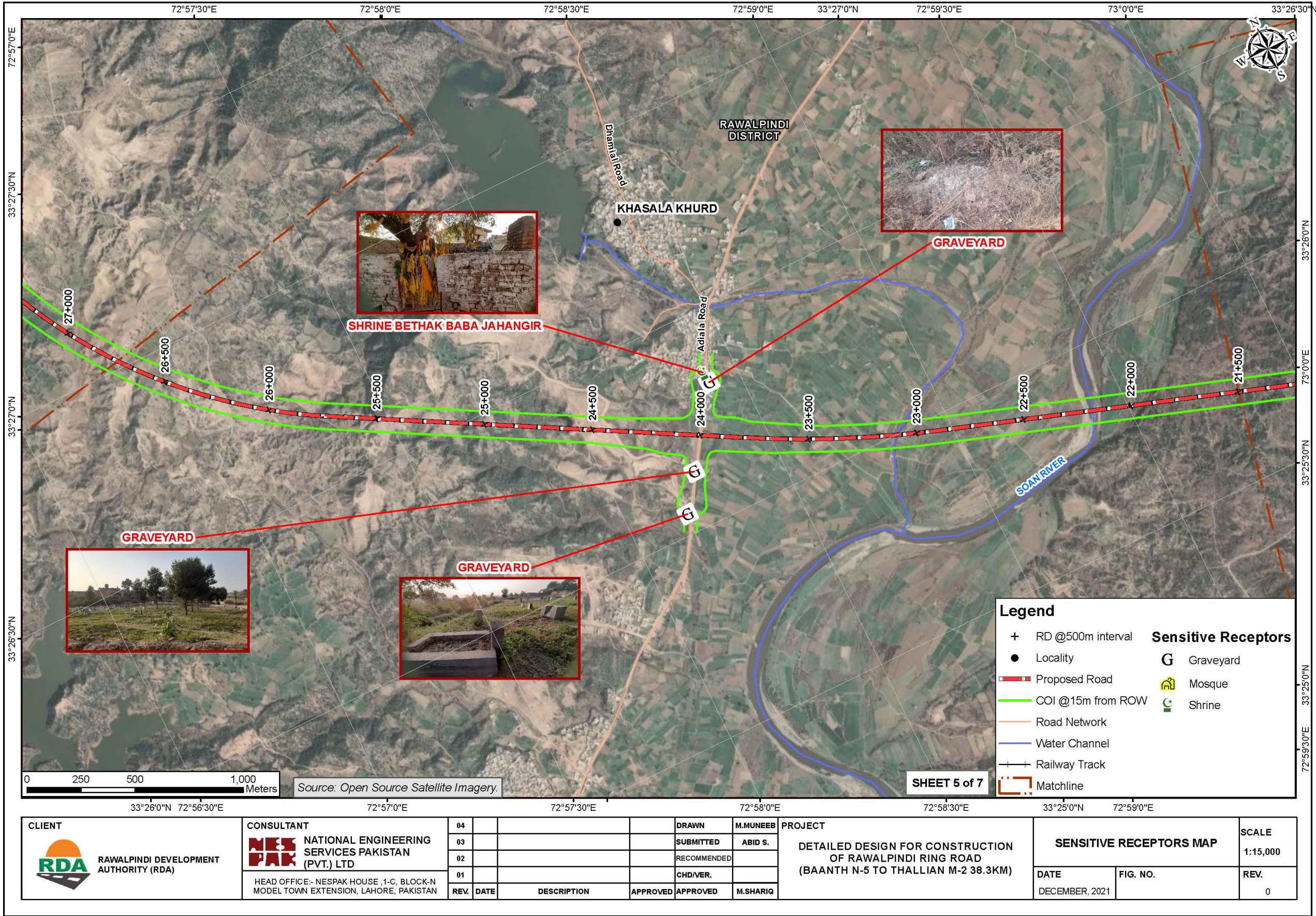
ANNEX-III: SENSITIVE RECEPTOR STRETCH WISE MAPS

