

PRMSC

Punjab Rural Municipal Services Company

"Engineering Design & Construction Supervision
Punjab Rural Sustainable Water Supply &
Sanitation Project, Cluster Central"

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

(Water Supply & Sanitation Services System in Revenue Villages – Tehsil Bhowana)

May-2026

ASIAN CONSULTING ENGINEERS
www.asiancon.com

Head Office:
C-3, Jhelum Block, Green Fort-II, Lahore.
Phone: +92 42 35450914-15
Fax: +92 42 35450916,
Email: arslan@asiancon.com

Islamabad: Office No. 21, 2nd Floor, 44-Zaki Centre, I-8 Markaz, Islamabad.

Karachi: Office No. 410, 4th floor, Business Avenue, PECHS, Block-6, Main Shahrah-e-Faisal, Karachi.

Peshawar: Syed's Tower, Office No. 1, 4th Floor, Opposit to Custom House, University Road, Peshawar.

ISO 9001

Quality Control Sheet



QUALITY CONTROL SHEET		
DOCUMENT	**Environmental Impact Assessment (EIA) Report (Water Supply & Sanitation Services System in Revenue Villages – Tehsil Bhowana)**	
PROJECT	**"Engineering Design & Construction Supervision Punjab Rural Sustainable Water Supply & Sanitation Project, Cluster Central"**	
CODE		
AUTHOR	**MA**	
VERIFIED	**AB**	
RECIPIENT	**PRMSC** **Punjab Rural Municipal Services Company**	
NOTES		

Sections Table of Contents

EXECUTIVE SUMMARY 1

SECTION - 1: INTRODUCTION 18

SECTION - 2: REGULATORY AND POLICY REVIEW 34

SECTION - 3: SCREENING AND SCOPING OF PROJECT 54

SECTION - 4: ANALYSIS OF ALTERNATIVES 58

SECTION - 5: DESCRIPTION OF THE PROJECT 60

SECTION - 6: DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE 84

SECTION - 7: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES ... 109

SECTION - 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PROGRAM 128

SECTION - 9: STAKEHOLDER CONSULTATION 168

SECTION - 10: GRIEVANCE REDRESS MECHANISM 176

SECTION - 11: CONCLUSION AND RECOMMENDATIONS 180

Table of Contents

EXECUTIVE SUMMARY 1

SECTION - 1: INTRODUCTION 18

1.1 Purpose of the Report 18
1.2 Project Background 18
1.3 Overview of the Project 20
1.4 Project Development Objective 22
1.5 Project Area 22
)&-&) @ZQWZQ\a FQTT I OM[..... **
1.6 Objectives of EIA 25
1.7 Identification of the Project 26
1.8 The Proponent 26
1.9 The Consultant 27
1.10 Brief Description of Project 27
)&) (&) > I \ ] ZM ! CQbM WN @ZWRMK\ ..... */
1.11 Project Location 28
1.12 Approach & Methodology to Work 29
)&) *&) 3XXZW I KP *1
)&) *&* =M\PWLWTWOa *1
1.13 Structure of Report 31
1.14 EIA Team 32

SECTION - 2: REGULATORY AND POLICY REVIEW 34

2.1 Overview 34
2.2 National and Provincial Legislative Framework 34
2.3 Comparison of International and Local Environmental Legislations 43
2.4 International Laws / Treaties 49
*&,&) DPM GWZTL 4 I VS ? XMZ I \QWV I T @WTQKQM[..... ,1
&,& GWZTL 4 I VS 7V^QZWVUMV\ I T$: M I T\P I VL CWKQ I T 9]QLMTQVM[..... -(
*&,&+ 9]QL I VKM >W\M WV < I JW] Z ;VNT] ` ..... -(
*&,&, 7V^QZWVUMV\ I T$: M I T\P ! C I NM\a 9]QLMTQVM[..... -)
&,&- GWZTL 4 I VS 9ZW] X 9MVLMZ C\Z I \MOa "( ) . %*(*+# ..... -)

*&,&. GWZTL 4IVS @WTQKa 5WZM @ZQVKQXTM[IVL 3XXTQKIJQTQ\a WVC]J%XZWRMK\ ..... -)

&,&/ GWZTL 4IVS 7V^QZWVUMV\IT 5WLM WN @ZIK\QKM[..... -

SECTION - 3: SCREENING AND SCOPING OF PROJECT 54

3.1 Screening of the Project 54

3.2 Spatial and Temporal Boundaries of Environmental Assessment 55

3.3 Important Issues and Concerns Raised During Consultation 57

3.4 Significant Impacts and Factors to be Determined 57

SECTION - 4: ANALYSIS OF ALTERNATIVES 58

4.1 Location Alternatives 58

4.2 Design / Technology Alternatives 58

4.3 Environmental Alternatives 58

4.4 Economic Alternatives 59

SECTION - 5: DESCRIPTION OF THE PROJECT 60

5.1 Area Description 60

5.2 Objectives of the Project 60

5.3 Location & Site Layout of Project 61

5.4 Land Use 62

5.5 Road Access 63

5.6 Cost & Magnitude of the Project 63

5.7 Labour Requirement 63

5.8 Schedule of Implementation 64

5.9 Scope of Work 64

5.10 Project Description 64

-&)(& 5WUXWVMV\[WN GI\MZC]XXTa Ca[\MU ..... -

-&)(&* GI\MZCW]ZKM ..... -

-&)(&+ 6M[QOV 5ZQ\MZQI NWZD]JM _MTT[..... .

-&)(&, @]UXQVO 8IKQTQ\QM[..... 1

-&)(&- GI\MZDZIV[U\[QWV Ca[\MU 1

-&)(&. GI\MZBM[MZ^WQZ[..... /)

-&)(&/ GI\MZ6\[\ZQJ]\QWV Ca[\MU ..... /*

-&) (&0 CM_MZIOM Ca[\MU ..... /*
-&) (&1 CM_ IOM 6◊[XW[I T C\ I \◊WV[..... /-
5.11 Water Consumption & Wastewater Disposal 78
5.12 Solid Waste 78
-&) *&) G I [\M = IVIOMUMV\ IVL 6◊[XW[I T ..... /1
5.13 Sources of construction material 79
5.14 Machinery & Equipment 79
5.15 Storage of Materials 80
5.16 Description of Work Activities 80
5.17 Construction / Labour Campsite 80
5.18 Restoration and Rehabilitation Plans 81
-&)O&) 6M\ I ◊T[WN BM[\WZ I \◊WV IVL BMP I J◊T◊\ I \◊WV I \ \PM 7VL WN @ZWRMK\ <◊NM ..... 0)
5.19 Government & Local Approvals: 81
5.20 Land Requirement & Land Acquisition 81
5.21 Labor Health & Safety 82
5.22 Traffic Management 82
5.23 Existence of Utility Services within RoW 82
5.24 Vegetation Removal / Tree Cutting 82
5.25 Area of Impact 82
-&*-&) 6◊ZMK\ ;UXIK\[..... 0+
-&*-&* ;VL◊ZMK\ ;UXIK\[..... 0+
SECTION - 6: DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE 84
6.1 Overview 84
6.2 Purpose of Environmental & Social Baseline 84
6.3 General Characteristics of Project Area 84
6.4 Physical Resources 85
.&,&) 9MWOZIXPa$ 9MWTWOa$ IVL CW◊T[..... 0-
.&,&* DWXWOZIXPa 0-
.&,&+ 5T◊UI\M IVL DMUXMZI\]ZM ..... 0.
.&,&, BI◊VNITT 0/
.&,&- G◊VL CXMML IVL 6◊ZMK\◊WV 00
.&,&. CM◊[U◊K◊\a 01
.&,&/ 9ZW]VL GI\MZ IVL GI\MZ C]XXTa "6◊[\Z◊K\ 5P◊V◊W\# ..... 1(

.&,&0 C]ZN I KM G I \MZ "6Q[\ZQK\ 4PW_ I V I #.....1+
.&,&1 3QZ A] I TQ\a.....1,
.&,&)(>WQ[M.....1.

6.5 Biological Resources.....98

.&-&) GQTLTQNM$ 8Q[PMZQM[I VL 3Y] I \QK 4QWTWOa.....10
.&-&* FMOM\ I \QWV 5W^MZ I VL DZMM[.....11
.&-&+ GM\T I VL[.....11
.&-&, GQTLTQNM C I VK\] I ZQM[.....11
.&-&- GQTLTQNM @ I ZS[.....)((
.&-&. 8WZM[\[.....)((
.&-&/ 9 I UM ZM[MZ^M[.....)((

6.6 Social and Cultural Resources 101

.&.&) @WX]T I \QWV 5WU U]VQ\QM[.....)()
.&.&* 9MVLMZ C\ I \][.....)()
.&.&+ <I VL%][M.....)()
.&.&, <I VO] I OM[.....)(*
.&.&- <Q\MZ I Ka B I \M I VL 7L]K I \QWV 8 I KQTQ\QM[.....)(*
.&.&. :M I T\P 8 I KQTQ\QM[.....)(,
.&.&/ :M I T\P @ZWJTMU[.....)(,
.&.&0 6MKQ[QWV%U I SQVO =M\PWL I VL 5WVNTQK\ BM[WT]\QWV[Ca[\MU .....)(,
.&.&1 :W][MPWTL ;VNWZU I \QWV.....)(,
.&.&)(CM\\TMUMV\ WN BM[XWVLMV\[.....)(-
.&.&)) 8 I UQTa Ca[\MU.....)(-
.&.&)* CW]ZKM WN <Q^MTQPWWL I VL ;VKWUM.....)(-
.&.&)+ 3OZQK]T\]Z I T<I VL C\ I \][.....)(-
.&.&), :WZ\QK]T\]ZM.....)(.
.&.&)- BW I L I VL B I QT >M_WZS.....)(.
.&.&). 7VMZOa CW]ZKM[.....)(.
.&.&)/ 5WU U]VQ\a 4 I [ML ?ZO I VQb I \QWV "54?[# I VL >9?[.....)(/
.&.&)0 <WK I T 9W^MZVUMV\ I VL 3L UQVQ[\Z I \QWV.....)(/
.&.&)1 <I _ I VL ?ZLMZ CQ\] I \QWV.....)(/
.&.&*(5WU U]VQ\a 3_ I ZMVM[[I JW]\C]JXZWRMK\ GWZS[.....)(/
.&.&*) 5WU U]VQ\a 6MU I VL[.....)(/

6.7 Physical Cultural Resources.....107

6.8 Industries in Bhowana 108

6.9 Suitability of Site.....108

SECTION - 7: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES...109

7.1 General 109

7.2 Approaches and Methodology 109

/&*&) 5PMKS[\ .....))(

/&*&* ?^MZI a[.....))(

7.3 Characteristics of Impacts 110

7.4 Environmental Impacts and their Mitigation During Pre-Construction Phase 112

/&,&) 7V^ZWVUMV\ I ;UX I K\[BMO I ZL VO @ZWMK\ <WK I \WV .....))*

/&,&* 7V^ZWVUMV\ I ;UX I K\[BMO I ZL VO @ZWMK\ 6M[OV .....))*

7.5 Environmental Impact and their Mitigation During Construction Phase 113

/&-&) @Pa[K I UX I K\[.....))+

/&-&* 7KWWO K I 7V^ZWVUMV\ .....))0

/&-&+ CWK W 7KWVWUK 7V^ZWVUMV\ .....))0

7.6 Environmental Impacts and Mitigation Measures during the Project Operation 122

/&.&) 5WV[ ] UX\WV W 5WV\ I UV I \ML G I \MZ .....)**

/&.&* CW L G I [\M 9MVMZ I \WV .....)**

/&.&+ F[ ] I ;UX I K\[.....)*+

/&.&, ;UX I K\[\W ?KK]X I \WV I : M I T\P I VL C I NM\a .....)*+

/&.&- ;UX I K\[WV 5WUU]V\a : M I T\P I VL C I NM\a .....)*,

/&.&. ;UX I K\[WV DZ I NN K .....)*,

/&.&/ ;UX I K\ WV 3Z A] I T\a .....)*,

/&.&0 >W[M I VL F JZ I \WV 7U[[WV ;UX I K\[.....)*-

/&.&1 3[[M[[VO ;UX I K\[.....)*-

/&.&)(3XXZW I KP \W 3[[M[[UMV\ .....)*-

/&.&)) >MO I \^M UX I K\ .....)*.

/&.&)* @W[\\^M ;UX I K\[.....)*.

7.7 Cumulative and Induced Impacts 126

7.8 Potential Environmental Enhancement Measures 127

SECTION - 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PROGRAM 128

8.1 Objective 128

8.2 Institutional Arrangements 128

0&*&) <9 ! 566 ' @B=C5%: ? .....)*0

0&*&* CMZ^KM 6M^MZa EV\["C6E# I \ DMP[<M^MT "C6E%D ?# .....)*0

O&*&+ 5WV[]T\IV\[.....)*0
O&*&, DPM 5WV\ZIK\WZ .....)*0
8.3 Mitigation Plan 130
8.4 Monitoring Plan 130
8.5 Monitoring, Audit and Evaluation 130
8.6 ESMMP Monitoring Mechanism 130
8.7 Reporting and Documentation 131
8.8 Information Disclosure 131
8.9 Inclusion of EIA In Bidding / Contract Documents 131
8.10 Environmental and Social Non-Compliance 132
8.11 Budget Estimate for PPE During the Construction Phases . 159
8.12 Proposed EMP Reporting and Reviewing Procedure OF EPA 165
8.13 Contractor's Training 165
SECTION - 9: STAKEHOLDER CONSULTATION 168
9.1 General 168
9.2 Proponent's Environmental Management Team 168
9.3 Responsible Authority 168
9.4 Project Stakeholders 169
9.5 Modes of Consultations 170
1&-&) DaXM[WN C\ISMPWTLMZ[.....)/(
9.6 Environmental Practitioners and Experts 174
9.7 Disclosure of Project Information 175
9.8 Future Consultation Plan 175
SECTION - 10: GRIEVANCE REDRESS MECHANISM 176
10.1 Communication & Awareness 176
10.2 Record & Maintenance 176
10.3 Proposed Institutional Mechanisms 177
10.4 GRM Process Implementation 177
10.5 GRM Procedures and Timelines 178
10.6 Types of Grievances 179