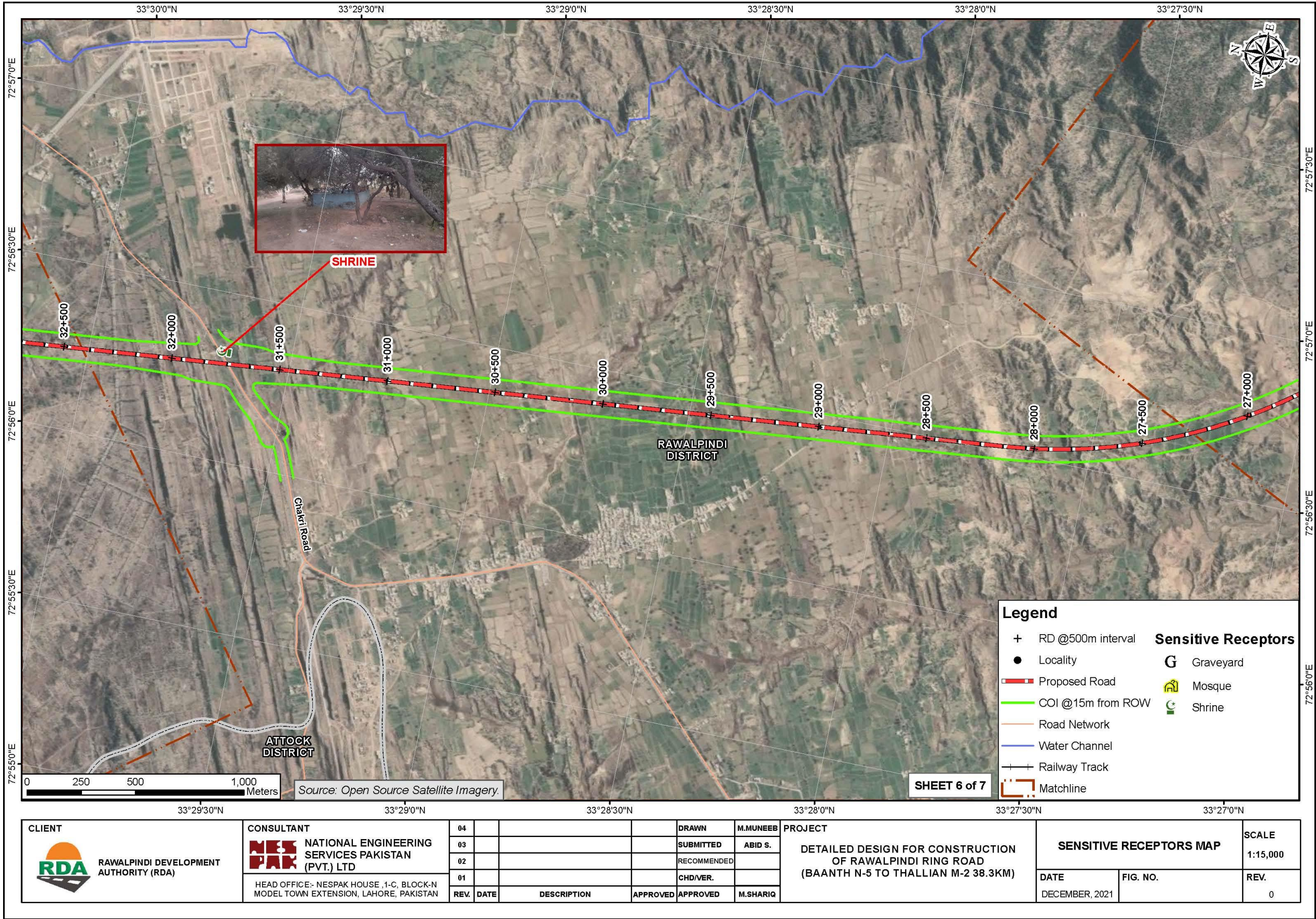


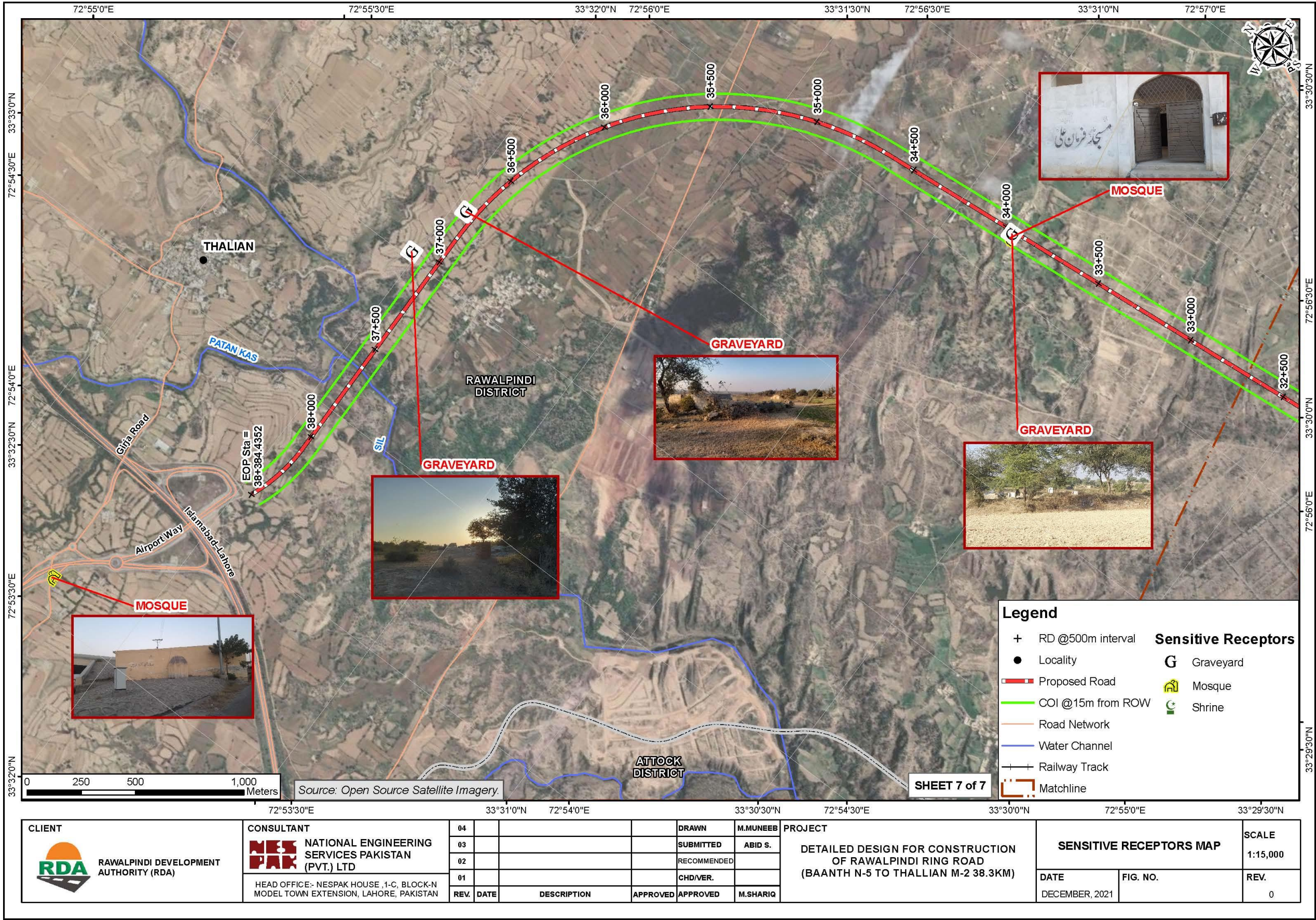












ANNEX-IV: LIST OF PARTICIPANTS OF FOCUS GROUP DISCUSSIONS

ANNEX-IV

- 4- Pressing Needs of the Local Community: Medical Facility, Educational Facility
- 5- General Remarks & Suggestion of the Participants: Market based compensation
- Avoid to disturb residential area.
- 6- General Observations: _____

Mouza - Baantr

List of Participants

[illegible]

Conducted by: _____

Mouza Bagwal Dargai



NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb (NIC)
1	مک سن د 3 کور	Retired	Saadat
2	مک 1 سم کور	Labour	باسر محمود
3	مک 2 سم کور	Labour / Agriculture	جمال الدین
4	مک 4 سم کور	Labour	عبدالحکیم
	مک 5 سم کور	-	بکر علی افسر

Conducted by:

Name: _____ Signature _____

ANNEX-IV

Mouza Harido Jaggi



NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb (NIC)
1	03000-200055 MALIK SOHAIL	Business	
2	0306-6248242 HUSSEIN AKHIL	UC Khatam Counselor	M + H
3	0332-5755203 MAHAMMAD SALIM	Education	ms.
4	0333-518882 SADIA QUTUB	Banker	
5	0313-5241812 BASHIR AHMAD	MIL	
6	0332-5490759 NASIR AWAN	Govt Servant	
7	0344-5171569 Asif Zia	u	
8	MOHAMMAD Junaid	MIL	
9	TAYAB AWAN	Agriculture	Tayab
10	umer MASOOD	Agriculture	umer
11	KHALID MAHAMMAD	Govt Servant	KHALID
12	MUSTAFA Husein	RET Army	
13	MALIK. Khalid		
14	Naeem Babin	Rtd Reinstated	

Conducted by:

Name: _____ Signature: _____

Mouza Bisallu



NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb (NIC)
	عمر منگانی	ایس ای	[Signature]
	محمد فاروق	ایس ای	Farooq -
	بابا ایوب	ایس ای	Bubair Hogni
	راشد محمد	ایس ای	Profound MANS
	راشد انجم	ایس ای	R. Khaliq
	رافع ناصر	ایس ای	Nasir Ali
	راشد قریم	ایس ای	[Signature]
	محمد فاروق	ایس ای	Farooq -
	سید ظفر	ایس ای	[Signature]

Conducted by:

Name: _____ Signature: _____

Chamber Pakistan



NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb (NIC)
	خالد محمد	زیریں	KHALID MEH
	مسک فاطمہ	"	نازک
	مسک حفصہ	"	حفصہ
	مسک محمد علی	"	محمد علی
	مسک نقیہ احمد	"	نقیہ احمد
	مسک اسرار	"	اسرار
	مسک بلال	"	بلال
	مسک عزیز الرحمن	Student	عزیز
	مسک عارفہ فرحان	"	arif saffan
	انفا / احسن	Student	احسن
	مسک وسیمہ	زیریں	وسیمہ
	عزیز علی پروین	"	عزیز
	عابد جاوید	زیریں	عابد
	حفصہ شہزادہ	زیریں	حفصہ

Conducted by:

Name:

Signature

ANNEX-IV

4- Pressing Needs of the Local Community: _____

5- General Remarks & Suggestion of the Participants: _____

6- General Observations: May Prefer old Route upto Idiala, Interchange shifted 1 km or place like Faizabad
Rate of land Market / Khasra wise, Entrance way of village.

Mouja Dhakki Kallan

List of Participants

Sr. No.	Name	Occupation	Signature/Thumb
1300-5119086	راجا احسان	زیرکار	[Signature]
	حقیق محمود احمد	زیرکار	[Signature]
	عبدالحمید راجا	زیرکار	[Signature]
	راجا شہنواز حسین	زیرکار	[Signature]
1333-5482719	راجا محمد عتیق	زیرکار	[Signature]
	راجا محمد سکین	زیرکار	[Signature]
1301-5034441	راجا عاطف	ملازم زیرکار	[Signature]
	راجا عید	زیرکار	[Signature]
	راجا عنبر	زیرکار	[Signature]
	راجا عبداللہ	زیرکار	[Signature]
	راجا فوال قرین	زیرکار	[Signature]
	راجا لقم		[Signature]
	راجا رزاق		[Signature]

Conducted by: _____

Mouza Maiba Mohva

- ## List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb
	ساجد حسین	زیرکار	ساجد حسین
	عاطف حسین	زیرکار	Adif Hussain
	نور عباس	زیرکار	DP
	محمد رمضان	زیرکار / زیرکار	M.F
	راجا مقبول	زیرکار	Samir
	محمد سعید	زیرکار	Shahid
	راجا مقبول	زیرکار	DP
	راجا محمد مقبول	زیرکار	فکر
	راجا شعیب خان	زیرکار	شعیب
	فاجی اربتر محمد ذ	زیرکار	راجا
	راجا منیر احمد	زیرکار	راجا منیر احمد
	محمد رفیع حسین	زیرکار	محمد رفیع حسین
	راجا شعیب	زیرکار	راجا شعیب
	راجا ظہیر	زیرکار	راجا ظہیر
	راجا عادل حسین	زیرکار / Cement supply	Adil
	راجا سعید	زیرکار	سعید
	فہم نواز	زیرکار	Shahid
	ساجد حسین	زیرکار	Shahid

Conducted by: _____

ANNEX-IV

- 4- Pressing Needs of the Local Community: _____
- 5- General Remarks & Suggestion of the Participants: _____
- 6- General Observations: _____

⇒ Adyala

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb
1	محمد عمار	Govt. Job.	محمد عمار
2	ناظر محمود	//	ناظر محمود
3	محمد صبا	Retired Teacher.	محمد صبا
4	محمد باج	Army Retired.	محمد باج
5	طلعت محمود	Private Job.	طلعت محمود
6	فدا حسن	Busniss	فدا حسن
7	محمد آصف	Retired WOF	محمد آصف
8	فدا حسن	Govt. Job	فدا حسن
9	محمد اسحاق	Agriculture.	محمد اسحاق
10	محمد اسحاق	Army	محمد اسحاق
11	عمر محمود	Govt. Job.	عمر محمود
12	محمد سرور	Retired.	محمد سرور
13	محمد صبا	Govt. Job.	محمد صبا
14	محمد يوسف	//	محمد يوسف
15	محمد اسحاق	//	محمد اسحاق
16	محمد صبا	Busniss	M. Ghani
17	محمد اسحاق	Retired.	محمد اسحاق
18	محمد صبا	Agri	محمد صبا

Conducted by: _____

19 محمد يوسف 2 Agri محمد يوسف

5- General Remarks & Suggestion of the Participants: _____

6- General Observations: _____

Ghareeba

List of Participants

[illegible]

Conducted by: _____

ANNEX-IV

- 4- Pressing Needs of the Local Community: _____
- 5- General Remarks & Suggestion of the Participants: _____

- 6- General Observations: _____

Pelw

List of Participants

[illegible]

Conducted by: _____

ANNEX-IV

4- Pressing Needs of the Local Community: _____

5- General Remarks & Suggestion of the Participants: _____

6- General Observations: _____

Thalian

List of Participants

[illegible]

Conducted by: _____

ANNEX-IV

4- Pressing Needs of the Local Community: _____

5- General Remarks & Suggestion of the Participants: _____

6- General Observations: _____

Risala Khurd

List of Participants

Sr. No.	Name	Occupation	Signature/ Thumb
	سید تیمور اختر	Agri	
	بلال اکبر	Gov. Job	
	محمد صادق	Agri	
	سید اویس	Agri	
	امیران بھٹو	Agri	Rizwan
	عبدالرحمن	Agri	Rehan
	عمر سجاد	Agri	
	محمد اصفیاء	Gov. Job	
	محمد ریاض	Agri	
	سید محمد	Gov. Job	
	محمد علی	Agri	
	محمد علی	Gov. Job	
	محمد علی	Agri	
	محمد علی	Agri	

Conducted by: _____

ANNEX-V: GUIDELINE FOR CONTRACTOR'S TMP

GUIDELINE TRAFFIC MANAGEMENT PLAN

1. Need for Plan

During the construction period of the project, considerable vehicular movement carrying large amounts of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

2. The Plan

The objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas and wash-out areas. It is intended to compliment and work alongside relevant EMP. The TMP will be classed as “live” and therefore be subjected to updates as required.

The Contractor, at the time of the execution of the project, will prepare a comprehensive TMP in coordination with local traffic police department, PMU RDA, emergency services and local administrative department. PMU RDA and CSC will review and approve the Contractor's TMP. The Contractor's TMP shall include following mitigation measures during its preparation:

- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project development.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to project site to minimize journey distance and limit movements to site access roads.
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site.
- Provision of bus/minibus services for personnel living in nearby settlements.
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods.
- Driver training for HGV drivers and refresher course every six months for project drivers.
- Speed restrictions for project traffic travelling through communities (to be agreed with National Highway Authority).
- Run a safety campaign to improve the people's knowledge of the traffic hazard on their roads, public information and other activities to address the issues.
- Run a pedestrian awareness programme.
- Temporary signage

The traffic management plan for the project corridor is provided below.

3. Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the tower sites would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

i. Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts

Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

ii. Site Workers Traffic

Site personnel should not be permitted to park vehicles right on the road; this will lead to disruption in material deliveries. Designated parking areas with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

iii. Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

4. Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of any access roads and construction of the detours (as applicable and practical) must be completed

prior to start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. Contractor must ensure that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to CSC, PMU-RD, emergency services and Traffic Police, and also publish weekly programme in the local newspaper.

5. Rail Road Crossings

The guidelines for highway-rail grade crossing perspectives have been extracted from Guidance on Traffic Control Devices at Highway-Rail Grade Crossings by U.S. Department of Transportation (Federal Highway Administration, 2002). These may be used by the Contractor as a guidelines during the construction phase to prepare a detailed TMP. These are elaborated hereunder:

The important elements required for “safe” passage through the crossing, which are the same elements a driver needs for crossing a highway-highway intersection are:

Advance Notice - Stopping Sight Distance

The first step pertains to “stopping” or “braking” sight distance, which is the ability to see a train and/or the traffic control device at the crossing ahead sufficiently in advance so that a driver can bring the vehicle to a safe, controlled stop at least 4.5 m (15 ft) short of the near rail, if necessary. This applies to either a passive or active controlled crossing. Stopping sight distance is measured along the roadway and is a function of the distance required for the “design” vehicle, traveling at the posted speed limit to safely stop. Insufficient stopping sight distance is often due to poor roadway geometry and/or surrounding topography.

Safe Approach Speed

The Contractor should designate a flag man to control the speed of construction and private vehicles that should control both the traffic and the speed. This flag man should ensure to maintain the safe distance for all type of traffic from the railway crossings to avoid any hazard.

Coordination with Pakistan Railways

The Proponent should obtain prior approval from Pakistan Railways to start the construction. Moreover, the Contractor and the Proponent should coordinate with Pakistan Railways to accommodate the railway traffic during the entire construction phase and if required may update the traffic management plan accordingly.

**ANNEX-VI: CONTRACTOR'S
OCCUPATIONAL HEALTH AND
SAFETY PLAN**

GUIDELINE OCCUPATIONAL HEALTH AND SAFETY PLAN

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

SCREENING AND REGULAR UNANNOUNCED CHECKING OF WORKERS

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as COVID-19, HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

MINIMIZING HAZARDS AND RISKS AT THE WORKPLACE

To ensure safety at all work sites, the following will be carried out:

- i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
- ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
- iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
- iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more

- than 6 feet high.
- v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.
 - vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;
 - vii. Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontal.
 - viii. Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.
 - ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
 - x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.
 - xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

PROVISION OF PERSONAL PROTECTIVE EQUIPMENT

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

- i. High visibility clothing for all personnel during road works must be mandatory.
- ii. Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.
- iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.
- iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
- v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
- vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.
- vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.
- viii. Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.

The specific PPE requirements for each type of work are summarized below.

Table 1: PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

PROCEDURES TO DEAL WITH EMERGENCIES SUCH AS ACCIDENTS, SUDDEN ILLNESS AND DEATH OF WORKERS

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

- i. Provision of dispensaries by the individual EPC contractor.
- ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.
- iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.
- iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

RECORD MAINTENANCE AND REMEDIAL ACTION

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend

for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

COMPENSATION FOR INJURIES AND DEATH

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws of Pakistan. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

AWARENESS PROGRAMS

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

- i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS, COVID-19), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
- ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

NOMINATION OF A HEALTH AND SAFETY FOCAL PERSON

Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

- i. Function as the focal person/representative for all health and safety matters at the workplace;
- ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;
- iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;
- iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;
- v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

SUGGESTED CONTENTS OF OCCUPATIONAL HEALTH AND SAFETY PLAN

The suggested contents of Occupational Health and Safety Plan to be developed by the Contractor(s) are described below:

- i. Purpose
- ii. Scope of Application
- iii. Complying Basis
- iv. Occupational Health and Safety Objectives
- v. Organization and Responsibility
 - Contractor's Project Manager
 - HSE Management Department of the Contractor(s)
 - Medical Treatment Room of the Contractor(s)
 - Subcontractor's Project Manager
 - Subcontractor's HSE Managers
 - Occupational Health and Safety
 - Community Health and Safety
- vi. Health Plan
 - Labour Protection
 - Sanitary Epidemic Prevention
- vii. Safety Plan
 - Summary
 - Qualification Review
 - Safety Training
 - Construction Plans and Documents
 - Control Measures
 - Monitoring Measures
 - Management of the Key Safety Accidents
- viii. Public Security Plan
- ix. Local Community Health and Safety

ANNEX-VII: QUARRY MANAGEMENT PLAN

QUARRY MANAGEMENT PLAN

The contractor is responsible for extraction of resources for the construction aggregate from quarry area is required to prepare and implement a Quarry Management Plan (QMP). The overall objective of the QMP is to manage the extraction and processing of a valuable aggregate resource while avoiding, remedying or mitigating adverse effects on the environment and enhancing environmental performance wherever practicable.

The activities conducted in quarry areas are carried out under license or a mining lease under the Punjab Mining Concession, Rule 2002. The lease is issued based on open bidding. The lease is granted for a period not exceeding five years. The leased area may be re-auctioned within three months before its expiry but if the auction or the grant of lease is delayed due to the certain reason, the licensing authority may extend the period of previous lease upto the date of next grant.

The Licensing Authority of the Mines and Minerals Development Department Punjab shall inspect the lessee during the operation. If on inspection or otherwise, the licensing authority is of the opinion that lessee is working in a manner contrary to the conservation of mineral property or safety of workers and other people, the licensing Authority require the lessee, in writing, to remove the defects or amend the method of mining within the period, not exceeding two months, as is determined by the Licensing Authority. If the lessee fails to comply with the instruction within the specified period, the licensing authority shall have the power to stop the work of extraction of mineral in whole or in any part of the area demised under lease till such time that the defects are removed to the satisfaction of the Licensing Authority and if the defects are not removed or the method of mining are not amended to the satisfaction of the licensing authority within two months from the date of stoppage of work the lease shall be cancelled and bid money already paid shall be forfeited. Inspectorate of mines will ensure the safe mining practices, authorized mining and worker health and safety. Punjab Environmental Protection Agency (PEPA) also plays vital role in environmental monitoring of the criteria pollutant at the Quarry area.

1. Key Quarry Activities

The Key activities identified in extraction of material from quarry are discussed as under:

i. Pre Operation

Pre Operation includes Land clearing and Overburden stripping

ii. Quarry Operation

Quarry Operation includes:

- Excavation of rock
- Loading and transportation of rock
- Crushing and stockpiling
- Asphalt manufacturing
- Water supply
- Transportation to the construction site.

iii. Rehabilitation

- Reclamation activities are conducted after the completion of quarrying activities to restore or rehabilitate the site.

2. Environmental Considerations

Quarrying has the potential to have a range of adverse environmental effects. This QMP identifies these effects and suggests measures to mitigate or minimize these impacts.

i. Vegetation Removal

During land clearance and vegetation removal the following shall be considered:

- Minimize the amount of vegetation removal; and
- Allow timber and other useful resources to go to the local communities.

ii. Overburden Clearance

During overburden clearance the following shall be considered:

- No direct discharge of sediment laden water without treatment.
- Earthworks and land clearance should be minimized and phased.
- Provide treatment to achieve a reduction in suspended solids prior to discharge to a natural water course.
- Any discharges to rivers should occur during high flow to dilute the unavoidable discharges;
- Stockpiling should be at least 10m from a water course;
- Waste rock or overburden should be placed in properly designed dumpsites, which are located and shaped to blend in with the surrounding landscape;
- Compaction and re-vegetation of exposed areas as soon as practicable;
- Earthwork control measures should be inspected and maintained in efficient operating condition;
- Existing drainage channels should be kept free of overburden.
- Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil.

iii. Noise

To keep noise generated due to the different activities to an acceptable level, the following measures shall be adopted:

- Managing the time and location of particularly noisy operations around the site to ensure minimum disturbance to the localities;
- The majority of fixed processing plant, excluding conveyors will be housed within structures that reduce the noise level at the boundary of the quarry;
- Machinery shall be regularly maintained to ensure that noise produced from machinery is kept minimal; and
- Monitoring of noise levels shall be done.

iv. Excavation and Blasting

To keep vibration and air overpressure due to excavation and blasting to an acceptable level, the following practices shall be adopted:

- Removing rock, where practicable, with an excavator by free digging or ripping instead of blasting.
- A comprehensive blasting management plan shall be prepared and implemented addressing the following concerns:
 - i. Control of blasting area
 - ii. Time schedule
 - iii. Training of personnel
 - iv. Announcement/ Communication
 - v. Traffic management
 - vi. Hazardous material handling and storage
 - vii. Waste disposal
 - viii. Post blast re entry
 - ix. Health and safety of worker

v. Traffic

To avoid, remedy or mitigate the adverse effects associated with quarry traffic following measures shall be adopted:

- All the vehicles used shall be regularly maintained and checked to ensure that appropriate noise suppression devices are installed and being operated effectively.
- All trucks leaving the quarry shall be checked for overloading to avoid risk of quarry products being spilled on public roads.
- Loader drivers shall be appropriately trained to help ensure that container/trucks are loaded securely.
- A wheel wash shall be used to spray truck wheels as they leave the quarry site. This will help reduce the risk of dust being carried onto public roads by trucks.
- To ensure the safety and convenience of local traffic, a Traffic Control Plan is required to be communicated that ensures minimized traffic stoppage times.

iv. Dust (Air quality)