SECTION - 11: CONCLUSION AND RECOMMENDATIONS 180

11.1 Conclusion 180

11.2 Recommendations 180

Hira Fatima (Assistant Director (EIA)-2)
EPA

Annexures

ANNEXURE - A: REFERENCES 182

ANNEXURE - B: GLOSSARY 183

ANNEXURE - C: LIST OF ABBREVIATIONS 184

ANNEXURE - D: GOOGLE SATELLITE MAP 186

ANNEXURE - E: EIA TEAM 188

ANNEXURE - F: TYPICAL DETAILS / FIGURES / DIAGRAMS OF PROJECT COMPONENTS 189

ANNEXURE - G: LAB REPORTS OF ENVIRONMENTAL MONITORING 248

ANNEXURE - H: TORS 263

ANNEXURE - I: IFC EHS GUIDELINES FOR CONSTRUCTION AND DECOMMISSIONING 267

ANNEXURE - J: ILO GUIDELINES ON OHS 274

ANNEXURE - K: IMPACT MATRIX 308

ANNEXURE - L: SCREENING CHECKLIST 309

ANNEXURE - M: PPES ACCORDING TO HAZARDS 313

List of Tables

Table 0-1, Criteria for Project Interventions 5
Table 0-2, Summary of Major Impacts during Construction & Operation Phase 6
Table 0-3, Summary of Recommendations during Construction & Operation Phase 10
Table 0-4, Proposed Monitoring Schedule 15
Table 1-1, Project Villages List of Tehsil Bhowana District Chiniot 22
Table 1-2, Criteria for Project Interventions 26
Table 1-3, Criteria for Project Interventions 27
Table 1-4, List of EIA Team Members 32
Table 2-1, National and Provincial Legislative Framework 34
Table 2-2, IFC Work Environment Noise limits 44
Table 2-3, Comparison of International and local Air Quality Standards 44
Table 2-4, Comparison of International and Local Noise Standards 45
Table 2-5, Maximum Permissible Construction Phase Vibration Levels 46
Table 2-6, Comparison of National and International Drinking Water Standards 46
Table 2-7, Comparison of National and International Surface Water Standards 47
Table 2-8, Assessment of Applicable World Bank Operational Policies 49
Table 3-1, Criteria for Project Interventions 54
Table 5-1, Criteria for Project Interventions 60
Table 5-2, Criteria for Project Interventions 64
Table 5-3, Manhole Spacing 74
Table 5-4, Manhole Diameter 74
Table 5-5, Waste Management Collection and Disposal Techniques 79
Table 5-6, Required Machinery / Equipment 79
Table 6-1, Bhowana Climate Summary 86
Table 6-2, Ground Water Analysis Results of Point 01 in Tehsil Bhowana (Coordinates; 31°38'43"N 72°48'46"E) 90
Table 6-3, Ground Water Analysis Results of Point 02 in Tehsil Bhowana (Coordinates; 30°22'32"N 73°31'60"E) 92
Table 6-4, Ambient Air Monitoring Results of Point 01 in Tehsil Bhowana (Coordinates; 31°33' 54" N 72°38'35" E) 95
Table 6-5, Ambient Air Monitoring Results of Point 02 in Tehsil Bhowana (Coordinates; 31°34' 0" N 72°38'59" E) 95
Table 6-6, Noise Level Monitoring Results of Point 01 in Tehsil Bhowana (Coordinates; 31°33' 54" N 72°38'35" E) 96

Table 6-7, Noise Level Monitoring Results of Point 02 in Tehsil Bhowana (Coordinates; 31°34' 0" N 72°38'59" E) 97
Table 6-8, Demographic Data 103
Table 7-1, Impact Characterization 111
Table 8-1, Reporting Mechanism 131
Table 8-2, Environmental & Social Management & Monitoring Plan 133
Table 8-3, Environmental Monitoring & Analysis 158
Table 8-4, ESMMP Implementation Budget for Each Village 159
Table 8-5, Village-wise ESMP Cost 159
Table 8-6, ESMP Implementation Cost - Village Wise 160
Table 8-7, Framework for Trainings under PRSWSSP 166
Table 9-1, Project Stakeholders 169
Table 9-2, Frameworks for Consultation 169
Table 9-3, Public Consultation / Attendance Sheet 171
Table 9-4, Institutional Stakeholders Consulted 172
Table 9-5, Findings of Consultation Meetings and Responses 172

List of Figures

Figure 0-1, Project Location Map 5
Figure 1-1, Project Location Map 25
Figure 1-2, Project Location Map 28
Figure 3-1, Google Map of Project 56
Figure 5-1, Project Location Map 62
Figure 5-2, Representative Pictures of the Site 63
Figure 5-3, Project Location Map 65
Figure 5-4, Process Flow Diagram of STP / WWTP / ABR 76
Figure 5-5, Process Flow Diagram of Water Supply 77
Figure 5-6, Estimated Water Balance for Each Village 78
Figure 6-1, Administrative Map of Bhowana 85
Figure 6-2, Topography of Bhowana 86
Figure 6-3, Maximum and Minimum Temperature 87
Figure 6-4, Annual Precipitation 88
Figure 6-5, Wind Speed 88
Figure 6-6, Wind Rose 89
Figure 6-7, Seismic Zones of Pakistan 89
Figure 6-8, The Khanki Headworks 94
Figure 6-9, Fauna in Bhowana 99
Figure 6-10, Flora in Bhowana 101
Figure 7-1, Septic Tank 114
Figure 8-1, Institutional Mechanism 129
Figure 9-1, Representative Photolog of Stakeholder Consultation Meetings 174
Figure 10-1, Mode of Complaint 178

EXECUTIVE SUMMARY

This Environmental Impact Assessment (EIA) Report has been prepared for Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana, Punjab which is being funded by the World Bank and Local Government & Community Development Department (LG&CDD), Government of Punjab (GoPb) for Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) through Punjab Rural Municipal Services Company (PRMSC) and to be implemented by Local Government & Community Development Department (LG&CDD) through Punjab Rural Municipal Services Company (PRMSC) and supervised by the PRMSC itself and consultants appointed by PRMSC.

ES-1. Project Background

Punjab Rural Municipal Services Company (PRMSC) has been established under the Punjab Rural Sustainable Water and Sanitation Project approved by Punjab Development Working Party (PDWP) dated 03/09/2021. The project is being executed by Local Government and Community Development Department. Project Development Objective (PDO) of PRSWSSP is to "provide equitable and sustainable access to safely managed water and sanitation, and reduce child stunting."

Government of the Punjab and World Bank are the sponsors and the project is spread over the period of 5 years. PRMSC has been established with the aim of providing improved water and sanitation facilities in 1,800 villages of Punjab. PRMSC is registered under Section 42 of Companies Act, 2017 and works in the coordination with Local Government and Community Development, Housing, Urban Development & Public Health Engineering, Irrigation, Health, and Livestock Departments. The mission of PRMSC is "To improve existing sanitation conditions, provide clean drinking water, improve living conditions through solid waste management, behaviour change and capacity building for the sustainability of the project in rural settlements of Punjab."

PRSWSSP aims at generating integrated benefits with the provision of safe drinking water to improve health and education with significant impact on poverty reduction, gender development, environmental improvement, and human resource development in the service areas. Major objectives include the following;

- Extend water supply, drainage and sanitation, solid waste management coverage through a professional and demand-driven approach, to the villages that did not have access to organized water supply in rural Punjab.

- Strengthen newly constituted Tehsil Councils / Village Councils and build their capacity to manage rural water supply and sanitation schemes and improve related management functions.
- Implement a behavioral change and hygiene awareness program to help the beneficiaries in the selected villages to efficiently use, develop and maintain improved water and sanitation facilities, under the project.

The PRSWSSP through its planned interventions for behaviour change, and water and sanitation investments are likely to provide dividends for the following:

- Increase household saving due to health outcomes and enhancement in productivity due to better health projected through the provision of clean drinking water and proper sanitation.
- Save time in fetching water, particularly for girls, by providing piped water supply to all the households of a village.
- Water conservation through water metering and efficient monitoring.
- Improve socio-economic well-being of masses belonging to neglected areas.
- Eliminate stagnant water bodies which are generating water related diseases, through proper sewage treatment and disposal.
- Re-use of treated wastewater for irrigation, and as far as possible make it a source of revenue.
- Proper solid waste management including animal waste.
- Improve child care; lower morbidity rates in children; and reduce infant mortality rates.
- Reduce the incidence of waterborne disease.
- Strengthen Tehsil Councils by improving their capacity to deliver services efficiently.
- The United Nations created 17 distinct but interrelated goals to guide global development between 2015 and 2030. Out of these sustainable development goals (SDGs), SDG 06 pertains to clean water and sanitation, which is; "ensure access to water and sanitation for all', and the goal is, "by 2030 achieve universal and equitable access to safe and affordable drinking water for all".

It is evident from the goals of SDG that instant project will be a positive step towards achieving these goals and targets.

ES-2. Overview

The Government of Punjab has launched a project for service improvement in rural areas of the Punjab through Punjab Rural Municipal Services Company (PRMSC) which has been established under the section 42 of Companies Act 2017. This has been established through various studies that

poor condition of WASH not only affects the health of population, but it also adversely affects the economic growth of that area. The WASH program works on long-term prevention and control measures for improving health, reducing poverty, and improving socio-economic development as well as responding to global emergencies and outbreaks of life-threatening illnesses. A number of mega initiatives have been taken by the Government, and international organizations in the urban areas of all provinces of Pakistan for the improvement of water and sanitation but the rural areas still remain neglected. Rural settlements of Punjab, which is almost 73% the provinces population living in 23,000 revenue villages, requires investments for improvement of WASH on urgent basis.

Pre-Feasibility Studies (PFS) have identified requirements for improving WASH Conditions of 1,800 villages which has been made part of the project for the water supply, sanitation and solid waste management interventions. Poverty, water contamination, stunting and sanitation condition of the areas have been taken as basic parameters for selection of the tehsils.

In Pakistan, water resources, specifically ground water, are under severe threat both in terms of quantity and quality. The ground water is stored in the pores of the soil through the infiltration of surface water. In cases where there is excessive use of groundwater for agricultural and all other purposes, sweet water zones are depleted causing the intrusion of saline / brackish water from saline zones.

In addition, when there is an excessive ground water extraction and decline of aquifer recharge, the quality of water is affected. Increase in the concentrations of arsenic and other potentially harmful contaminants are major threats to the health of the users.

In view of this situation, the Government of the Punjab through PRMSC, intends to develop projects for safe drinking water supply to the under-served rural population using localized and customized solutions with regard to sources, treatment technologies and supply options. The projects are also intended to promote sustainable O&M models with community engagement and participation. In Punjab, target area is 1800 villages in 16 districts including: Khushab, Mianwali, Sargodha, Chakwal, Bhakkar, Pakpattan, Chiniot, Jhang, Rajanpur, Rahim Yar Khan, DG Khan, Lodhran, Bahawalpur, Muzzafargarh, Bahawalnagar and Multan. For this purpose, PRMSC has engaged Asian Consulting Engineers (Pvt.) Ltd. to plan, design and execute water and sanitation infrastructure in Revenue Villages of the following Tehsils of districts Bhakkar, Jhang, Chiniot, and Pakpattan. This is called Cluster Central comprising of 401 Revenue Villages of Tehsils Darya Khan, Ahmedpur Sial, Bhowana and Pakpattan mentioned as under.

Sr. No.	Districts	Names/Number	
		Tehsils	No. of Revenue Villages
Central			
1	Jhang	Ahmedpur Sial	89
2	Chiniot	Bhowana	92
3	Bhakkar	Darya Khan	85
4	Pakpattan	Pakpattan	135
Total			**401**

This Environmental Impact Assessment (EIA) Report is prepared according to the World Bank Core Principles and Environmental and Social laws of Government of Punjab (GoP) – EPA Punjab, for tehsil Bhowana. It will be used to identify and mitigate the environmental and social impacts that may emerge during implementation of proposed project "Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana" which will be executed by PRMSC from the financial grant of PRSWSSP. This EIA follows the social and environmental appraisal and compliance as mentioned in the Environmental and Social Management Framework (ESMF) of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSSP).

ES-3. Project Location

The project is located in Tehsil Bhowana, Punjab. Bhowana is a historic town situated in Central Punjab, Pakistan, geographically located at approximately 31°33'52.78" North latitude and 72°38'41.02" East longitude, with an average elevation ranging from about 157 to 171 meters above mean sea level. Bhowana lies nearly 38.3 km (23.79 miles) south of Chiniot and about 52.1 km (32.37 miles) south-west of Faisalabad, while it is 46.9 km (29.14 miles) from Jhang District. The Chenab River enters from the north-eastern side of the district and flows towards the south-west, playing a significant role in the irrigation, agriculture, and hydrological system of the region. The project area comprises 92 revenue villages located within Tehsil Bhowana. According to the 2023 Population and Housing Census of the Pakistan Bureau of Statistics, Bhowana Tehsil has a predominantly rural population, reflecting the agricultural importance of the area. The project location map showing the spatial distribution of these revenue villages is presented below:

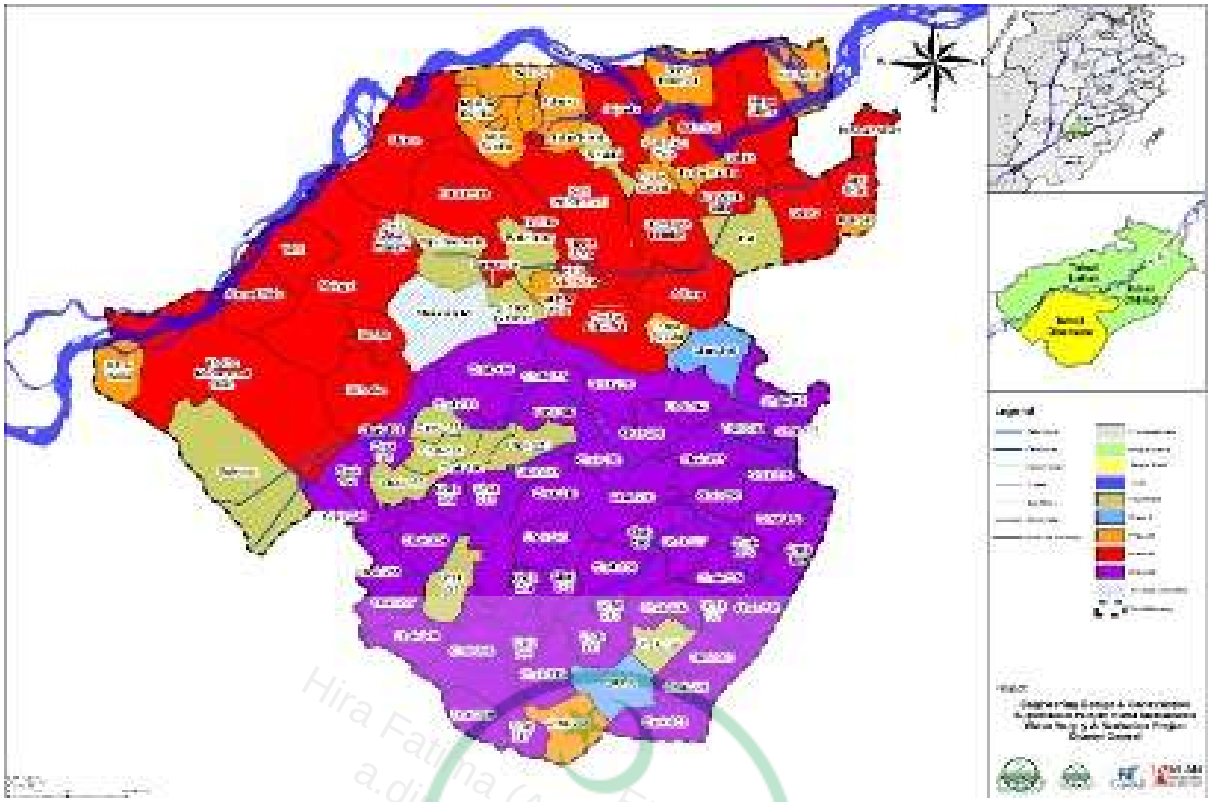


Figure 0-1, Project Location Map

ES-4. Project Proponent

Chief Executive Officer of Punjab Rural Municipal Services Company (PRMSC) is the proponent of project and intends to get Environmental approval for the said project as the proponent by submitting the Environmental Impact Assessment Report (EIA) for the compliance of section 12, PEPA, 1997 (Amended 2012).