Dust emissions have the greatest potential for off-site effects. However, provided the operation site is well controlled and the activities well managed, dust emissions can be reduced by adopting the following measures:

- Locating the fixed processing plant away from quarry boundaries;
- The fixed processing plant is covered in areas where dust generation could become a nuisance;
- Potential dust generating conveyors are covered where practicable to contain dust;
- Water sprays to suppress dust emissions wherever practicable;
- Blasting will be restricted if windy conditions are likely to carry visible dust emissions beyond the quarry boundary where they could create a nuisance;
- Minimizing dust emissions from blasting by sequential firing and using minimum force;
- Re-vegetating areas that will not be further disturbed as soon as possible;
- Proper maintenance and tuning of the vehicles and equipment also shall also be considered in avoiding any off-site effects; and

- Good blasting practice, including using waterproof explosives in areas where groundwater levels are high, to avoid the degradation of the explosive, will minimize incomplete combustion and any associated NOx emissions.

vi. Altering Water Flow

Quarries and pits can affect ground-water and surface-water systems by lowering of local ground-water and surface-water levels from mining operations and mine dewatering, changes in turbidity levels in ground water due to blasting and quarry operations, interruption of ground-water conduit flow paths by rock removal and temperature change (thermal impacts) in springs and surface-water streams. To avoid reduced water flow from springs to water ways and irrigation/drinking water schemes, changes in water flow direction and increased storm water runoff, following mitigation measures shall be adopted:

- Create temporary ponds to treat sediment and reduce runoff speed of surface water flow especially during high rainfall.
- Create a channel from the settling ponds to the nearest river.
- Create a special water channel for citizens to source clean water from springs.
- Divert groundwater and surface water around the quarry area.

vii. Landscape

Following shall be considered in order to minimize impacts to the landscape;

- Vegetation and landscape plan for the site shall be devised and followed by the contractor that gives a comprehensive description of all measures that will be taken on site to protect the landscape and visual characteristics of the site;
- Provide earth mounding and vegetation screening to mitigate visual effects of quarry operations and on-site truck routes where practical.

viii. Hazardous Substances

To deal with issues relating to the release of hazardous substances from storage facilities or during their use, transport or disposal within the quarry site, the following shall be considered:

- Ensure that only the imminent operational requirements are stored on the site.
- Explosives and detonators shall not be stored for long time on site.
- Fuel, lubricant and waste oil storage, dispensing and operating facilities are designed and operated in such a way that contamination of soil and water is avoided as far as practicable.
- Rain runoff carrying fuel, lubricant and waste oil shall be directed to an oil separator before entering the storm water drainage system. Oil separators are cleaned out on a regular basis.
- All transport, storage and operating conditions meet the requirements of Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017) relevant sections of Handling of Hazardous Substances.

ix. Rehabilitation of the site

Restoration of the former quarry areas may be done using the overburden and fertilizers to restore soil stability and soil fertility.

- Remove all stockpiles.
- The use of imported fill shall be minimized.

- Plant local plant species and productive vegetation as part of the restoration plan.
- Stabilize all slopes and unstable areas.

x. Worker Health and Safety

To ensure worker health and safety the following shall be adopted on or near the project site:

- Restrict the access to the quarry areas for unconcerned persons;
- All personnel shall be provided (and wear) Personal Protective Equipment (PPE), such as safety helmets, safety shoes, vests, dust masks, goggles, and a high visibility vest;
- Providing radio communications equipment to facilitate coordination in the field;
- Conducting periodic monitoring of heavy vehicles and equipment for safety risks;
- Limiting the hours of operation of heavy vehicles and equipment, to minimize risks relating to staff fatigue;
- Conduct inspections of the access point to the location of transport because of the steepness of the route;
- In case of accidents or emergencies, basic medical facility shall be provided;
- The team shall be able to handle emergency situations and the possible emergency services shall be notified in advance; and
- No damage occurs to people, property, livestock or power lines.

xi. General Prohibitions

The following General prohibitions shall be adopted in and around the quarry area:

- Cutting of trees for any reason outside the quarry;
- Hunting, fishing, wildlife capture and poaching, or plant collection;
- Buying of wild animals or their meat for food or any other purposes;
- Disturbance to anything with architectural or historical value;
- Use of firearms (except authorized security guards);
- Washing car or machinery in streams or creeks;
- Doing maintenance (change of oils and filters) of equipment outside authorized areas;
- Littering of the site and disposing trash in unauthorized places;
- Workers driving motorbikes without wearing helmets;
- Control construction plants or vehicles by unauthorized person;
- Driving at speeds exceeding limits;
- Having caged wild animals (especially birds) in camps;
- Working without safety equipment (including gloves, boots and masks);
- Creating nuisances and disturbances in or near communities;
- Disrespecting local customs and traditions;
- The use of welding equipment, oxy-acetylene torches and other bare flames where fires constitute a hazard;
- Indiscriminate disposal of rubbish or construction wastes or rubble;
- Spillage of potential pollutants, such as petroleum products;
- The storage and use of explosives;
- Collection of firewood; and
- Burning of wastes and/or cleared vegetation.

ANNEX-VIII: SANITATION PLAN

SANITATION PLAN

1. Introduction

This plan outlines the measures that can improve conditions of sanitation at construction sites during construction and operation phase.

2. Purpose of The Plan

The plan intends to ensure sanitation including the control of water supplies, excrete and wastewater disposal, refuse disposal, vectors of diseases, housing conditions, food supplies and handling, atmospheric conditions, and the safety of the working environment.

3. Management of Sanitation During Construction Phase

i) Responsibility

The Health and Safety Inspector designated by construction contractor shall also inspect sanitation conditions and ensure safe working environment for workers.

ii) Location of Camp Sites

The construction camps shall be located at least 300-500 meter (subject to availability) away from residential community. The accommodation and ancillary facilities for labor shall be constructed and maintained to standards and scales approved by the Resident Engineer.

The camps must be located such that the drainage from and through the camps shall not endanger any domestic or public water supply.

All sites must be managed to avoid ditches and depressions to minimize nuisance due to stagnant water.

iii) Water Supply

An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes.

Potable water supply systems for labor camps occupants shall meet the drinking water quality standards of PEQS, 2016. In addition, the design of water system facilities shall be based on the suppliers Engineer's estimates of water demands. The drinking water must be monitored regularly for drinking water quality parameters.

At all construction camps and other workplaces, good and sufficient water supply shall be provided and maintained to eliminate chances of waterborne diseases to ensure the health and hygiene of the workers.

iv) Toilet Facilities and Hygiene

According to health and safety guidelines OR-OSHA number of toilets required at construction site is as one toilet for 20 workers.

Within the premises of every workplace, toilets and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards prevailing in the province and country.

Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located, so as to be accessible.

A toilet room must be located within 200 feet of the camp. No toilet may be closer than 100 feet to kitchen and sleeping area.

These toilets must be distinctly marked by signs printed in native language of the persons occupying the camp, or marked with easily understood pictures or symbols.

Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit.

Proper facility for hand washing and other cleaning activities to be provided as follows:

- Provide individual hand towels from a sanitary dispenser and receptacles for disposing of waste towels;
- Providing hand soap and industrial hand cleaner for removing paints and other contaminants;
- Prohibited use of gasoline or solvent for hand washing; and
- Keep the floor of facilities dry to prevent spills and falls.

v) Waste Disposal

The sewage system for the camp must be designed, built and operated in compliance with the relevant legislation so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place.

Garbage bins must be provided in the camps and regularly emptied and the garbage disposed of in a hygienic manner.

Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta should be done in the already existing sewerage system in the area.

On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.

vi) Maintenance of Sanitary Facility

Proper maintenance of toilets and other sanitary facilities should assure by health and safety inspector. Toilets and other sanitary facilities shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year.

All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition, and be protected from rubbish accumulation.

All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp.

4. Management of Sanitation During Operational Phase:

A proper sanitation plan is to be adopted for maintaining the hygienic conditions during the operational phase of the project. These includes

- Site Clearance;
- Sewage and Storm Water Drainage Clearing, and
- Solid Waste Management.

i) Site Clearance

The construction contractor shall assure the clearance of construction machinery, vehicle and other equipment used during the construction period after the completion of the project.

ii) Storm Water and Sewage Clearance

One of the main issue that may arise during construction and operational phase is the clogging of drainage and sewer pipelines as a result of construction material, oil spillage from vehicles, and throwing of solid waste by the road users due to lack of bins into the nearby drainage and sewer pipes, as the blockage of these drainage pipes will cause over flow of water on road, which will have negative impacts on the road in form of deterioration of road surface as well as a source of water borne diseases in the area.

Responsible Authorities

In case of storm water drains and sewer pipes clogging, the concerned department PMU-RDA is responsible for un-clogging of these sewer and drainage pipelines.

iii) Solid Waste Management

Municipal solid waste produced as a result of commercial activities, by road users and from nearby residential community should be collected and managed properly by the concerned department. Waste bins should be placed along the roads, regular cleaning of the road should

be carried out using mechanical sweepers twice a day and at least one sweeper should be deputed for the whole stretch of project site to assure regular cleaning.

iv) Awareness and Training

A training and awareness sessions shall be conducted for workers before commencement of the project. The implementation of sanitation plan would be more effective if the importance of hygiene; sanitation and safety are known to the workers.

ANNEX-IX CHANCE FIND PROCEDURE

CHANCE FIND PROCEDURES

Project may involve deep excavation. Therefore, the possibility of chance find is not ignorable. In case of any chance find, the contractor will immediately report through Supervision Consultant to Director Archaeology & Museum, Government of Punjab to take further suitable action to preserve those antique or sensitive remains. Representative of the DG will visit the site and observed the significance of the antique, artifact and cultural (religious) properties and significance of the project. The report will be prepared by representative and will be given to the DG. The documentation will be completed and if required suitable action will be taken to preserve those antiques and sensitive remains.

In case any artifact, antiques and sensitive remains are discovered, chance find procedures should be adopted by contractor workers as follows:

- Stop the construction activities in the areas of chance find;
- Delineate the discovered site or area;
- Consult with the local community and provincial Archeological Department
- The suggestion of the local communities and the concerned authorities will be suitably incorporated during taking the preventive measures to conserve the antique, artifact and cultural (religious) properties;
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remain, a night guard shall be arranged until the responsible local authorities take over; and
- After stopping work, the contractor must immediately report the discovery to the Supervision Engineer.

The contact Address of Directorate General of Antiquities, Government of Punjab, is given below:

Director General
Archeology Department
1st Floor Auqaf Department,
Shahrah-e-Quaid-e- Azam, Lahore
Tel: 042-99231526 and 99231527

ANNEX-X EMERGENCY RESPONSE PLAN

GUIDELINE EMERGENCY PREPAREDNESS AND RESPONSE PLAN

PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the project. The aim of the Emergency Response Procedure is to:

- i. Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.
- ii. Ensure all personnel are aware of the importance of this procedure to protection of life and property.

EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

- i. Construction Accident
- ii. Road & Traffic Accident
- iii. Hazardous material spills
- iv. Structure collapse or failure
- v. Trauma or serious illness
- vi. Sabotage
- vii. Fire
- viii. Environmental Pollution
- ix. Loss of person
- x. Community Accident

RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table 1** below.

Table 1: Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	▪ Overall control of personnel and resources. ▪ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ▪ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	▪ Overall responsibility for activating emergency plan and for terminating emergency actions. ▪ Be alternative of emergency response chairpersons. ▪ Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth.

Action Group	Responsibility
	- Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. - Notify outside authorities if assistance is required. - Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. - Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. - Establish and appoint all emergency organization structure and team. - Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. - Ensure resources available to purchase needed emergency response equipment and supplies. - Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. - Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. - The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	- Ensure that the exit route is regularly tested and maintained in good working order. - Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. - Assist with strong/activation of services during an emergency. - Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
Rescue & Medical Team	- Protect the injured from further danger and weather. - Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. - Remain familiar with the rescue activities and rescue apparatus. - Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	- Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. - Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	- Call up of personnel into the safe location for protective life and property. - Take immediate and appropriate action while Emergency Response Team is being mobilized. - Keep in touch with the Emergency Commander - Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. - Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response

Action Group	Responsibility
	Team. ▪ Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure 1: Emergency Procedures for Fire

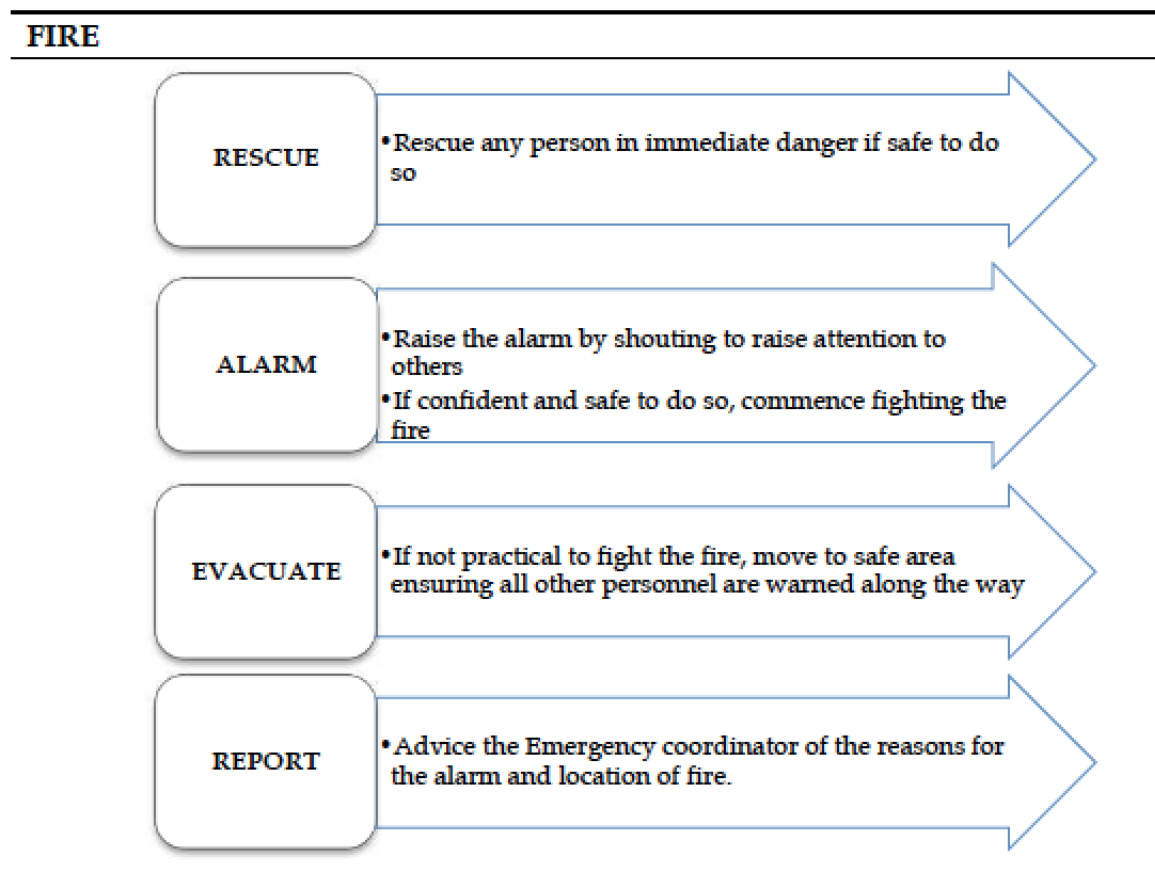


Figure 2: Emergency Procedures for Serious Accident

ACCIDENT

In the event of injuries of persons, the first person on the scene should take the following action:

If a hazard exists consider your own safety then if possible remove the hazard or the injured person.

Assess the patient by checking for Airway, Breathing, Pulse and obvious

Report directly to First Aid or Security Centers, when raising the alarm you must clearly give the following information;

- Your name and the detail of accident
- The location of the injured person(s)
- The number of persons injured
- The extent of the injuries, if known
- What known hazards are in the area

Make the injured person as comfortable as possible

Treat the obvious injuries

Reassure the injured person

COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoided politely, at all costs, with the terse comment that "the matter is under investigation and relevant information when available will be provided by our Head Office" Do not ever give your opinion or story.

FIRST AID PERSONS

Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,

- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

GENERAL ADMINISTRATION TEAM

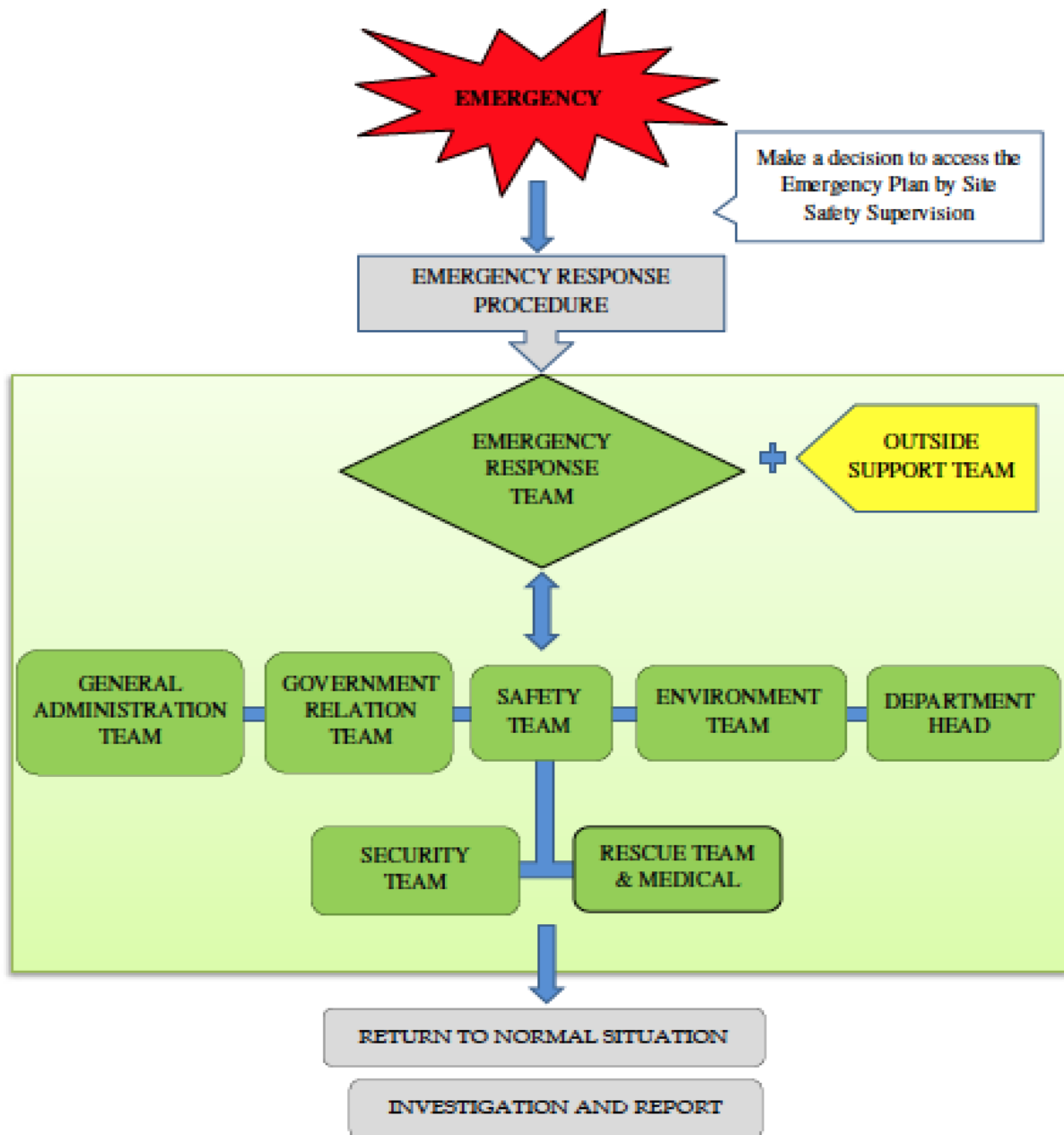
Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

SECURITY TEAM

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

EMERGENCY COORDINATOR

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/ Contractor to be determined.