ES-5. Brief Description of Project

Project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 0-1, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS	Covered Drains or Communal /

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
	or a Public Stand-post will be provided	Single / Multiple household's septic tanks with soakage pits to be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

ES-6. Need of EIA

This project involves construction / installation piped network along with tube wells, OHRS, Standposts, WWTPs and Septic tanks with soakage pits.

The project will be executed in the rural areas / villages that may have minor mitigatable environmental impacts during construction works like dust generation and noise etc. There is no resettlement required in the project as the project will be established on government owned land.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub clauses [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million & Wastewater Channels / Sewerage System Schemes].

After the review of the legal framework and the scope of project, it has been decided to conduct EIA of the said project.

ES-7. Major Impacts & their Mitigation Measures

In order to identify all the activities associated with the project during construction & operation phase with potential to cause significant environmental & social impacts and harm, a thorough review has been conducted. Project will not have significant negative impacts on the nearby community but may pose minor mitigatable impacts on environment in terms of dust, noise etc. And, the project will have positive impacts on the local population and country as a whole.

Table 0-2, Summary of Major Impacts during Construction & Operation Phase

Pollutant	Constructional Phase	Operational phase
Ambient Air Quality	• The impact on air quality is expected as a result of construction works, specifically excavation of the trenches	• Resources utilization i.e., fuel and energy for the operation of pumps and tube wells.

Pollutant	Constructional Phase	Operational phase
	which will generate dust with motorized equipment also generating gases. Smoke from vehicles, Generator and other fuel consuming machinery and Construction material.	
Noise and vibration	• During the implementation of the project, a large amount of equipment and construction machinery will be utilized for construction. • The equipment would include excavators, concrete mixer, trucks, generator and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the project area and neighborhood residential may be disturbed by the noisy activities.	• Noise and vibration emission and associated impacts during repairs and maintenance is expected to be low and will emanate from motorized equipment. This impact is expected to be low in nature and short term, experienced only in cases where motorized equipment is used. • Resources utilization i.e utilization of pumps and machinery also cause noise and vibration.
Odor	• Nil	• Nil
Flora and fauna	**Impact on Flora:** • A few trees and vegetation (like small grass) are present near the sites for proposed project activities. However, it will be made sure that no tree is cut during the construction. **Disturbance to Fauna:** • No impacts.	• No significant impact on flora and fauna during operation phase.
Solid Waste	• Solid waste will be generated due to construction activities and domestic sources. Also, due to sludge from septic tank.	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others: • Excavated soil. • Cement storage bags and other packets from materials used during repair and maintenance. • Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may

Pollutant	Constructional Phase	Operational phase
		also encompass solid wastes.
Soil Contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the project site and in its nearby surroundings. • Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites.	• Soil can be contaminated due to leaching of oil, fuel, from vehicles or machinery any stored oil. Storage & handling of hazardous chemicals.
Surface and Ground water contamination.	• Sewage and sanitary wastewater generated from the construction site may contaminate groundwater, if not disposed of properly. • Construction / installation of tube-wells (project components) on the embankment of canals may have the proximity to pollute surface water bodies during construction activities.	• Nill.
Health and safety issues	• Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death. • Accidents may also occur.	• Health and safety issues will be arising if flue gases or noise exceed the permissible limits of PEQS, and improper practice of work during storage, handling and transportation of fuel.
Socioeconomic	• Disturbance to neighbors by constructional activities • People's earning routes associated with the sites will be temporarily disturbed. • Employment opportunities will be enhanced	• Employment opportunities will be enhanced as staff will be hired for the operational purposes.
Gender & privacy issues	• Project activities may cause hindrance to mobility especially for women in terms of privacy or harassment, during construction stage.	• Privacy of the community may be disturbed.

Pollutant	Constructional Phase	Operational phase
	• Privacy of the community may be disturbed. • Harassment issues.	
Land acquisition	• Project will be executed on the lands owned by PRMSC / government owned land. • If private land has to the acquired, then land will be acquired through VLD by PRMSC; ultimately making the land as government owned.	• Nil
Mobility issues & Traffic management	• The roads maybe temporarily blocked at the active construction zone that may create problems of traffic for nearby community. • Blockage due to construction waste. • Blockage due to machinery and vehicles.	• The roads maybe temporarily blocked at the active construction zone during repair / maintenance in operation phase that may create problems of traffic for nearby community.
Loss of livelihood	• The project is of short duration and will not have significant impact on the livelihood of the community.	• Nil
Community health and safety	• The community health and safety must be ensured during construction phase especially the hazard of falls during excavation of trenches. • Accidents & disputes can also arise	• The community health and safety must be ensured during repair / maintenance in operation phase especially the hazard of falls during excavation of trenches.
Resettlement issues	• There are no resettlement issues during this project	• Nil
Child protection	• Child labor might get involved in the construction activity.	• Child labor might get involved in the construction activity during repair and maintenance.

Table 0-3, Summary of Recommendations during Construction & Operation Phase

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
Ambient Air Quality	• Tuning off vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM_{10} when they are not in use. • Equipment and vehicles powered with diesel should be well maintained and tuned to minimize particulate emissions. • Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin. • The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water-by-water trucks will be done. • As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.	• It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance and monitoring of vehicles, use of high-quality fuel, etc. • Further, the sub-project will be implemented through the significant use of manual labor and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.
Noise and vibration	• During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary. Contractor will ensure the use of well-tuned vehicles • Contractor will ensure the use of well-tuned machinery and skilled labor • Attenuation boxes can be installed • Silencer can be fitted to reduce and suppress the noise • Constructional activities should be planned or scheduled • Restricting access to noisy area • Shutting down the noisy	• The repair and maintenance works will mainly be carried out during the daylight working hours with no night working expected unless it is an emergency e.g., pipe burst or blockage. Mitigation measures will prescribe daylight working hours in the most affected zones.

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	equipment when not needed • Providing personal protective measures to labors working • Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/ mitigation measures applied where necessary.	
Odor	• Nil	• Nil
Impacts on flora and fauna	• In this sub-project, low impact is expected on vegetation (like small grass or shrubs but not trees) since the pipeline routes are devoid of significant unique floral and faunal life, as per design. No tree will be cut. • The clearing of sub-project sites through excavations for the pipelines (reservoir) will not affect flora and fauna and all the minor impacts caused by construction work on flora (like small grass / shrubs) are of temporary and reversible in nature and can be mitigated by appropriate good working practices that will be prescribed in ESIAESIA.	• Maintenance and monitoring of plantation around the sub-project corridor.
Solid Waste	• A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site. • The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping. • Arrangements should be made for regular garbage collection and removal of sewage from the construction site. • A barrier between surface water bodies and the active construction zone should be made	• The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would reduce wastes associated with oil spills, repair and maintenance. • The soil excavated during maintenance will be used as backfill and thereby reducing the generation of waste material and related waste pollution concern. • There will be limited hazardous wastes generated from this sub-project including the cement bags, grease and oil. Site for hazardous waste should we constructed using concrete so infiltration of

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	to make sure that no construction debris is disposed-off intentionally or unintentionally in the canals.	material in soil cannot take place • All wastes will be disposed in an approved waste disposal site. The operator will develop a Waste Management Plan (WMP) to guide the disposal of all types of wastes emanating from the sub-project
Soil erosion / Soil Contamination	• Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining the construction vehicles as well as generators. • The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste. • Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination. • Ground shall be leveled to avoid slopes. • Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.	• Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining and use of well-tuned vehicles as well as machinery & generators. • The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste. • Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination. • Ground shall be leveled to avoid slopes. • Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.
Surface and ground water	• Sewage from construction camp will be disposed of using septic tank • Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard. • Construction site effluent drainage should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents. • Efforts will be made to make sure that the surface water quality is not	• The water supply will be closed down during construction phase ensure that no polluted water gets into water supply.

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	disturbed in any way during the construction activities and contingency plans will be made to ensure that.	
Health and safety issues	• Occupational health and safety impacts during construction phase is considered to be of moderate in significance. The construction activities will use a mix of hand-held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained and skilled labor or personnel will be engaged in operating equipment. • Heath safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.	• Occupational health and safety impacts during operation/maintenance and repair is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery. The construction activities will use hand held tools in digging the trenches with very limited use of excavators. Experienced and trained personnel will be engaged in operating equipment. • First aid box should be present on sites • Construction safety SOPs should be followed. • Road lights should be maintained on construction sites at night • Labors should be provided with PPEs to avoid accidents. • Labors should be trained for healthy team work • Conflicts should be settled according with law • Labors should be trained for healthy team work • Sign boards should be displayed at sites
Socioeconomic	• People will be informed in advance when work is about to start at the site. • Job opportunity was provided to local people of the area	• Community wellbeing should be considered and neighbor's privacy should not be disturbed. • Local people should be preferred for the employment. • Working should be scheduled and informed to the concerned public.
Gender issue	• Workers would be trained to address privacy issues and ethically behaved.	• Workers would be trained to address privacy issues and ethically behaved.

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	• Labours would be strictly asked to cater the privacy issues. • staff capacity-building	• Labours would be strictly asked to cater the privacy issues. • Staff capacity-building
Land acquisition	• Project land is government owned, either by PRMSC or other government departments. So, all these relevant stakeholders have been consulted during the survey. Applications will be submitted for relevant NOCs / consent letters by PRMSC that will be submitted to EPA upon issuance.	• Nil
Traffic management	• Provision of alternative routes • Water sprinkling at sub-project site at consecutive intervals • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents • Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience • Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents; • In case of any complaint, focal person of GRC may contact (details will be highlighted at sub-project site).	• Provision of alternative routes • Indicators/signboards regarding alternate routes should be provided at proper distance to avoid accidents • Vehicles should be parked at designated points • Machinery after use should be allocated to designated places • Storage of construction material should store at proper places that should not affect mobility • Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience
Loss of livelihood	• As there will be no significant impact hence no mitigation measure is required	• Nil
Community health and safety	• Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62 will be ensured by the Contractor. • The active construction zone must	• The active construction zone must be cordoned off to avoid injuries due to accidents.

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	be cordoned off to avoid injuries due to accidents.	
Resettlement issues	• As no resettlement is required hence there will be no need for mitigation measures	• Nil
Child protection	• Child labor must be prohibited on sub- project site	• Child labor must be prohibited on sub- project site

ES-8. Proposed Environmental Monitoring

To oversee the environmental performance of the project through its lifecycle, enforcing the PEQS, an Environmental Monitoring Program should be formulated which ensures effective surveillance of the environmental parameters at various stages of the project development and compliances with PEQS and legal obligations. Monitoring for following Environmental Parameters is recommended:

Ambient Air

Regular monitoring for ambient air should be conducted during construction & operational activities of the project and report should be submitted to EPA Punjab.

Noise

Regular monitoring for noise level should be maintained periodically during construction & operational phases of the project and report should be submitted to EPA Punjab.

Water Quality

Regular monitoring of water quality should be conducted during construction & operational phases of the project and report should be submitted to EPA Punjab.

Table 0-4, Proposed Monitoring Schedule

Sr. No.	Parameters	Monitoring Schedules
1	Ambient Air Monitoring (NOx, COx, SOx, VOCs, PM10)	Quarterly
2	Noise Level	Quarterly
3	Water quality	Quarterly

Note: *7V^\ZWVUMV\ I T =WV\WZ\VO L I \ I TWO JWWS [PW]TL JM U I\V\ I\VML Ja XZW®MK\ XZWXWVMV\&*

ES-9. ESMMP Implementation and Monitoring Arrangements of EIA

LG&CDD / PRMSC-HO

Local Government and Community Development Department (LG&CDD) and / or Punjab Rural Municipal Services Company (PRMSC), Government of

Punjab is the Implementing Agency for Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSSP). The implementation of the project will be done through Project Implementation & Management Unit (PIMU) at LG&CDD. The Project Director (PD) of PRSWSSP based at PIMU will be assisted with team of experts, officers and supporting staff to ensure execution of the project as per action plan.

Service Delivery Units (SDU) at Tehsil Level (SDU-TO)

In the next step, there will be Service Delivery Units (SDU) at Tehsil level (SDU-TO). They will Support and coordinate with ESS and SSS throughout implementation of ESMMP at district / field level developed by the consultant.

Consultants

The safeguard team of the consultants will be responsible for the on-field supervision and monitoring of the implementation of ESMMP being done by the contractor. The contractor will report the progress of ESMMP to the safeguard team of the consultants. And the safeguard team of the consultants will report the progress to SDU-TO. SDU-TO will then report to PIMU who will then formulate a comprehensive report to be submitted to World Bank regarding the progress of implementation of ESMMP.

The Contractor

The Contractor will be responsible for on-field implementation of the ESMMP and environmental protection liabilities under the Punjab Environmental Protection Act (Amendment 2012) and World Bank's Environmental and Social Safeguard Policies. He will also be responsible for compliance of ESMMP provisions keeping in view his contract with PRMSC. The Contractor will train his crews in all aspects for implementation of the ESMP.

The ESMMP will be an integral part of the contract document. The bid would include a detailed environmental mitigation budget as part of the engineering costs of the respective works. Contractor will engage environmentalist to fulfil the above requirements.

ES-10. EIA Implementation and Monitoring Budget

The costs for the implementation of construction stage activities given in this EIA will be included within the civil works contract for this project with total cost of project is 553 million USD (WB: 442.40, GoPb: 110.60 (Million)). The total cost of EIA implementation is 1,520,575 PKR per village. Detail is given in Table 8-4.