INCIDENT AND ACCIDENT REPORT

Section A: Identification Data										
Report No:	Date of Reported:				Reporter:		Sign:			
Job Title:					Company Name:					
Section B: Violence Rate										
Accident Violence: ☐ 01-Death ☐ 02-Serious Injury ☐ 03-Lost Time Injury ☐ 04-First Aid ☐ 05- Not Injury ☐ 06-Near Miss Property Damage Cost: ☐ 1-2,000 USD ☐ 2,001-10,000 USD ☐ 10,001-50,000 ☐ > 50,001										
Section C: Environmental Impact										
Affected area		☐ Construction area		☐ Public area						
Receptor		☐ None		☐ Workers		☐ Community				
Type of pollution		☐ Physical		☐ Chemical		☐ Biological				
Toxicity		☐ Non-toxic		☐ Low - toxic		☐ High - toxic				
Return to Normal		☐ 1 day		☐ 1 day to 1 week		☐ ≥ 1 week				
Cumulative impact		☐ Non-cumulative		☐ Cumulative						
Section D: Injured/Illness Employee										
1.Name:		Sex:	Date of Birth:			Age:	Regular Job Title:		Experience:	
		☐ Male ☐ Female	Month	Day	Year				In this job title Years Weeks	In this Project Years Weeks
Site:		Company:		Reference:			Phone No:		Social Security Number	
Part of Body Injured or Affected:			Nature of Injury or Illness:							
☐ Head ☐ Hands ☐ Face ☐ Nose			☐ Laceration ☐ Amputation ☐ Puncture ☐ Fracture							
☐ Eyes ☐ Legs ☐ Teeth ☐ Neck			☐ Strain & Sprain ☐ Burns ☐ Contusion ☐ Dry Heat Friction							
☐ Trunk ☐ Toes ☐ Elbow ☐ Shoulder			☐ Hernia ☐ Foreign Body ☐ Chemical ☐ Contamination							
☐ Back ☐ Ankle ☐ Wrist ☐ Foot			☐ Skin (Occupational) ☐ Rash ☐ Irritation							
☐ Arms ☐ Thumb ☐ Fingers ☐ Internal										
Remark:			Remark:							
2.Name:		Sex:	Date of Birth:			Age:	Regular Job Title:		Experience:	
		☐ Male ☐ Female	Month	Day	Year				In this job title Years Weeks	In this Project Years Weeks
Site:		Company:		Reference:			Phone No:		Social Security Number	
Part of Body Injured or Affected:			Nature of Injury or Illness:							
☐ Head ☐ Hands ☐ Face ☐ Nose			☐ Laceration ☐ Amputation ☐ Puncture ☐ Fracture							
☐ Eyes ☐ Legs ☐ Teeth ☐ Neck			☐ Strain & Sprain ☐ Burns ☐ Contusion ☐ Dry Heat Friction							
☐ Trunk ☐ Toes ☐ Elbow ☐ Shoulder			☐ Hernia ☐ Foreign Body ☐ Contamination ☐ Chemical							
☐ Back ☐ Ankle ☐ Wrist ☐ Foot			☐ Skin (Occupational) ☐ Rash ☐ Irritation							
☐ Arms ☐ Thumb ☐ Fingers ☐ Internal										
Remark:			Remark:							
Section E: Accidents/Incident Details										
Date Accident/Incident Occurred:			Time Accident/Incident Occurred:				Exact Location of the Accident / Incident:			

Details of the actual Job Being done at the time:		
Details of Accident / Incident / What actually happened?		
Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)		
UNSAFE CONDITIONS 1 ☐ Inadequately Guarded 2 ☐ Unguarded 3 ☐ Defective Tools, Equipment, or Substance 4 ☐ Unsafe Design or Construction 5 ☐ Hazardous Arrangement 6 ☐ Unsafe Illumination 7 ☐ Unsafe Ventilation 8 ☐ Unsafe Clothing 9 ☐ Insufficient Instruction 10 ☐ Lack of system of work Why was the unsafe act committed? _____	UNSAFE ACTS 1 ☐ Operating Without Authority / Training 2 ☐ Operating at Unsafe Speed 3 ☐ Marking SHE Device Inoperative 4 ☐ Using Unsafe Equipment or Equipment Unsafely 5 ☐ Unsafe Loading, Placing, Mixing 6 ☐ Taking Unsafe Position 7 ☐ Working on Moving or Dangerous Equipment 8 ☐ Distraction, Teasing, Horse Play 9 ☐ Failure to use Personal Protective Devices 10 ☐ Lack of effective instruction or supervision Why did the unsafe condition exist? _____	
Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)		
UNSAFE ACT ☐ Stop the Behaviour ☐ Study the job ☐ Instruct (tell-show-try-check) ☐ Follow Up ☐ Enforce	UNSAFE CONDITION ☐ Remove ☐ Guard ☐ Warn ☐ Supervisory Training	If Supervisor can't handle, then recommend to ☐ Site Engineer, or ☐ Site Manager, or ☐ Project Manager, or ☐ Safety Committee
Detail below any immediate remedial actions that have been taken:		
Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence:	Responsible	Completion Date

Section H: Witness Statement			
Witness Name		Interviewer Name	
Section I: Reviewed & Recommend by Recommendation:			
Reviewed By:	Position:	Signature:	Date:
Remarks : If Accident or Incident happened with lost time injury and affected to the publicity must further report to Safety Department; : First Aid Cases will not applicable to this form; : The accident report shall submit to Safety Department within 3 days : Attached the photograph or sketch the location of accident / incident;			

SUGGESTED CONTENTS OF EPRP

The Contractor should prepare the EPRP based on the guidelines provided in the above sections. The suggested structure of the EPRP is listed below:

1. Purpose
2. Applicable Scope
3. Preparation Basis
4. Emergency Response System
 - 4.1 Generals
 - 4.2 Emergency Response System
 - 4.3 Responsibilities
5. Major Safety Risks
6. Precautionary Measures
 - 6.1 Training and Exercise
 - 6.2 Hazard Source Monitor
 - 6.3 Alert Action
 - 6.4 Management Measures
7. Control Measures
 - 7.1 Response
 - 7.2 Response Procedures
 - 7.3 Emergency Response
 - 7.4 Emergency Completion and Restoration
- 8 Emergency Response Report and Settlement
- 9 Supporting Measures

ANNEX-X

- 9.1 Communication
- 9.2 Emergency Team
- 9.3 Funding for Emergency
- 9.4 Provisions and Resources
- 10. Records

ANNEX-XI: GUIDELINES TO COMBAT WITH COVID-19

PRECAUTIONARY ACTION AGAINST THE POTENTIAL RISK OF NOVEL CORONAVIRUS

INTRODUCTION

On February 11, 2020 the World Health Organization announced an official name for the disease that is causing the 2019 novel coronavirus outbreak, first identified in Wuhan China. The new name of this is coronavirus disease 2019, abbreviated as COVID-19. In COVID-19, 'CO' stands for 'corona,' 'VI' for 'virus,' and 'D' for disease. Formerly, this disease was referred to as "2019 novel coronavirus" or "2019-nCoV".

Coronaviruses are a large family of viruses. Some cause illness in people, and others, such as canine and feline coronaviruses, only infect animals. Rarely, animal coronaviruses that infect animals have emerged to infect people and can spread between people. This is suspected to have occurred for the virus that causes Coronavirus Disease 2019 (COVID-19). Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) are two other examples of coronaviruses that originated from animals and then spread to people.

The risk of exposure to COVID-19 is no different for employees of Employer, Engineer, Contractor, and suppliers than for the general population. Contractor, therefore, must consider the physical well-being and safety of all the persons entitled to be on the Site and follow reasonable guidelines and recommendations of Government authorities and healthcare professionals. As experience has shown in other countries, confirmed cases of COVID-19 expand exponentially if health and safety controls are left unheeded.

Contractor should enforce all health and safety procedures at Site including sanitary protocols, proper hygiene, social distancing, use of personal protective equipment (PPE), toolbox talks on special COVID-19 requirements, and prompt reporting of health issues related to COVID-19. Contractors must put safeguards in place to keep workers exposed to COVID-19 away from Site for at least 14 days after the last potential exposure.

WHO declared the COVID-19 as a Public Health Emergency of International Concern (PHEIC) in January 2020 and afterwards announced the COVID-19 outbreak as pandemic on 11th March 2020 due to the widespread of the disease in 114 countries at that time. WHO Director General urged the countries to take action now to stop the disease.

The rapid spread of COVID-19 hits all the provinces of Pakistan Sindh, Balochistan, Punjab & Khyber Pakhtunkhwa including the Gilgit Baltistan and Azad Jammu & Kashmir. The prevailing virus creates the menacing and distressing situation when it arrived around the closed proximities of the Project Area.

Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at <https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf>. The Government of Pakistan has launched the real-time data portal for COVID-19 <http://covid.gov.pk/>. These measures are mostly relating to the containment and awareness and capacity building.

Besides this COVID-19 daily situation report is also available at <https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf>.

All the stakeholders are on board to jointly prevent/ limit/ control the spread of COVID-19. All of the staff is required to take precautionary measures as well as maintain social distances. The use of thermal guns for checking every single person body temperature, placement of relevant flyers and disinfection spray inside of all the containers are few of the measures to combat COVID-19.

OBJECTIVE

Following are the objectives of this report to jointly prevent / limit/ control the spread of COVID-19 at Site that can hamper the progress of proposed Project:

- i. To enhance understanding of the evolving COVID-19;
- ii. To share knowledge on COVID-19 and preparedness measures being implemented at Site;
- iii. To generate recommendations for adjusting COVID-19 containment and response measures; and
- iv. Outline the measures taken at Site. The advised measures will help all the stakeholders to plan their work continuity in response to the COVID-19.

Due to the evolving situation of the COVID-19, this document should be read in conjunction with the latest relevant advisories issued by WHO (especially "[Getting your workplace ready for COVID-19, 3 March 2020](#)") and Government of Pakistan.