ES-11. Grievance Redress Mechanism

Grievance Redress Mechanism will be applicable throughout the project under the World Bank GRM policy. It will deal all the public issues regarding Environment and social. GRM will hold the diversity of community and will

interact to all the community members. GRM will go in stages in accordance of WB policies and Punjab Local Government Ordinance 2021.

It is proposed to establish the following prior to commencing project implementation activities including pre-construction activities:

Tehsil Level-Public Complaints Center (PCC) in SDU-TO will be responsible to receive, log, and resolve complaints at site and in Village level. Complainant would be able to launch complaint on a toll-free number, app, message or call.

Teir 1: village level – Panchayt/Village Councils made under Punjab Local Government (Amendment) Ordinance 2021 will act as the 1st tier of GRM at village community level.

Teir 2: Grievance Redress Committee (GRC-Tehsil Level) in SDU-TO will be established for each district that will manage GRM aspects for all sub-project locations in each district including decisions to be taken, actions and monitoring of complaints resolution at sub-project level.

Teir 3: PIMU Level-GRC at PMIU (LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly review.

SECTION - 1: INTRODUCTION

This Environmental Impact Assessment (EIA) Report has been prepared for Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana, Punjab which is being funded by the World Bank and Local Government & Community Development Department (LG&CDD), Government of Punjab (GoPb) for Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) through Punjab Rural Municipal Services Company (PRMSC) and to be implemented by Local Government & Community Development Department (LG&CDD) through Punjab Rural Municipal Services Company (PRMSC) and supervised by the PRMSC itself and consultants appointed by PRMSC. This report has been prepared to meet compliance with environmental regulations and requirements under Punjab Environmental Protection Act (PEPA) (Amended 2012) and the World Bank's Safeguard policies applicable to the project.

1.1 Purpose of the Report

Environmental Impact Assessment (EIA) Report is being submitted to the Environmental Protection Agency (EPA), Government of the Punjab, Lahore for the compliance of Section 12 of Punjab Environment Protection Act-1997 (Amended 2012) for obtaining No Objection Certificate (NOC) before starting the construction activity at the project site. The other relevant regulations and guidelines considered while preparing this EIA report include:

- Policy and procedures for filing, review and approval of environmental assessments
- Guidelines for the preparation and review of environmental reports
- Guidelines for public participation writer
- Guidelines for sensitive and critical areas
- Detailed sectorial guidelines

Various aspects like environmental, social, physical and other aspects of the project at both during construction and its regular occupancy are highlighted in this EIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around, are also described. All the important information is also provided as described under the format used to help decision makers (EPA Punjab), before issuing the desired Environmental Approval.

1.2 Project Background

Punjab Rural Municipal Services Company (PRMSC) has been established under the Punjab Rural Sustainable Water and Sanitation Project approved by Punjab Development Working Party (PDWP) dated 03/09/2021. The project is being executed by Local Government and Community Development Department. Project Development Objective (PDO) of PRSWSSP is to "provide

equitable and sustainable access to safely managed water and sanitation, and reduce child stunting."

Government of the Punjab and World Bank are the sponsors and the project is spread over the period of 5 years. PRMSC has been established with the aim of providing improved water and sanitation facilities in 1,800 villages of Punjab. PRMSC is registered under Section 42 of Companies Act, 2017 and works in the coordination with Local Government and Community Development, Housing, Urban Development & Public Health Engineering, Irrigation, Health, and Livestock Departments. The mission of PRMSC is "To improve existing sanitation conditions, provide clean drinking water, improve living conditions through solid waste management, behaviour change and capacity building for the sustainability of the project in rural settlements of Punjab."

PRSWSSP aims at generating integrated benefits with the provision of safe drinking water to improve health and education with significant impact on poverty reduction, gender development, environmental improvement, and human resource development in the service areas. Major objectives include the following;

- Extend water supply, drainage and sanitation, solid waste management coverage through a professional and demand-driven approach, to the villages that did not have access to organized water supply in rural Punjab.
- Strengthen newly constituted Tehsil Councils / Village Councils and build their capacity to manage rural water supply and sanitation schemes and improve related management functions.
- Implement a behavioral change and hygiene awareness program to help the beneficiaries in the selected villages to efficiently use, develop and maintain improved water and sanitation facilities, under the project.

The PRSWSSP through its planned interventions for behaviour change, and water and sanitation investments are likely to provide dividends for the following:

- Increase household saving due to health outcomes and enhancement in productivity due to better health projected through the provision of clean drinking water and proper sanitation.
- Save time in fetching water, particularly for girls, by providing piped water supply to all the households of a village.
- Water conservation through water metering and efficient monitoring.
- Improve socio-economic well-being of masses belonging to neglected areas.

- Eliminate stagnant water bodies which are generating water related diseases, through proper sewage treatment and disposal.
- Re-use of treated wastewater for irrigation, and as far as possible make it a source of revenue.
- Proper solid waste management including animal waste.
- Improve child care; lower morbidity rates in children; and reduce infant mortality rates.
- Reduce the incidence of waterborne disease.
- Strengthen Tehsil Councils by improving their capacity to deliver services efficiently.
- The United Nations created 17 distinct but interrelated goals to guide global development between 2015 and 2030. Out of these sustainable development goals (SDGs), SDG 06 pertains to clean water and sanitation, which is; "ensure access to water and sanitation for all', and the goal is, "by 2030 achieve universal and equitable access to safe and affordable drinking water for all".

It is evident from the goals of SDG that instant project will be a positive step towards achieving these goals and targets.

1.3 Overview of the Project

The Government of Punjab has launched a project for service improvement in rural areas of the Punjab through Punjab Rural Municipal Services Company (PRMSC) which has been established under the section 42 of Companies Act 2017. This has been established through various studies that poor condition of WASH not only affects the health of population, but it also adversely affects the economic growth of that area. The WASH program works on long-term prevention and control measures for improving health, reducing poverty, and improving socio-economic development as well as responding to global emergencies and outbreaks of life-threatening illnesses. A number of mega initiatives have been taken by the Government, and international organizations in the urban areas of all provinces of Pakistan for the improvement of water and sanitation but the rural areas still remain neglected. Rural settlements of Punjab, which is almost 73% the provinces population living in 23,000 revenue villages, requires investments for improvement of WASH on urgent basis.

Pre-Feasibility Studies (PFS) have identified requirements for improving WASH Conditions of 1,800 villages which has been made part of the project for the water supply, sanitation and solid waste management interventions. Poverty, water contamination, stunting and sanitation condition of the areas have been taken as basic parameters for selection of the tehsils.

In Pakistan, water resources, specifically ground water, are under severe threat both in terms of quantity and quality. The ground water is stored in the pores of the soil through the infiltration of surface water. In cases where there is excessive use of groundwater for agricultural and all other purposes, sweet water zones are depleted causing the intrusion of saline / brackish water from saline zones.

In addition, when there is an excessive ground water extraction and decline of aquifer recharge, the quality of water is affected. Increase in the concentrations of arsenic and other potentially harmful contaminants are major threats to the health of the users.

In view of this situation, the Government of the Punjab through PRMSC, intends to develop projects for safe drinking water supply to the under-served rural population using localized and customized solutions with regard to sources, treatment technologies and supply options. The projects are also intended to promote sustainable O&M models with community engagement and participation. In Punjab, target area is 1,800 villages in 16 districts including: Khushab, Mianwali, Sargodha, Chakwal, Bhakkar, Pakpattan, Chiniot, Jhang, Rajanpur, Rahim Yar Khan, DG Khan, Lodhran, Bahawalpur, Muzzafargarh, Bahawalnagar and Multan. For this purpose, PRMSC has engaged Asian Consulting Engineers (Pvt.) Ltd. to plan, design and execute water and sanitation infrastructure in Revenue Villages of the following Tehsils of districts Jhang, Bhakkar, Chiniot and Pakpattan. This is called Cluster Central comprising of 401 Revenue Villages of Tehsils Ahmedpur Sial, Darya Khan, Bhowana and Pakpattan mentioned as under.

Sr. No.	Districts	Names/Number	
		Tehsils	No. of Revenue Villages
Central			
1	Jhang	Ahmedpur Sial	89
2	Chiniot	Bhowana	92
3	Bhakkar	Darya Khan	85
4	Pakpattan	Pakpattan	135
Total			**401**

This Environmental Impact Assessment (EIA) Report is prepared according to the World Bank Core Principles and Environmental and Social laws of Government of Punjab (GoP) – EPA Punjab, for tehsil Bhowana. It will be used to identify and mitigate the environmental and social impacts that may emerge during implementation of proposed project "Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana" which will be executed by PRMSC from the financial grant of PRSWSSP. This EIA follows the social and environmental appraisal and compliance as mentioned in the Environmental and Social Management Framework (ESMF) of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSSP).

The project comprises of construction / installation of piped network along with tube wells, standposts, OHRs, WWTPs, septic tanks, pumping machinery, electrification & other allied works.

1.4 Project Development Objective

Project Development Objective (PDO) of PRSWSSP is to "Provide equitable and sustainable access to safely managed water and sanitation, and reduce child stunting."

1.5 Project Area

As mentioned above, the project covers 401 Revenue Villages of four Tehsils of Districts Bhakkar, Chiniot, Jhang and Pakpattan which are Darya Khan, Bhowana, Ahmedpur Sial and Pakpattan respectively.

1.5.1 Priority Villages

Amongst above mentioned 401 Revenue Villages, there are 92 Revenue Villages of tehsil Bhowana are being developed through this project. Villages list and project location map showing 92 revenue villages of tehsil Bhowana is given below;

Table 1-1, Project Villages List of Tehsil Bhowana District Chiniot

Sr. No.	Tehsil	Village
Phase 00		
1	Bhowana	CHAK 156
2	Bhowana	CHAK 203
Phase 01		
3	Bhowana	THATTA RASALU
4	Bhowana	FATEH KOT TAJA
5	Bhowana	THATTA KUNDAL
6	Bhowana	ABHULKE
7	Bhowana	CHAK 248
8	Bhowana	KAMOKE
9	Bhowana	KOTLA SHAHZADA
10	Bhowana	MALAKE RAJOKE
11	Bhowana	MARAL WALA
12	Bhowana	SAGHAR WALA
13	Bhowana	SAIKE SALOKE
14	Bhowana	SHAH FATEH ALI
15	Bhowana	NAHRE HRSEH
16	Bhowana	KOT SAHIB
17	Bhowana	MEHROKE
18	Bhowana	THATTA VIROKA

Sr. No.	Tehsil	Village
19	Bhowana	AHMED WALA
20	Bhowana	HUSSAIN KHAN
21	Bhowana	JANI SHAH
22	Bhowana	LODHRE
23	Bhowana	SAHMBAL
24	Bhowana	SAMUNDER
25	Bhowana	CHAK 189
26	Bhowana	CHAK 228
27	Bhowana	CHAK 193
28	Bhowana	CHAK 244
29	Bhowana	CHAK 234
30	Bhowana	CHAK 154
31	Bhowana	CHAK 188
32	Bhowana	CHAK 236
33	Bhowana	CHAK 194
34	Bhowana	CHAK 249
35	Bhowana	CHAK 155
36	Bhowana	CHAK 186
37	Bhowana	CHAK 229
38	Bhowana	CHAK 222
39	Bhowana	CHAK 196
40	Bhowana	CHAK 212
Phase 02		
41	Bhowana	ADLANA
42	Bhowana	BUNGA
43	Bhowana	DURHATTAH KHARLAN
44	Bhowana	HARSE BULHA
45	Bhowana	KURK MOHAMMADI
46	Bhowana	LODHIA
47	Bhowana	MAINGNI
48	Bhowana	NAUSHEHRA
49	Bhowana	NITHARKE
50	Bhowana	NUR ALLAH DAD
51	Bhowana	SADEV
52	Bhowana	SAJANKE
53	Bhowana	TAHLI
54	Bhowana	THATTA FATEH ALI

Sr. No.	Tehsil	Village
55	Bhowana	THATTA LUNA
56	Bhowana	THATTA MYUHAMMAD SHAH
57	Bhowana	UBHAN
58	Bhowana	CHAK 157
59	Bhowana	CHAK 158
60	Bhowana	CHAK 185
61	Bhowana	CHAK 187
62	Bhowana	CHAK 198
63	Bhowana	CHAK 201
64	Bhowana	CHAK 202
65	Bhowana	CHAK 205
66	Bhowana	CHAK 206
67	Bhowana	CHAK 211
68	Bhowana	CHAK 227
69	Bhowana	CHAK 235
70	Bhowana	CHAK 237
71	Bhowana	CHAK 238
72	Bhowana	CHAK 241
73	Bhowana	CHAK 246
74	Bhowana	CHAK 239
75	Bhowana	CHAK 245
76	Bhowana	CHAK 197
77	Bhowana	CHAK 200
78	Bhowana	CHAK 210
79	Bhowana	CHAK 223
80	Bhowana	CHAK 240
81	Bhowana	CHAK 209
82	Bhowana	CHAK 243
83	Bhowana	CHAK 225
84	Bhowana	CHAK 242
85	Bhowana	CHAK 224
86	Bhowana	CHAK 207
87	Bhowana	CHAK 466
88	Bhowana	CHAK 247
89	Bhowana	CHAK 208
90	Bhowana	CHAK 204
91	Bhowana	CHAK 184

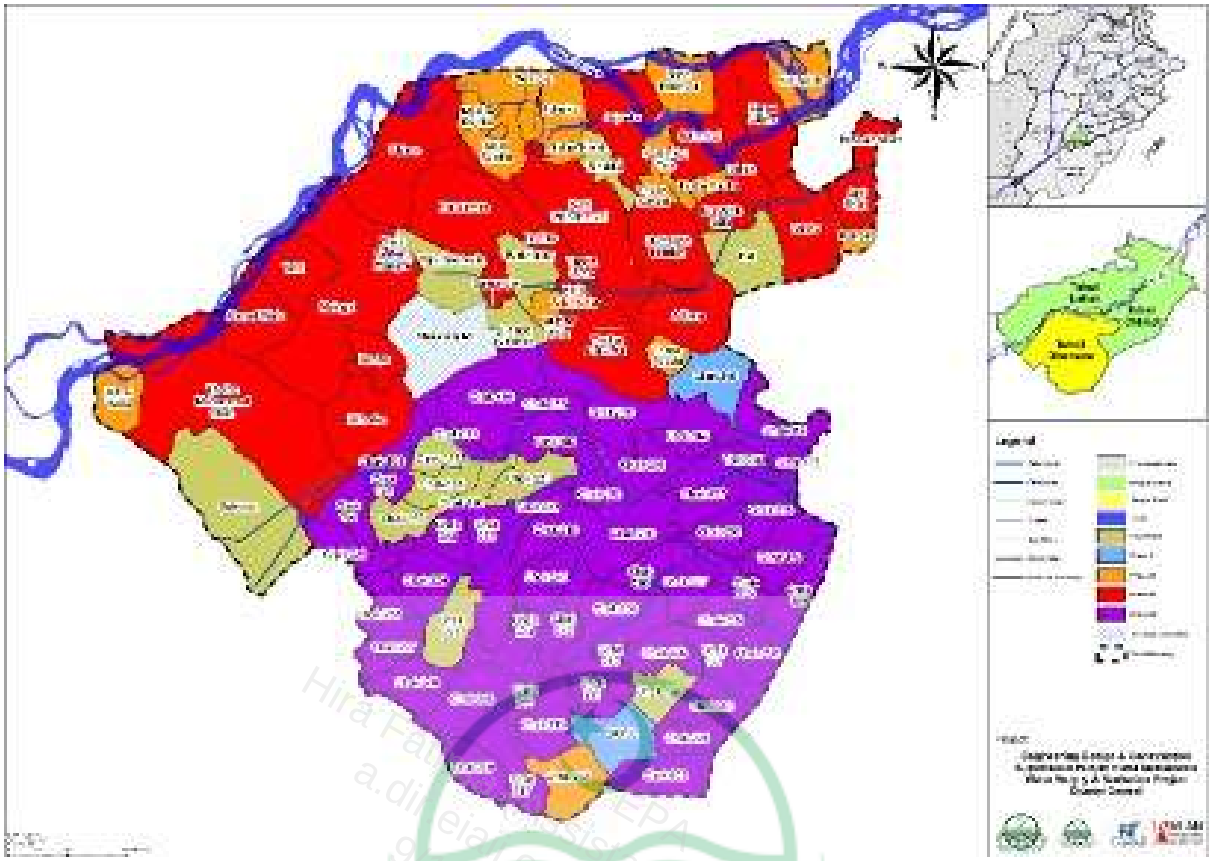


Figure 1-1, Project Location Map

1.6 Objectives of EIA

The major objective of this EIA study is the identification of the possible and induced impacts of the proposed project on both short and long-term basis. The impact identification process focuses particularly on biophysical, socio-economic and cultural aspects of the environment. Based on the level and nature of these observations, the EIA then delineates proper mitigation measures. As a planning tool, the EIA aims to ensure that environmental, socio-economic and cultural issues throughout the entire project lifecycle are anticipated and considered by the project proponent. It also serves as a framework for establishing project controls to reduce or prevent adverse environmental or socio-economic impacts.

The specific objectives of this EIA are:

- To assess the existing environmental and socioeconomic conditions of the project area;
- To identify potential impacts of the proposed project on the physical, ecological and social aspects of the project area, to predict and evaluate these impacts and determine their significance;
- To propose appropriate generic mitigation measures that should be incorporated in the design of the project to avoid or minimize if not eliminate the potentially adverse impacts;

- To assess the compliance status of the proposed activities with respect to the national and provincial environmental legislation and WB's OPs,
- To provide institutional, monitoring, reporting and documentation measures for environmental safeguards compliance;
- To aid decision makers to take informed decisions.

1.7 Identification of the Project

Project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 1-2, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS or a Public Stand-post will be provided	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub clauses [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million & Wastewater Channels / Sewerage System Schemes].

1.8 The Proponent

Chief Executive Officer of PRMSC, is responsible to get Environmental approval for the said sub-project as the proponent by submitting the Environmental Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

1.9 The Consultant

Asian Consulting Engineers Private Limited (AsCE) is providing the services to conduct environmental assessment for the project. Asian Consulting Engineers Private Limited is an independent consulting company working in the field of environment. AsCE provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The contact details for the company are given as under-:

Asian Consulting Engineers Private Limited
Tel: +92 42 35450914-5 | **Fax:** +92 42 35450916 | **Mobile:** +92 321 4260133
E-mail: arslan.hanif@asiancon.com, aleem.butt@asiancon.com
Address:C-3, Jhelum Block, Green Forts-II, Lahore, Pakistan.

1.10 Brief Description of Project

1.10.1 Nature & Size of Project

This project has been formulated on the basis of demand from public residing in the project area. Project is based on dire need basis because of existing water supply and sanitation system unable to serve ever increasing load and to meet the needs of water supply and sanitation needs of the community. The people are mainly relying upon ground water to meet their domestic demands including drinking water requirements. The residents have installed in-house handpumps / motor pumps to meet their demands including that of drinking water. Multiple water borne and sewerage related diseases been observed in project area / villages. Some of the common diseases are typhoid, cholera hepatitis, diarrhea, intestinal worms and malaria etc. in sub-project area / villages.

If water supply system & sanitations services system is not improved / developed at this stage, then people residing there will be adversely affected.

Project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 1-3, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS or a Public Stand-post will be provided	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
		be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

1.11 Project Location

The project is located in Tehsil Bhowana, Punjab. Bhowana is a historic town situated in Central Punjab, Pakistan, geographically located at approximately 31°33'52.78" North latitude and 72°38'41.02" East longitude, with an average elevation ranging from about 157 to 171 meters above mean sea level. Bhowana lies nearly 38.3 km (23.79 miles) south of Chiniot and about 52.1 km (32.37 miles) south-west of Faisalabad, while it is 46.9 km (29.14 miles) from Jhang District. The Chenab River enters from the north-eastern side of the district and flows towards the south-west, playing a significant role in the irrigation, agriculture, and hydrological system of the region. The project area comprises 92 revenue villages located within Tehsil Bhowana. According to the 2023 Population and Housing Census of the Pakistan Bureau of Statistics, Bhowana Tehsil has a predominantly rural population, reflecting the agricultural importance of the area. The project location map showing the spatial distribution of these revenue villages is presented below:

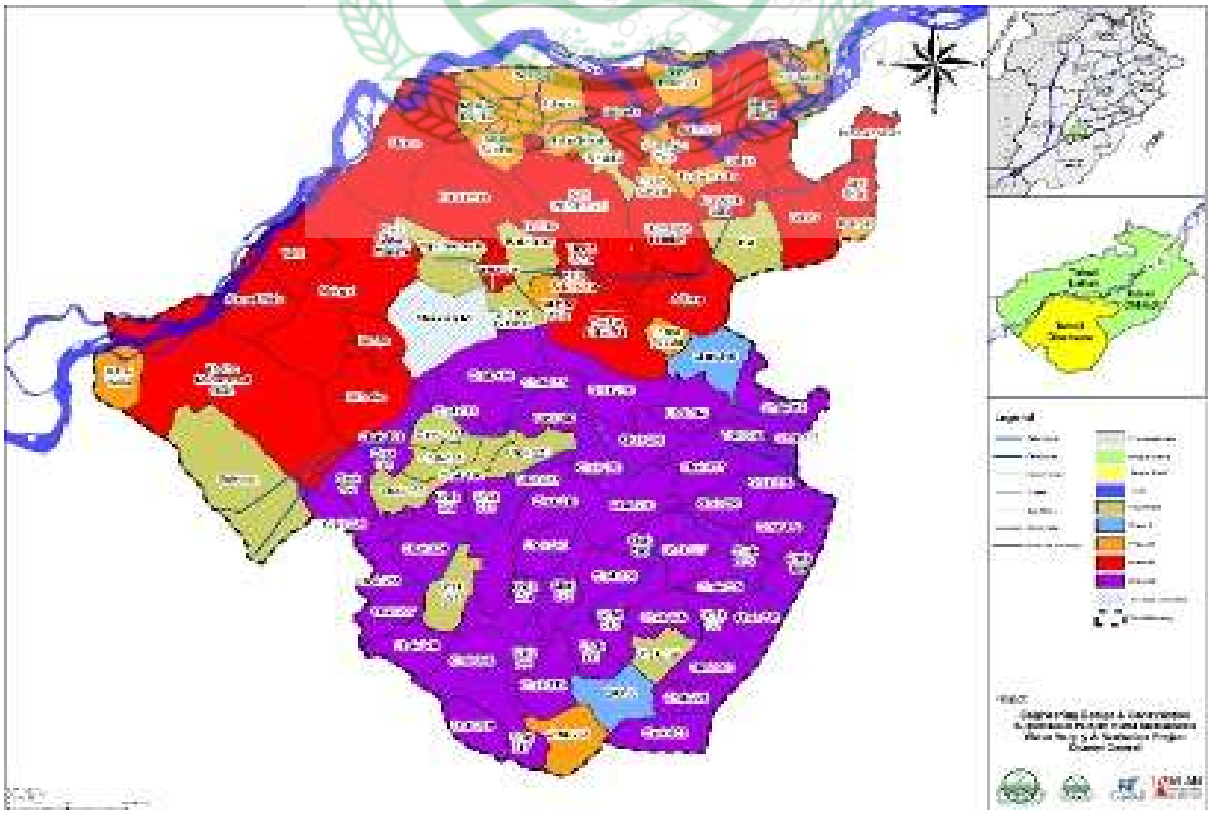


Figure 1-2, Project Location Map

1.12 Approach & Methodology to Work

1.12.1 Approach

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines, 1997 and the World Bank Safeguards policies (OP4.01, OP4.04, OP4.36, OP4.11 and OP4.12) applicable to this project. The study is based on both primary and secondary data and information. The primary data includes data collected from field i.e., information about land use; environmental sampling and analyses for air, water and noise; biodiversity & ecological survey; social survey including demographic characteristics, income dependency & quality of life, occupation, agriculture and cropping pattern and social amenities etc. The secondary data includes a review of relevant information from literature. Discussions were held with stakeholders including government officials, community representatives and a wide range of people living in the area. The main purpose of this approach was to obtain an impartial impression of the people's perceptions about the project and its environmental and social impacts.

1.12.2 Methodology

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

A) Orientation

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

B) Data Collection Planning

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

C) Detailed Field Survey

Detailed site visits for collection of data were conducted in November, December (2025), January, February, March, & April, (2026). The data collected from field include:

- Identification of environmental sensitive receptors including air sensitive receivers, noise sensitive receivers and water bodies expected to receive pollutant load;
- Sampling and analysis for air, noise and water;

- Ecological survey;
- Socioeconomic survey including public consultation;
- Stakeholders' consultation;

Meetings with different departments were held and subsequent data was collected.

D) Sampling & Analysis of Physical Environmental Parameters

Asian Environmental Services Private Limited, which is EPA certified laboratory, was hired for physical environmental sampling and mobilized on 23/12/2026 to 24/13/2026 for sampling and analysis of air quality, water and noise quality. Samples were collected from two (02) locations for analysis in the laboratory.

E) Review of Secondary Data

Previous environmental and social soundness assessment for Bhowana and other published and unpublished information was collected in order to gain a complete understanding of existing environmental conditions of the area including:

- **Physical environment:** topography, geology, soils, surface and ground water resources and climate;
- **Biological environment:** habitat types, flora and fauna (particularly rare or endangered species), critical habitats/zones and vegetation communities within the sub-project area;
- **Socio-economic environment:** settlements, socio-economic conditions, infrastructure and land use.
- **Heritage aspects:** sites of cultural, archaeological or historical significance.

F) Corridor of Impact (COI) / Area of Impact (AOI)

AOI include the actual project Right of Way (ROW) as well as the area in the surroundings in which positive and adverse impacts may be foreseen due to the implementation of the proposed project. The area of influence is the area likely to be affected by the project, including all its ancillary aspects, such as relocation and access roads, borrow and disposal areas and construction camps, as well as unplanned developments induced by the project (e.g., spontaneous settlement, logging, or shifting agriculture along access roads).

G) Stakeholder Consultations

For this EIA study, stakeholder consultation was carried out through questioners and one on one meeting. The EIA team met with the government functionaries, affected persons and local communities along the proposed route. The objective of the consultation was to disseminate information on the project and its expected impact, long-term as well as short-term, among

primary and secondary stakeholders and to gather information on relevant issues so that the feedback received could be used to address these issues at an early stage.

H) Environmental and Social Impact Assessment

The data collected from the field was analyzed and the impacts of the proposed project on the physical, biological and socio-economic environment prevalent in the project area were identified and characterized with respect to significance and probability of occurrence at the design, construction, operation and decommissioning phases. The impacts were analyzed using various tools such as

- Overlay Mapping
- Screening Checklists
- Impacts matrix

Possible mitigation measures and implementation mechanisms are proposed so that the impacts can be mitigated / controlled and the project implementation remains sustainable.

I) Development of Environmental and Social Management & Monitoring Plan (ESMMP)

An ESMMP for the proposed project activities was prepared. The ESMMP provides a plan for implementing and managing the mitigation and monitoring measures recommended in the EIA. The ESMMP includes the following:

- Mitigation and monitoring plan.
- Definition of roles and responsibilities of the proponent, contractors and monitoring teams.
- Requirements for communication, documentation and training during the project.
- Restrictions on design, timing and conduct of the project.
- Change Management Plan to cover unforeseen events / environmental conditions during the project.

1.13 Structure of Report

The structure of this report is listed below:

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

Section 2: Legal and Administrative Framework Lists national as well as provincial laws, regulations and procedures and applicable World Bank Operational Policies (OPs).

Section 3: Scoping will discuss the spatial and temporal boundaries of the project. Important issued raised by the community during the consultative

sessions and significant impact that are determined during the initial visits.

Section 4: Project Description provides an overall description of the project including proposed alignment, design considerations and concepts, manpower requirement, waste generation, machinery and material requirements.

Section 5: Project Alternatives enlists possible design alternatives for the said project and their influence on environment and social situation.

Section 6: Baseline Environmental & Social Conditions gives a description of baseline physical, biological and socio-economic conditions of the project area.

Section 7: Public Consultation and Information Disclosure identify the main stakeholders and their concerns rose during scoping sessions and deals with the measures to mitigate the social impacts.

Section 8: Potential Environmental and Social Impacts and their Mitigations Measures identify, predicts and evaluates impacts of the project activities during the construction and operation stages and deals with the measures proposed to mitigate potential environmental impacts of the proposed project.

Section 9: Environmental and Social Management Plan:

This section outlines organizational framework, mitigation and monitoring plans training requirements, defines roles and responsibilities, estimates budgets requirements for satisfactory implementation.

Section 10: Grievance Redress Mechanism: Committees for grievance redressal and process for amicable resolution of any grievance faced by the community.

1.14 EIA Team

A multidisciplinary team conducted the EIA study. The team consisted of environmentalists, ecologists and sociologists.