WHAT IS CORONA VIRUS (COVID-19)

The COVID-19 belongs to a family of viruses known as the Coronaviruses, which can cause illnesses ranging from the common cold to more severe diseases, such as the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS)¹⁰.

SYMPTOMS

The symptoms of the COVID-19 are similar to that of regular pneumonia. Typical symptoms include;

- Fever;
- Cough;
- Difficulty in breathing;
- Pneumonia;
- Runny nose;
- Sore throat; and
- Feeling of being unwell.

¹⁰ Source: World Health Organization

MODE OF SPREAD

Infected person – person transmission; Infected people can spread COVID-19 through their respiratory secretions via droplets produced when an infected person coughs or sneezes, similar to how influenza and other respiratory pathogens spread. The spread from person-to-person is most likely among close contacts (about 6 feet);

- Infected animals' dead or Alive;
- Air by coughing and sneezing;
- Close personal contact, such as touching or shaking hands;
- Touching an object or surface with a virus on it; and
- Touching your mouth nose or eyes before washing your hands.

GENERAL STANDARDIZED PRECAUTIONARY MEASURES

Following measures/recommendations are suggested as a general guidance to be followed for the protection of potential impacts of COVID-19:

Since, there is no vaccine available to protect against human Coronavirus infections. Therefore, transmission can be prevented through following measures:

- Cover your mouth while cough or sneeze;
- Avoid close contact with people who are sick;
- Avoid the use of hard soap;
- Wash your hands often with liquid soap and water for at least 20 seconds;
- All the employees should ensure sanitization of hands at appropriate time;
- Avoid touching your eyes, nose, and mouth with unwashed hands;
- If you are concerned about your symptoms you should see your health care provider at site or in office;
- Use of Personal Protective Equipment (PPE) according to risk (a surgical or N95 mask);
- Do not spit, wrap your oral and nasal secretion with tissue and throw it in a covered dustbin;
- Balance your nutrition and exercise moderately;
- Sterilization / disinfection of medical devices at Site dispensaries; and
- Do not touch, buy or eat wild animals (gamey). Try to avoid visiting markets that sell such animals.

PROJECT SITE SPECIFIC PRECAUTIONARY MEASURES

Measures for protecting staff and labour from exposure to, and infection with, the COVID-19 depend on the type of work being performed and exposure risk, including potential for interaction with infectious people and contamination of the work environment. Regardless of specific exposure risks, following are the main actions that have been jointly taken at Site to combat the COVID-19:

Employer's Side

Employer should issue the notification containing the precautionary measures in the light of Government of Punjab guidelines to be implemented at Site. Upon receiving the Employer notification all the mentioned precautionary measures will be communicated to Engineer staff for compliance. Employer technical staff is also complying with the Government of Punjab guidelines and Contractor suggestion to control the spread of COVID-19 at Site in the best interest of the Project and country.

Consultant's Side

Consultant's top management will issue the orders in the light of Government of Punjab guidelines containing the precautionary measures to control the spread of COVID-19 for the staff working at Site.

Consultant staff at Site will fully complying with the orders including photographic evidence. Considering the severity of the prevailing virus Engineer devised the Standard Operating Procedure (SOP) containing precautionary action against the potential risk of novel corona virus.

Besides, above Consultant will ensure the following precautionary measures at Site.

- Adequate signage and information at all entrances and exits showing what is Corona Virus, how it spreads, what are the symptoms, standard precautions;
- The awareness session for the Contractor staff is equally important as of Consultant staff to combat the COVID-19 at Site. The Consultant will ensuring that Contractor is arranging such session at Site from time to time to reduce the potential risk of COVID-19. Further, all the newly inducted and existing staff have been given HSE training by the Consultant & Contractor.

Contractor's Side

Contractor will communicate various precautionary measures to Employer and Engineer through letters to control the spread of COVID-19 at Site. Following are the major steps to be taken by the Contractor:

- Contractor will convey the instructions and requirements of its superior unit for the prevention and control of COVID-19 epidemic at Site.
- Contractor will establish a special organization for epidemic prevention and control on the Project Site that is responsible for arranging, implementing, publicizing and supervising the epidemic prevention and control measures.
- Launch the plan for epidemic prevention and control on the project Site that includes:
 - All personnel in temporary camp are required to wear masks;
 - Contractor personnel incharge of Site to wear masks;
 - Arranged special personnel to measure and record the temperature of all personnel when entering or leaving the temporary camp;

- If any person with fever, cold and other symptoms are found, they will be admonished to go home for isolation and asked about the development of the disease every day; and
- Propagate and implement the epidemic prevention measures for the staffs and labours and warn them not to go outside and home as much as possible.
- All these meetings should be carried out through video conference.

Contractor is not limited to the above precautionary measures but practicing and implementing the following;

- Contractor will prepare a pamphlet for the awareness of Site staff to combat the COVID-19. It will also be placed/posted at strategic points at Site.
- Launch awareness campaign to inform all the staff and labour about the coronavirus, to use facemask, hand hygiene, cough etiquette, and avoidance of close contact with animals and consumption of their raw products.
- Everyday awareness speech in English and Urdu in the temporary camp.
- All the employees are not allowed to go outside of the Project Area or on vacation to their homes and on daily basis visit to sites;
- Contractor will provide medical masks and antibacterial liquid hand wash to all personnel.
- Contractor will prepare the isolation facility at Site and provide three isolated rooms for such patients inside the temporary camp. Each room has three beds, oxygen cylinder, sanitizers, isolation kit, hand wash.
- Thermal scanning will be carried out continuously in the morning for everybody at the main gate of temporary camp.
- Record will be maintained for everyone that includes the temperature value of each person with their names, every morning and afternoon go to each department for scanning separately and noted down their name with temperature values.
- Contractor carry out disinfectant spray on daily basis morning and afternoon in each office and rooms and all the area of the camp.
- Avoid interaction with the Proponent and the Consultant staff physically rather through electronically by emails or video conferencing.

RECOMMENDATIONS FOR THE CONTROL OF COVID-19 AT SITE

To Avoid Transmission

For all personnel at Site, it is always a good to practice the following precautionary measures:

- Workers to remain at least two meters apart from each other at all times (social distancing) – i.e. spread out and reduce the number of people working together in one area of the site;
- Avoid eating lunch in the form of group in available mess/canteens at Site;
- Close site canteens/ food preparation and eating areas (avoid gatherings) – workers to bring their own prepared lunch to site and eat alone e.g. in their van, car, or in an open space;

- Avoid in-person meetings if possible. In the case that an in-person meeting is unavoidable, make sure to have it in a well-ventilated area with sufficient space for attendees to distance themselves from one another. For meetings such as toolbox talks, consider breaking them up into smaller group meetings versus one large meeting;
- Introduce enhanced cleaning procedures across the Site and touch points e.g. office equipment, plant and machinery controls, taps/toilet/washing facilities, handrails;
- Stagger start times on site to avoid congestion in entrance areas;
- Reduce the number of people on site inductions at any one time and hold them outdoors if possible;
- Stop workers moving across various sites (potential for cross contamination);
- No outsiders should be at the Project Site;
- Contractor, Consultant and Employer personnel are advised to avoid travelling and in case traveling is unavoidable, prior approval from the management should be essential. In case of travelling, the above mentioned measures need to be strictly followed by the traveller;
- Prompt identification and isolation of potentially infectious individuals is a critical first step in protecting workers and other Site staff. An isolated area should be available at Site to immediately isolate suspected person, as it is most important to stop its spread at Site.
- Rapid Response Team should be formed and be informed immediately in case of suspect and confirmed case of COVID-19.
- Medical team at Site should separate the suspected person displaying fever, cough or difficulty breathing from other personnel; and
- If a person has had close contact with an individual that has confirmed COVID-19, that person will not be allowed to return to the Site until he/she has been symptom free for 14 days.
- Clean and fumigate all the workplaces at Site on daily basis;
- Ask people to stay at home if they have fever, cough, difficulty in breathing, runny nose, sore throat as per organizational rules;
- An immediate replacement of solid soap with liquid anti-bacterial soap bottles may be appropriate.
- Provision of alcohol-based hand sanitizer need to be available for all staff;
- Clean the religious places carpets and rugs. Have them washed in place over the weekend and then do regular cleaning;
- Have the cleaners/ maintenance crews regularly clean surfaces that are touched frequently by personnel with disinfectants such as in and out doors;
- Fresh medical tests of staff working should be carried out at Site;
- Dispose of all contaminated waste (gloves, paper, swab handles, etc.) into biohazard waste bags for disposal;
- Ensure that panic is not created. In fact the posters should start with statements such as do not panic and fear the virus but know and prevent; and
- Ensure proper ventilation system for all the personnel at Site.

Use of Personal Protective Equipment (PPEs)

ANNEX-XI

- Necessary PPE should be available at Site all the times and are being issued to each personnel at Site;
- Practice of using masks is also being ensured by all parties at Site (a surgical or N95 masks);
- Re-usable PPE should be thoroughly cleaned after use and not shared between workers. Single use PPE should be disposed of so that it cannot be reused;

Outside Visitors

- Visitors should enter with strictly wearing visitors card;
- Ensure sanitization of hands;
- All parties should ensure that the sick persons should be wearing a surgical or N95 masks;
- Note down the complete information of outsiders before entrance;
- Proper screening should be carried out before entering the Site;
- Refrain from handshakes. Rather than shaking hands, visitors may explain why handshakes can contribute to the risk of spread;
- Attempt to maintain a general six (6) feet distance between themselves. This will be challenging to follow at all times but it is Engineer recommendation to follow;
- Refrain from and/or limit touching of workplace surfaces; and
- In addition to these on-site procedures, it is advised to follow their respective organizational instructions related to Site visits.

ANNEX-XII: TREE PLANTATION PLAN

TREE PLANTATION/ AFFORESTATION PLAN

The basic purpose of afforestation/plantation of suitable species in the project area is to reduce the risk been made due to cutting of trees for the proposed project and to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Plantation will be done after the removal of trees during the construction work immediately. Plantation of indigenous trees species is highly important to maintain the biodiversity and ecological balance. It is also important to prevent global warming, soil erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of roads construction, the afforestation activity will further help in enhancing the socio-economic condition of the area and project sustainability.