The team of experts are given as under;

Table 1-4, List of EIA Team Members

Sr. No.	Name	Designation	Department
1.	Hussain Kamran	Environment Specialist	PRMSC-HO
2.	Haji Aman Ullah Saifi	Social & BCC Specialist	PRMSC-HO
3.	Asma Abdul Ghuffar	Gender Specialist	PRMSC-HO
4.	Hafiz Abdul Rasheed	Deputy Manager (I&S)	PRMSC-TO
5.	Muhammad Hussain	BCC Officer	PRMSC-TO
6.	Ehtisham Ali	Research Analyst	PRMSC-TO
7.	Aleem Butt	Environment Specialist	AsCE
8.	Noman Ashraf	Environment Specialist	AsCE

Sr. No.	Name	Designation	Department
9.	M. Abbas	Environment Specialist	AsCE
10.	Ayesha Rasheed	Environment Specialist	AsCE
11.	Wahab Ali	Environmentalist	AsCE
12.	Eisha Mehmood	Environmentalist	AsCE
13.	Aftab Reham	Sociologist and Resettlement Specialist	AsCE
14.	Atif Hussain	Sociologist and Resettlement Specialist	AsCE
15.	Javeria Islam	Sociologist	AsCE
16.	Sidra Minhas	Gender Specialist	AsCE
17.	Muhammad Ibrar	Ecologist	AsCE
18.	Sajjad Hussain	Chief Chemist	AsCE

Hira Fatima (Assistant Director (EIA)-2)
EPA

SECTION - 2: REGULATORY AND POLICY REVIEW

2.1 Overview

This chapter provides details of the national / provincial legislations, regulations, EPA guidelines, World Bank Operational Policies and Guidelines which are relevant and applicable to the sub-project.

2.2 National and Provincial Legislative Framework

Table 2-1, National and Provincial Legislative Framework

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
1.	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.	The core areas that are relevant in the context of the proposed sub-project are pollution prevention during construction and conserving biodiversity and forestry.
2.	Punjab Environmental Protection Act, 1997 (Amended 2012)	The Punjab Environmental Protection Act, 1997 (Amended, 2012 & 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 interrelationships	The provision of the act is applicable to proposed sub-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, section 13 of the act prohibits the import of hazardous waste.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
		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 recent amendment of 2012, legislatives 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 (GoP) 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.	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.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
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	
4.	Pakistan Environmental Protection Agency, (Review of IEE / EIA) Regulations, 2000	These regulations set out: • Key policy and procedural requirements for filing an EIA; • The purpose of environmental assessment; • The goals of sustainable development; • 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.	The provisions of these regulations are applicable for environmental screening of the project, which implies that an Environmental study is required for the proposed project. The process described in the regulation will be useful for PRMSC to follow the procedure to file an Environmental study with Punjab-EPA and to understand its review process along with timelines to be followed.
5.	Pakistan Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2022	These regulations set out: • Key policy and procedural requirements for filing an EIA; • The purpose of environmental assessment; • The goals of sustainable development;	The provisions of these regulations are applicable for environmental screening of the project, which implies that an Environmental

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-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.	study is required for the proposed project. The process described in the regulation will be useful for PRMSC to follow the procedure to file an Environmental study with Punjab-EPA and to understand its review process along with timelines to be followed.
6.	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.
7.	The Canal and Drainage Act 1873 and amendment 2016	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	This act will be applicable as the sub-project is for improvement and development of water supply and sewerage system and some of the tube wells will be installed at the bank of canals passing over there near the revenue villages.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
		magistrate a person who has willfully damaged or obstructed the canal or "rendered it less useful."	
8.	Punjab Water Act, 2019	This act provides a framework for comprehensive management of all water resources in the Punjab and to regulate their use in the interest of conservation and sustainability	This act will be applicable as the project is for improvement and development of water supply system.
9.	Punjab Water Policy, 2018	This Punjab Water Policy is a sectoral policy document at provincial level. The overall objective of Punjab's Water Policy is to provide clear policy directions to the Government of Punjab on the sustainable management and development of water from all sources of water (surface water, groundwater and rainwater), for all sub-sectors of water use (domestic, stock water, agriculture, industry, commercial and environment) and for all regions (Indus basin canal commands and outside the canal commands) at the basin level through equitable water allocations, management and development.	This act will be applicable as the project is for improvement and development of water supply system.
10.	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.
11.	Motor Vehicle Rules 1969	It defines powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions during operation phase.	This act is applicable to the gaseous emission that will be released from sub-project vehicles.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
12.	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	This act is applicable to sub-protect; the rights of labor involved in the sub-project implementation.
13.	The Bonded Labour System (Abolition) ACT 1992	According to this act, forced labour is any type of work or kind of service in which someone engages involuntarily and under implied coercion a manifest threat of a party or oppression measures. The bonded labour can exist in following forms under different situations: • Bonded labour in exchange of advance/an amount of money given before services are rendered, received by a person or his family. • Bonded labour as a consequence of some social or customary obligations. • Bonded labour in exchange of an economic benefit/consideration received by a person or his family, • Bonded labour of a guarantor in exchange for debtor who was unable to pay off his debt. Bonded labour is prevalent in agriculture sector, brick kilns, domestic work and begging.	This act is applicable to sub-protect; the rights of labor involved in the sub-project implementation.
14.	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	This act provides guidelines to protect the trees present in the sub-project corridor.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
		reserved and protected forests. There is no protected forest situated in and around the Project area.	
15.	Employment of Child 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 sub-project.
16.	The Land Acquisition Act, 1894	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 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.	This act will not trigger as no land acquisition is required.
17.	The Punjab Land Acquisition Rules, 1983,	It describes the land acquisition procedure for public purposes or for a company.	This act will not trigger as no land acquisition is required.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
18.	Provincial 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.	This act will not trigger as no trees will be cut and no habitat loss will not occur.
19.	Pakistan Antiquities Act 1975 and 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 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.	The law will be applicable to the project mainly due to its two provisions: • According to the law, any construction activity within 61 meter 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 sub-Project.
20.	The Punjab Special Premises (Preservation) Ordinance, 1985	It is expedient to preserve certain premises of historical, cultural and architectural value in the Punjab and to control and regulate alterations therein and demolition and re-erection thereof and for matters ancillary thereto;	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 sub-Project.
21.	Katchi Abadis Act, 1987	The Katchi Abadis Act covers the urban squatter's rehabilitation	This act is not triggered as there is

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
		rights by providing plots in public resettlement areas or cash assistance.	no resettlement required in this project
22.	Land Revenue Act, 1967	Determination of disputes under section 44 of LR Act 1967 sub-section (2) If in any such dispute, the Revenue Officer is unable to satisfy himself as to which of the parties thereto is in possession of any property to which the dispute relates, he shall (a) if he be not below the rank of Assistant Collector of the first grade, ascertain, after an inquiry in which an opportunity shall be given to all the parties, to the dispute of being heard and adducing evidence in support of their claims, who is the person best entitled to the property, and shall by written order direct that the person be put in possession thereof, and that entry in accordance with that order be made in the record or register; and (b) if he be below the rank of Assistant Collector of the first grade, report the matter to the Assistant Collector of the first grade, who shall thereupon proceed in the manner provided in clause (a). (3) A direction under sub-section (3) shall be subject to any decree or order which may be subsequently passed by any Court of competent jurisdiction.	This act will not trigger as no land acquisition is required.
23.	Colonization of Government Lands Act, 1912	This Act shall, unless the Provincial Government, otherwise directs, apply to land to which the provisions of the Government Tenants (Punjab) Act 1893, have been applied and to any other land to which the Provincial Government may by notification in the Official Gazette apply it and which at the time of the notification was the property of the Provincial Government ,Provided that unless the Provincial Government by general or special order otherwise	This act will be triggered as some of the Tube wells / OHRs / WWTPs are proposed at the government land.

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance with the sub-project
		directs nothing in Sections 20, 21, 22 and 23, or in the proviso to section 14, of this Act shall, apply to tenancies specified in Schedule I of this Act, or to any class of tenancies created hereafter which the Provincial Government may declare to be scheduled tenancies under this section.	
24.	Protection of Trees and Brushwood Act, 1949	Act refers to save trees / brushwood / greenery / plantations to make the environment better for living.	This act will be triggered as saving trees / plantations is one of the major parts of this ESMP.
25.	National Forest Policy, 2015	This act is for the protection of forests.	This act will not be triggered as there is no forest present in sub-project area.
26.	Punjab Restriction of Employment of Children Ordinance, 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.	The relevance of this act to the project will be to prohibit child employment for construction of the proposed sub-project.
27.	Guidelines for Public Consultation, 1997	Act refers to the guidelines for conducting public consultations.	This act will be triggered as consultation with public is main component of this ESMP.

2.3 Comparison of International and Local Environmental Legislations

In order to select the most stringent standards applicable, a mix of local (PEQS) and international (IFC) regulations have been adopted. The IFC Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental, Noise Management has noise level guidelines for daytime and nighttime, which are applicable. It shall be ensured that all necessary noise mitigation measures are implemented to minimize the noise levels in the sub-project area.

Table 2-2 presents IFC workplace noise standards that are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the Sub-

project should not result in an increase of more than 3 dB(A) over existing ambient noise at the nearest receptor location off-site.

Table 2-2, IFC Work Environment Noise limits

Sr. No.	Type of Work, workplace	IFC General EHS Guidelines
1	Heavy Industry (no demand for oral communication)	85 Equivalent level Leq,8h
2	Light industry (decreasing demand for oral communication)	50-65 Equivalent level Leq,8h

A comparison of applicable local and international guidelines for ambient air quality has been provided in Table 2-3 below. In the case of most pollutants, the PEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO / IFC standards. The applicable and most stringent parameters for each respective pollutant are highlighted in green.

Table 2-3, Comparison of International and local Air Quality Standards

Sr. No.	Pollutants	USEPA		WHO / IFC		PEQS	
		Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
1.	SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr	40 ug/m^3	Annual Mean 24 hrs	80 ug/m^3 120 ug/m^3
2.	CO	8 hrs 1 hr	9 ppm (11 mg/m3) 35 ppm (43 mg/m3)	-	-	8 hrs 1 hr	5 mg/m^3 10 mg/m^3
3.	NO_2	Annual Mean 1 hr	100 ug/m3 (53 ppb) 100 ppb	24Hour Annual Mean	25 ug/m^3 10 ug/m^3	Annual Mean 24 hrs	40 ug/m^3 80 ug/m^3
4.	O_3	8 hrs	0.07ppm (148 ug/m3)	8 hrs daily maximum 8hr mean peak season	100 ug/m^3 60 ug/m^3	1 hr	130 ug/m^3
5.	TSP	-	-	-	-	Annual Mean 24 hrs	360 ug/m^3 500 ug/m^3
6.	PM_{10}	24 hrs	150 ug/m3	Annual Mean 24 hr	15 ug/m^3 45 ug/m^3	Annual Mean 24 hrs	120 ug/m^3 150 ug/m^3
7.	$PM_{2.5}$	Annual Mean 24 hrs	15 ug/m3 35 ug/m3	Annual Mean 24 hr	5 ug/m^3 15 ug/m^3	Annual Average 24 hrs 1 hr	15 ug/m^3 35 ug/m^3 15 ug/m^3

The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

In instances where the air shed is significantly degraded and the pollutant levels are already exceeding the ambient pollutant concentrations provided in the table above, it shall be ensured that the sub-project activities cause as small an increase in pollution levels as feasible, and amounts to a fraction of the applicable short term and annual average air quality guidelines or standards as established in the project specific environmental assessment.

Similar to the standards for air quality, the comparison of noise standards provided in Table 2-4 clearly shows that PEQS standards for noise are more stringent in comparison to the IFC standards. The only exception is the daytime noise level standard for Industrial areas where the IFC standard is more stringent i.e., 70 dB(A) in comparison to PEQS i.e., 75 dB(A) and so for this particular parameter, the IFC standard will be used. Apart from this one exception, the PEQS standards have been used for the proposed project. Further, the IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the sub-project should not result in an increase of more than 3 dB over existing ambient noise at the nearest receptor location off-site.

Table 2-4, Comparison of International and Local Noise Standards

Sr. No.	Category of Area/Zone	Limit in dB(A) Leq			
		PEQS		WHO/IFC	
		Day Time 06:00 – 22:00	Night Time 22:00-06:00	Day Time 07:00 – 22:00	Night Time 22:00-07:00
1	Residential area (A)	55	45	55	45
2	Commercial area (B)	65	55	70	70
3	Industrial area (C)	75	65	70	70
4	Silence zone (D)	50	45	55	45

* The standards highlighted in green for each respective Area/Zone are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

* In instances where baseline noise levels are already exceeding the standards above, it will need to be ensured that the sub-project activities do not cause an increment of more than 3 dB(A) from the baseline noise levels.

Table 2-5 presents the vibration levels below which there is no risk of damage to buildings. These limits apply to vibration frequencies below 15Hz where the most conservative limits are required and are presented for both transient and continuous vibrations. For protected or potentially vulnerable buildings, the recommended construction vibration limit is reduced by half.

Table 2-5, Maximum Permissible Construction Phase Vibration Levels

Building Type	Vibration Limit - PPV for Transient Vibrations for Frequencies <15Hz	Vibration Limit – PPV for Continuous Vibrations for Frequencies <15Hz
Structurally sound and not protected structures	12.5 mm/s	6.25 mm/s
Protected and/or vulnerable structures	6 mm/s	3 mm/s

Source: British Standard (7385-2) 'Evaluation and Measurement for Vibration in Buildings, A Guide to Damage Levels Arising from Ground borne Vibration, 1993

The comparison of water quality standards provided in Table 2-6 and Table 2-7 clearly shows the PEQS standards for surface and drinking water quality as compare to WHO and FAO standards.

Table 2-6, Comparison of National and International Drinking Water Standards

Sr. No.	Parameter	Units	PEQS	WHO Standards
1	Temperature (During Sample Collection)	OC	NS	NS
2	Color	Pt-Co	≤15TCU	<15TCU
3	pH	pH unit	6.5-8.5	6.5-8.5
4	Turbidity	NTU	<5	<5
5	Total, Hardness	mg/L	<500.00	NS
6	Total Dissolved Solid (TDS)	mg/L	<1000.00	<1000.00
7	Total Suspended Solid (TSS)	mg/L	NS	NS
8	Ammonia	mg/L	NS	NS
9	Fluoride F-	mg/L	<1.50	1.50
10	Sulfate (SO4-2)	mg/L	NS	NS
11	Chloride (Cl-)	mg/L	<250.00	250
12	Nitrate (NO3)-	mg/L	<50.00	50.00
13	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable
14	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable
15	Sodium	mg/L	NS	NS
16	Iodine	ppm	NS	NS
17	Arsenic (As)	mg/L	< 0.05	0.01
18	Iron (Fe 3+)	mg/L	NS	NS
19	Zinc (Zn 2+)	mg/L	5.0	3.0
20	Conductivity	µS/cm	NS	NS

Sr. No.	Parameter	Units	PEQS	WHO Standards
21	Bicarbonate	mg/L	NS	NS
22	Nitrite	mg/L	<3	3
23	Magnesium	mg/L	NS	NS
24	Calcium as Ca	mg/L	NS	NS
25	Phosphate	mg/L	NS	NS
26	Potassium	mg/L	NS	NS
27	Boron	mg/L	<0.3	0.3
28	SAR Iodine (I)	mg/L	NS	NS
29	Aluminum	mg/L	< 0.2	0.2
30	Antimony	mg/L	<0.005	0.02
31	Cadmium	mg/L	0.01	0.003
32	Mercury	mg/L	<0.001	0.001
33	Nickel	mg/L	<0.02	0.02
34	Selenium	mg/L	0.01	0.01
35	Barium	mg/L	0.7	0.7
36	Total Chromium	mg/L	<0.05	0.05
37	Copper	mg/L	2	2
38	Lead	mg/L	<0.05	0.01
39	Cyanide (CN)	mg/L	<0.05	0.07
	Manganese	mg/L	<0.5	0.5
40	Total Coliforms	cfu/100ml	0/100 ml	0/100 ml
41	Fecal Coli forms (E.Coli)	cfu/ml	0/100 ml	0/100 ml

NS = Not Specified

* The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project. Other are same in both case.

Table 2-7, Comparison of National and International Surface Water Standards

Sr. No.	Parameter	Units	PEQS (Regional)	WHO Class V (Agriculture)	FAO Standards
1	Temperature	OC	--	--	--
2	pH	pH unit	6-9	<5.3	6.0-8.5
3	COD	mg/L	150	>30	--
4	(BOD5)	mg/L	80	--	--

Sr. No.	Parameter	Units	PEQS (Regional)	WHO Class V (Agriculture)	FAO Standards
5	Solids, Total dissolved (TDS)	mg/L	3500	--	0-2000
6	Solids, Total suspended (TSS)	mg/L	200	--	--
7	Chloride	mg/L	1000	--	0-1065
8	Fluoride (F-)	mg/L	10	--	--
9	Oil & grease	mg/L	10	--	--
10	Phenols, Total (Phenolic Compounds)	mg/L	0.10	--	--
11	Cyanide(CN-)	mg/L	01.00	--	--
12	Anionic Detergents as MBAS	mg/L	20.00	--	--
13	Sulfate (SO4-2)	mg/L	600	--	0-960
14	Sulfide (S)	mg/L	01.00	--	--
15	Ammonia NH3	mg/L	40.00	--	--
16	Cadmium (Cd)	mg/L	0.10	>0.0039 mg/L	--
17	Chromium (Cr) as Hexavalent & Trivalent	mg/L	1.00	>0.016 mg/L	--
18	Copper (Cu)	mg/L	1.00	>0.018 mg/L	--
19	Lead	mg/L	0.50	>0.082 mg/L	--
20	Nickel	mg/L	1.00	>1.4 mg/L	--
21	Zinc	mg/L	5.00	>0.12 mg/L	--
22	Iron	mg/L	8.00	--	--
23	Manganese	mg/L	1.50	--	--
24	Selenium	mg/L	0.50	--	--
25	Silver	mg/L	1.00	--	--
26	Arsenic	mg/L	1.00	>0.36 mg/L	--
27	Barium	mg/L	1.50	--	--
28	Magnesium	mg/L	--	--	0-61
29	Nitrate	mg/L	--	--	0-10
30	Sodium	mg/L	--	--	0-920
31	Boron	mg/L	6.00	--	0-2
32	Mercury	mg/L	0.01	>0.0024 mg/L	--
33	Chlorine	mg/L	01.00	--	--
34	Total Toxic Metals	mg/L	02.00	--	--
35	Turbidity	NTU	NS	--	--
36	Oxygen, Dissolved	mg/L	NS	--	--
37	Pesticides	µg/L	NS	--	--

Sr. No.	Parameter	Units	PEQS (Regional)	WHO Class V (Agriculture)	FAO Standards
38	Nutrients as Potassium	mg/L	--	--	0-2
39	Nutrients as Nitrogen	mg/L	--	--	--
40	Nutrients as Phosphorous	mg/L	--	--	--
41	Total Coliform	MPN/100ml	--	--	--
42	Fecal Coliform	MPN/100ml	--	--	--

NS = Not Specified

* The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed sub-project. Other are same in both case.

PEQS standards for ambient air quality, noise, water and wastewater were adopted as more parameter are covered in PEQS as compare to WHO and FAO guidelines may provide are clearer picture of baseline environmental conditions of the sub project area. Moreover, IFC itself guides that local standard i.e., PEQS should take precedence over any other international regulations.

2.4 International Laws / Treaties

2.4.1 The World Bank Operational Policies

The World Bank (WB) has approved a series of Operational Policies which define the conduct of WB operations. A summary of the status of those Operational Policies which relate to environmental and social impacts are provided in the following sections.

Table 2-8, Assessment of Applicable World Bank Operational Policies

Safeguard Policies	Triggered?	Explanation
Environmental Assessment OP/4.01	Yes	The ESMP in hand is fully committed to the requirements determined in the WB Safeguard Policy. The environmental works carried out by the consultants on behalf of project proponents have been essentially guided by these rules as enunciated in the OP 4.01. This sub-project has been categorized as 'Category B'. The sub-project activities under Component 3 may potentially cause negative environmental and social impacts. The sub-project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented.
Natural Habitats (OP/BP 4.04)	No	This OP is not triggered.

Safeguard Policies	Triggered?	Explanation
Physical Cultural Resource OP/4.11	No	The sub-project does not lie in any near any cultural and heritage resource therefore OP 4.11 will not be triggered. The possible discovery of archaeological sites or random findings during the excavation and earthworks may occur. In such case, this OP will trigger.
Involuntary Resettlement OP/4.12	No	OP 4.12 is not triggered as the sub-project does not require any land acquisition, therefore there be no involuntary resettlement, livelihood impacts, or restrictions on access. Consequently, there is no need of a Resettlement Action Plan.
Forests (OP/BP 4.36)	No	The sub-project area does not fall under forest area and will not affect any forest. So this OP is not triggered.

2.4.2 World Bank Environmental, Health and Social Guidelines

The principal World Bank publications that contain environmental and social guidelines are listed below.

- Environment, Health, and Safety (EHS) Guidelines prepared by International Finance Corporation and World Bank in 2007
- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook
- WB Committee on disability-inclusive development
- WB guidelines on labour influx
- WB Group Gender Strategy

;85 7:C 9]QLMTQVM[NWZ 5WV[\Z]K\QWV IVL 6MKWU UQ[[QWVQVO$ IVL ;<? O]QLMTQVM[IZM I\\IKPML I[IVVM`]ZM&

?\PMZ BMTM^IV\ GWZTL 4IVS 9]QLMTQVM[IVL @WTQKQM[IZM OQ^MV JMTW_2

2.4.3 Guidance Note on Labour Influx

A Guidance Note for "Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labour Influx" was issued by World Bank in 2016. This Note provides guidance on identifying, assessing and managing the risks of adverse social and environmental impacts that are associated with the temporary influx of labor resulting from Bank supported projects. It contains guiding principles and recommendations to be considered as part of the design and implementation of projects with civil works that require labor from outside the project's area of influence. It does not introduce new requirements, but rather seeks to provide concrete

guidance on how to approach temporary labor influx within the environmental and social assessment process.

2.4.4 Environmental, Health & Safety Guidelines

In addition to operational policies (OP), the WBG has also established its EHS guidelines for all the interventions that are financed by the group. These EHS Guidelines are technical reference documents with general and sector-specific examples of Good International Industry Practice (GIIP). Following EHS guidelines are relevant to the proposed project during the construction and operation phase:

General EHS Guidelines: Issues associated with the construction and operation of maintenance facilities are addressed in the General EHS Guidelines with other key element like Environment and OHS at workplace as well as for community.

EHS Guidelines for Construction Materials Extraction: ;[[]M[I[[WK◊I\ML _◊\P [W]ZK◊VO WN KWV[\Z]K\◊WV U I\MZ◊IT[IZM XZM[MV\ML ◊V \PM 7:C 9]◊LM◊VM[for Construction Materials Extraction.

Environmental, Health and Safety Guidelines for Toll Roads: EHS issues associated with road projects, which occur during the construction and operation phase, along with recommendations for their management are included in the guidelines.

Mitigations and preventive measures, based on the above guidelines, have been incorporated in the ESMP. The mentioned EHS guidelines will be adhered to during the construction and operation of the project.

2.4.5 World Bank Group Gender Strategy (2016-2023)

The 2015 Gender Strategy recognizes that stronger and better-resourced efforts are needed to address gender inequalities in access to jobs as well as control over and ownership of productive assets are key levers of change for women, their communities and economies and fundamental drivers of economic growth and poverty reduction. Gender equality is central to the World Bank Group's own goals of ending extreme poverty and boosting shared prosperity in sustainable manner.

2.4.6 World Bank Policy Core Principles and Applicability on Sub-project

Core Principles	Applicability
Core Principle 1 Environmental and social management procedures and processes are designed to (a) avoid, minimize, or mitigate against adverse impacts; (b) promote environmental and social sustainability in program design; and	EIA prepared under the light of this Principle in order to mitigate negative impacts envisaged in this project. ESMMP implementation and monitoring arrangements will help in achieving environmental and social sustainability.

Core Principles	Applicability
(c) promote informed decision making relating to a program's environmental and social effects.	
Core Principle 2 Environmental and social management procedures and processes are designed to avoid, minimize, and mitigate against adverse effects on natural habitats and physical cultural resources resulting from the program	Table 8-2 prepared to mitigate all minor impacts anticipated during the course of the sub-project.
Core Principle 3 Program procedures ensure adequate measures to protect public and worker safety against the potential risks associated with (a) construction and/or operations of facilities or other operational practices developed or promoted under the Program and (b) exposure to toxic chemicals, hazardous wastes, and otherwise dangerous materials	All the mitigation measures have been incorporated in the Table 8-2 to address risks associated with workers and community health and safety. Contractor will ensure compliance with these attributes.
Core Principle 4 Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in improving, or at least restoring, their livelihoods and living standards	This core principle doesn't trigger in this sub-project as no land acquisition is required.
Core Principle 5 Due consideration is given to cultural appropriateness of, and equitable access to, program benefits, giving special attention to rights and interests of indigenous peoples and to the needs or concerns of vulnerable groups.	No indigenous / vulnerable groups exist along with ROW of the project.
Core Principle 6 Avoid exacerbating social conflict, especially in fragile states, post-conflict areas, or areas subject to territorial disputes.	This principle doesn't trigger in this project.

2.4.7 World Bank Environmental Code of Practices

The World Bank Environmental Code of Practices (ECoPs) address less significant environmental impacts and all general construction related impacts of the proposed sub-project implementation. The ECoPs provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of

all environmental issues during execution of sub-project. The list of ECoPs is provided below.

ECP 1: Waste Management

ECP 2: Fuels and Hazardous Substances Management

ECP 3: Water Resources Management

ECP 4: Drainage Management

ECP 5: Soil Quality Management

ECP 6: Erosion and Sediment Control

ECP 7: Borrow Areas Development and Operation

ECP 8: Air Quality Management

ECP 9: Noise and Vibration Management

ECP 10: Protection of Flora

ECP 11: Protection of Fauna

ECP 12: Protection of Fisheries

ECP 13: Road Transport and Road Traffic Management

ECP 14: Construction Camp Management

ECP 15: Cultural and Religious Issues

ECP 16: Workers Health and Safe

SECTION - 3: SCREENING AND SCOPING OF PROJECT

3.1 Screening of the Project

As per the Environmental and Social Framework (ESMF) of the project, the sub-projects are categorised in E1, E2 and E3 category and S1, S2 and S3 category based on the magnitude and severity of the environmental and social impacts of the sub-project.

As per ESMF, this project falls in E-2 and S-3 categories for environmental and social perspectives, respectively. As per ESMF, water supply and sanitation services sub-projects are categorized as E-2 and an ESMP must be prepared against it, such sub-project will be further categorized as per Schedule I and II of PEPA Review of IEE & EIA Regulations 2022.

Project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 3-1, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS or a Public Stand-post will be provided	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub clauses [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million & Wastewater Channels / Sewerage System Schemes].

3.2 Spatial and Temporal Boundaries of Environmental Assessment

Spatial Boundaries	Temporal Boundaries
REGIONAL: Impact could extend to the region surrounding the proposed Sub-project	**YEAR ROUND:** Significant throughout the year
LOCAL: Impact limited to the local area in close proximity to the proposed Sub-project	**SEASONAL:** Significant on a seasonal basis, depending on nature of valued environmental component (VEC)

The spatial and temporal boundaries of the project can be observed through Figure 3-1.