Importance of Tree Plantation

- Trees contribute to their environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil, and supporting wildlife.
- Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer.
- Trees also preserve warmth by providing a screen from harsh wind.
- Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide.
- Both above and below ground, trees are essential to the eco-systems in which they reside.
- Trees absorb and store rainwater which reduce runoff and sediment deposit after storms. This helps the ground water supply recharge, prevents the transport of chemicals into streams and prevents flooding.
- Trees, shrubs and turf also filter air by removing dust and absorbing other pollutants like carbon monoxide, sulfur dioxide and nitrogen dioxide.

Objectives

- To Restore native species
- To improve the quality of air and reduce its pollution
- To add color to the landscape and enhances the beauty of the environment
- To uplift the quality of our living environment through active planting, proper maintenance and preservation of trees together with other vegetation.
- To Protect and conserve flora and fauna of the project area.
- To attract rain which is a positive impact on the project area at all.
- To reduce sedimentation by plantation in the project area which will act as protection wall against wind born dust particles.

PLANTATION PLAN RING ROAD RAWALPINDI PROJECT

Four rows of plants will be raised along the 38.3 Km road, two on either side of the road. Distance from the outer boundary of the ROW and between two plants will be kept as 4 meters. Thus in one kilometer, 250 number of plants are to be raised in single row. Total number of plants, along, 37-kilometer-long road, (1.3 Km will be considered not suitable for planting due to interchanges and other structures) with 2 plants each sides will be $9250 \times 4 = 37000$ Number. Thus a total of 37,000 trees shall be planted in lieu of expected 3,7000 effected plants.

**The Forest Department may update the standards of planting and choice of species as per the requirements and suitability.*

PLANTATION TECHNIQUE

Plantation of suitable broad leaved species is to be carried out in the immediate vicinity of the project area. The project area can be afforested and vegetation cover can be improved by adopting standard afforestation technique of digging pits. The project area is suitable for plantation activities and can be managed thoroughly with care.

Pits

Pits should be dug in the project area at a spacing of 10' linearly. The pits should be of 1.5 feet dia at the top and 1 foot dia at the bottom with a depth of 1-3/4" ft. The earth taken out of the pits will be deposited below each pit in a crescent shape, so as to form a ridge with a clear berm of 9 inches in front. The consecutive crescents will be joined to catch the maximum quantity of moisture. Moreover, planting should be carried out in the pits and sowing on the berms, before or immediately after the first shower of rain. The choice of species (Forest Department may change as per actual requirement and suitability *standards & Species as well) for the project area is given below:

Table: Recommended Species for Plantation of the Project Area

Sr. No.	Common Name	Scientific Name
1	Sukh Chain	<i>Pongamia pinnata</i>
2	Bottle Brush	<i>Callistemon spp</i>
3	Kikar & Phulai	<i>Acacia nilotica & Modesta</i>
4	Sirris	<i>Acacia lebbek</i>
5	Jacarnda	<i>Jacaranda moniosifolia</i>
6	Silver Oak	<i>Grevillea robusta</i>
7	Shisham	<i>Dalbergia sissoo</i>
8	Jaman	<i>Eugenia jambolina</i>
9	Kachnar	<i>Bauhinia variegata</i>

When to plant

Planting should be completed early in the rains in as short a time as possible. The trees must be given time to become well established prior to the dry season. A good rule of thumb is to start planting when the soil is moist to a depth of 15-25 cm or to the bottom of the planting hole. Failures because planting is too late are more common than failures because of planting too early. To obtain good results and avoid labor shortage in these areas considerable preparatory planning is needed. The size of the plantation might have to be adapted to the availability of labor. If dry sites cannot be planted in time, planting should be postponed until the next season.

Cost

Break-up of Expenditure per Avenue kilometer @ Rs. 1500/- per diem: Break-up of Expenditure per Avenue kilometer or 250 plants @ Rs. 1500/- per diem:

Note: These all activates of plantation plan should be implemented by Forest Department and they may change the standards as per rule and approved rates.

ANNEX-XII

FIRST YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Layout	1 Av.km	2 MD/Av.km	3000.00
2.	Digging of Pits 2.5 ft. each 2.5x250 = 625 cft.	625 cft.	5 MD/Av.km	7500.00
3.	Cost of Plants including	250 No.	Rs100/- plant	25,000.00
4.	Cost of planting of plants	250 No.	Rs. 25/- plant	6250.00
5.	Carriage of plants from private nursery to site including loading/unloading	250 No.	Rs. 10/- plant	2500.00
6.	Cost of Manure and Bhall (silt) including carriage	1 Av. Km		20,000.00
7.	H/watering 50 times 250x50 with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
8.	Weeding twice 250x2	500 no.	2 MD/per %	15,000.00
9.	Reopening of Pits twice (250x2)/cft/pit	500 cft.	2 MD/per %	15,000.00
10.	Unforeseen			5750.00
Total				200,000.00

SECOND YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 20% Restocking	50 No.	Rs.100/- plant	5,000.00
2.	Cost of planting	50 No.	Rs. 25/- plant	1250.00
3.	Carriage of plants	50 No.	Rs. 10/- plant	500.00
4.	H/watering 50 times with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
5.	Reopening of Pits twice (250x2)	500 cft.	2 MD/per %	1,5000.00
6.	Weeding twice 250x2	500 no.	2 MD/per %	1,5000.00
7.	Unforeseen			1250.00
Total				1,38,000.00

THIRD YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 10% Restocking 25 No.	25 No.	Rs.100/- plant	2500.00
2.	Cost of planting	25 No.	Rs. 25/- plant	625.00
3.	Carriage of plants	25 No.	Rs. 10/- plant	250.00
4.	H/watering 40 times x250 no.	10,000 no.	5MD/per %0	75000.00
5.	Reopening of Pits twice (250x2)	500	5MD/per %0	3750.00
6.	Unforeseen			2875.00
Total				85,000.00

FOURTH YEAR

ANNEX-XII

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	H/watering 30 times	7500 no.	5MD/per %0	56250.00
2.	Pruning and cleaning of plants	250 no.	5MD/per %0	1875.00
3.	Unforeseen			1875.00
Total				60,000.00

Cost for raising 1 Av. Km and Maintenance or 250 plants in single row: = Rs.4,83,000/-
For 4 years

Total cost for 37,000 plants and their maintenance for 4 years (two on each side) =
Rs. 71,484,000/- or say

Total Cost= 71.484 Millions

ANNEX-XIII: RESOURCE CONSERVATION PLAN

RESOURCE CONSERVATION PLAN

1. INTRODUCTION

The most of the resources in this world are finite and non-renewable in nature. We are completely dependent on these resources to fulfill all our daily requirements. Therefore, sustainable development calls for the need to conserve resources in a way that meet our needs of present generation as well as future generation, especially the non-renewable resources.

2. OBJECTIVE OF THE PLAN

The Resource Conservation Plan is intended to make an effort towards achieving sustainable development. The objective of the resource conservation plan is to:

- Minimize the use of natural resources; and
- Mitigate and prevent pollution contaminating the natural resources.

3. PLANNING

Careful estimations of quantities of material, fuel, water and energy required directly or indirectly shall be done to avoid excessive or unnecessary wastage of these materials. In addition to this, pollution prevention strategies shall also be devised to prevent contamination of resources.

The estimations include the following:

- Estimation of construction material required for the project;
- Estimation of fuel consumption for construction machinery, construction vehicles and generators;
- Estimations of the energy requirements during all the stages of the project; and
- Estimations of water consumption for construction activities and construction camp sites.
- Strategies shall be planned to reduce loads on the identified resources to be consumed;
- Best management practices shall be devised to control or reduce pollution resulting from the activities during different stages of the project; and
- An inspector shall be assigned responsibility to oversee the ongoing activities to check the compliance of the planned strategies.

4. EXECUTION OF THE PLAN

The planned strategies shall be implemented to conserve the natural resources including but not limited to the following:

Material

- Material supplied shall be in conformance with the estimated quantities and excess material shall be returned to the supplier;

- Material wastage shall be avoided by using best management practices;
- Waste produced during the project execution shall be disposed off safely to the designated disposal sites through approved contractors; and
- Reuse of the materials shall be appreciated.

Energy

- Reduce trips and optimize routes to and from the construction site for all kinds of activities;
- Regular maintenance of equipment and vehicles to avoid leaks and sustain efficient fuel consumption;
- Switch off idle equipment and vehicles to avoid wastage of fuel;
- Minimize warm up time, unnecessary acceleration and deceleration of the construction equipment and vehicles;
- Avoid unnecessary burning of fuel for cooking in construction camps;
- Avoid unnecessary use of heating and cooling systems during extreme weathers events;
- Construction shall start in early hours of the day to avoid heat in summers and utilization of day light; and
- Alternate energy sources shall be considered for electricity generations during construction and operation to conserve fossil fuel as it is non-renewable resource.

Water

- Avoid using potable water for sprinkling, curing and washing of equipment and vehicles. Surface water or treated effluent can be used instead;
- Wastage of water should be controlled through providing proper valves and through controlling pressure of the water;
- Unnecessary equipment washings should be avoided;
- Awareness amongst workers shall be raised to conserve water and immediately report for any leaks detected; and
- Ensure protection of canal water from contamination resulting from construction activities.

Pollution

- Emissions shall be reduced and controlled as far as possible and direct discharges to air shall be avoided by strictly adhering to the mitigation measures outlined in EIA report;
- Waste water shall not be discharged directly into the canal and must be managed as per the recommendations presented in EIA; and
- Construction and demolition waste, and municipal solid waste shall not be dumped and burnt openly, and shall be handled according to the preventative measure given in EIA study.

5. CHECKING AND CORRECTIVE ACTIONS

The PMU-RDA shall bind the construction contractor through contract agreement to comply with the strategies outlined in the Resource Conservation Plan. The Environmental Committee shall also appoint an Inspector who shall monitor the daily onsite activities and shall report any issues and concerns raised in relation to Resource Conservation Plan. The inspector shall recommend adequate corrective actions to mitigate the issues raised.

PHOTOLOG

PICTORIAL VIEW OF PROJECT AREA