Hira Fatima (Assistant Director (EIA)-2)
EPA

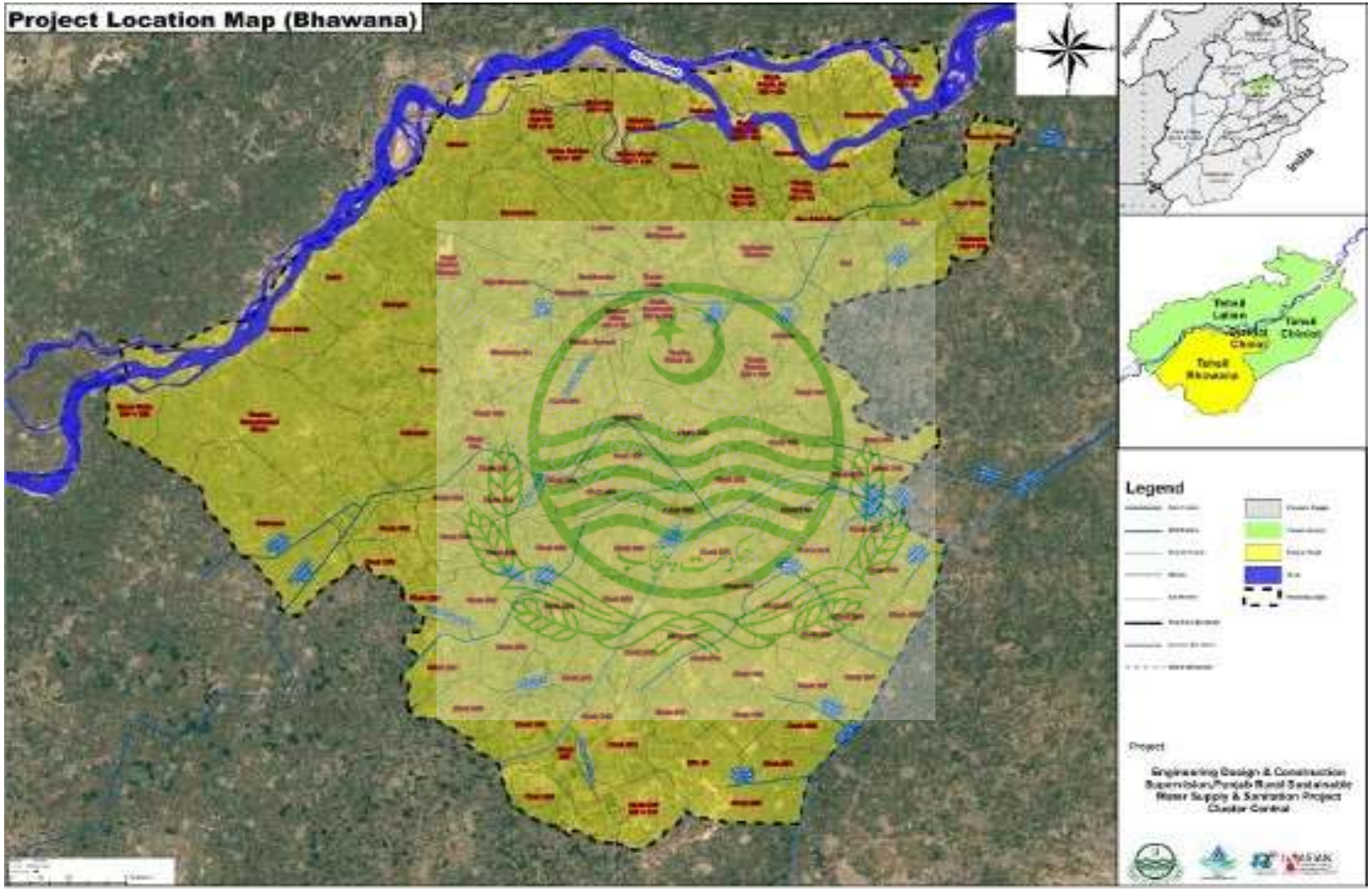


Figure 3-1, Google Map of Project

3.3 Important Issues and Concerns Raised During Consultation

During the survey, respondents were inquired about their views regarding the proposed project. Almost all respondents showed their concerns about the Proposed project. Some of the respondents had positive thinking and they were in favour of the project. But few respondents showed their concerns regarding construction phase dust and noise issues. They expressed vividly that such projects should be completed in time.

During the survey, respondents were inquired about their views regarding the perceived impacts of the sub-project during construction phase. Almost all respondents express their positive and negative views. The views are:

- There will be noise and dust pollution
- There will be health and safety issues

3.4 Significant Impacts and Factors to be Determined

- Soil Contamination and Erosion
- Ground water contamination
- Air quality deterioration
- Noise
- Waste material
- Labor HSE issues
- Impact on flora and fauna

SECTION - 4: ANALYSIS OF ALTERNATIVES

This chapter deals with the analytical overview of different alternatives that have been considered. The analysis has been carried out critically so as to justify the need of the project and to select the most feasible alternative. Besides the economic viability; environmental sustainability and social soundness of the project have also been considered while analyzing different alternatives.

4.1 Location Alternatives

Project area / villages have poor / insufficient water supply and sanitation services systems. The project involves improvement and development of water supply and sanitation services system in selected revenue villages of tehsil Bhowana. So, there is no other location / site alternatives envisaged because no other site available will serve for this purpose. If No Project Option (NPO) is applied then the people will be deprived of clean water supply and sanitation services, and will have to resort to alternative water sources. That will incur them with extra charges. The pressure on the alternative water sources will increase and the significant water source from the canal will be wasted.

4.2 Design / Technology Alternatives

The development will be constructed using modern, locally and internationally accepted technology and materials to achieve public health, safety, security and environmental aesthetic requirements.

Trenchless technology offers a cost-effective alternative for rehabilitating buried water supply infrastructure. There is an estimated 20% reduction in direct and indirect costs when appropriate trenchless methods specific to prevalent site conditions are used in place of open trenching. There will be no excavation for trenches so there will be less pollution due to dust and particulate emission.

However, due to limitations such as labor capacity and training in incorporating the trenchless system. The tradition trench water supply system will be implemented for the project.

4.3 Environmental Alternatives

The environmental conditions of the project were overall in compliance with the PEQS as per the baseline environmental reports attached with this report. The construction works during this project will lead to momentary dust / particulate and gaseous pollution, that will eventually subside.

Overall, this project will lead to the improvement of environmental quality of project site.

4.4 Economic Alternatives

Raw material for construction will be purchased from nearby area from local vendor, so that the transportation cost of material might be saved. Efforts will be made to save any unnecessary expenses to be taken out of the World Bank and public funds.

Hira Fatima (Assistant Director (EIA)-2)
EPA

SECTION - 5: DESCRIPTION OF THE PROJECT

This chapter presents all aspects of the project. It describes the nature of the project, its location, designs and site layout / plan. It presents the activities that will be involved during all stages of project, detail of process and machinery as well as details on supportive resources i.e., man power and utility requirements.

5.1 Area Description

Following sub-project has been designed to improve the existing infrastructure of the water supply and sewerage system with the provision of better living standards and the environment for rural populations in and around its project locations.

"Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana"

This project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 5-1, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS or a Public Stand-post will be provided	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

5.2 Objectives of the Project

PRSWSSP aims at generating integrated benefits with the provision of safe drinking water to improve health and education with significant impact on poverty reduction, gender development, environmental improvement, and human resource development in the service areas. Major objectives include the following;

- Extend water supply, drainage and sanitation, solid waste management coverage through a professional and demand-driven approach, to the villages that did not have access to organized water supply in rural Punjab.

- Strengthen newly constituted Tehsil Councils / Village Councils and build their capacity to manage rural water supply and sanitation schemes and improve related management functions.
- Implement a behavioral change and hygiene awareness program to help the beneficiaries in the selected villages to efficiently use, develop and maintain improved water and sanitation facilities, under the project.

The PRSWSSP through its planned interventions for behaviour change, and water and sanitation investments are likely to provide dividends for the following:

- Increase household saving due to health outcomes and enhancement in productivity due to better health projected through the provision of clean drinking water and proper sanitation.
- Save time in fetching water, particularly for girls, by providing piped water supply to all the households of a village.
- Water conservation through water metering and efficient monitoring.
- Improve socio-economic well-being of masses belonging to neglected areas.
- Eliminate stagnant water bodies which are generating water related diseases, through proper sewage treatment and disposal.
- Re-use of treated wastewater for irrigation, and as far as possible make it a source of revenue.
- Proper solid waste management including animal waste.
- Improve child care; lower morbidity rates in children; and reduce infant mortality rates.
- Reduce the incidence of waterborne disease.
- Strengthen Tehsil Councils by improving their capacity to deliver services efficiently.
- The United Nations created 17 distinct but interrelated goals to guide global development between 2015 and 2030. Out of these sustainable development goals (SDGs), SDG 06 pertains to clean water and sanitation, which is; "ensure access to water and sanitation for all', and the goal is, *cJa *(+(IKP‰M^M]V‰^MZ[IT IVL MY]‰\IJTM IKKM[[\W [INM IVL INNWZLIJTM LZ‰VS‰VO _ I\MZ NWZ ITTd&*

It is evident from the goals of SDG that instant project will be a positive step towards achieving these goals and targets.

5.3 Location & Site Layout of Project

The project is located in Tehsil Bhowana, Punjab. Bhowana is a historic town situated in Central Punjab, Pakistan, geographically located at approximately 31°33'52.78" North latitude and 72°38'41.02" East longitude, with an average elevation ranging from about 157 to 171 meters above mean sea level. Bhowana lies nearly 38.3 km (23.79 miles) south of Chiniot

and about 52.1 km (32.37 miles) south-west of Faisalabad, while it is 46.9 km (29.14 miles) from Jhang District. The Chenab River enters from the north-eastern side of the district and flows towards the south-west, playing a significant role in the irrigation, agriculture, and hydrological system of the region. The project area comprises 92 revenue villages located within Tehsil Bhowana. According to the 2023 Population and Housing Census of the Pakistan Bureau of Statistics, Bhowana Tehsil has a predominantly rural population, reflecting the agricultural importance of the area. The project location map showing the spatial distribution of these revenue villages is presented below:

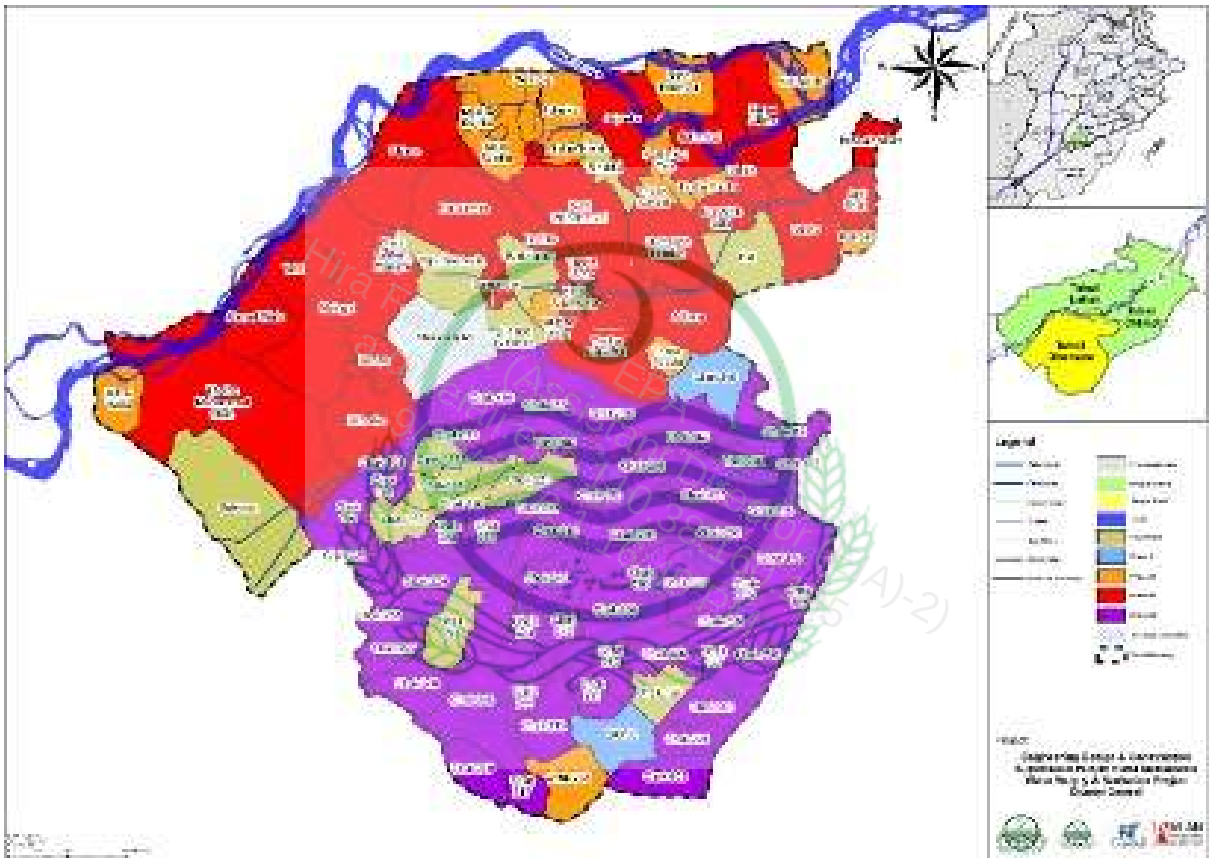


Figure 5-1, Project Location Map

5.4 Land Use

A few trees and vegetation (like small grass / shrubs) are present near the site for proposed installation of new tube wells / OHRs, but no tree will be cut. No trees will be affected during the construction of transmission lines as well. But, in any case / mishap / misfortune, a tree has to be cut then efforts will be made to transplant that tree to nearby available open area / space. And for each tree cut, 10 new trees of almost 06 ft. height will be planted.



Figure 5-2, Representative Pictures of the Site

5.5 Road Access

The project consists of the improvement and development of water supply and sanitation systems in the villages located within Tehsil Bhowana, District Chiniot. The project area is primarily accessible through the Bhowana–Chiniot Road, Bhowana–Jhang Road, Bhowana–Faisalabad Road, and Chiniot–Chak Jhumra Road, along with other existing link roads and minor rural roads within and around the project area.

5.6 Cost & Magnitude of the Project

Total cost of the project is 553 million USD (WB: 442.40, GoPb: 110.60 (Million)). The project will improve the water supply and sanitation services system of revenue villages within tehsil and district Chiniot.

5.7 Labour Requirement

At the peak of construction activities, up to 30 laborers are likely to be employed for the works at project, for each village, out of which 05 would be skilled employees and 25 would be construction workers. It is anticipated that approximately 75% of the workforce will be from the project area while some 25% of labour (skilled) would be hired from outside the project area.

5.8 Schedule of Implementation

The project is expected to be completed within 08 months, for each village, from the date of environmental approval. Subsequently the construction, operational and maintenance aspects of the sub-project will be undertaken by the proponent.

5.9 Scope of Work

This project comprises of piped network along with Tube-wells, Standposts, OHRs, Wastewater Treatment Plants and Septic tanks with soakage pits to be constructed in revenue villages of tehsil Bhowana according the criteria provided by PRMSC / Word Bank for project interventions (criteria is set according to the number of Households);

Table 5-2, Criteria for Project Interventions

No. of Households in settlement	Intervention for Water Supply System	Intervention for Sewerage System
HH < 50	Provision of Stand-Post	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered
50 < HH < 300	Either Inclusion in an MVS or a Public Stand-post will be provided	Covered Drains or Communal / Single / Multiple household's septic tanks with soakage pits to be considered (where no other option is feasible)
HH > 300	Piped Solution with tube-well and storage facilities, such as OHR's	Proper Piped Sewerage System and Wastewater Treatment Facilities i.e. ABR's, or BFTs will be proposed.

5.10 Project Description

The project is located in Tehsil Bhowana, Punjab. Bhowana is a historic town situated in Central Punjab, Pakistan, geographically located at approximately 31°33'52.78" North latitude and 72°38'41.02" East longitude, with an average elevation ranging from about 157 to 171 meters above mean sea level. Bhowana lies nearly 38.3 km (23.79 miles) south of Chiniot and about 52.1 km (32.37 miles) south-west of Faisalabad, while it is 46.9 km (29.14 miles) from Jhang District. The Chenab River enters from the north-eastern side of the district and flows towards the south-west, playing a significant role in the irrigation, agriculture, and hydrological system of the region. The project area comprises 92 revenue villages located within Tehsil Bhowana. According to the 2023 Population and Housing Census of the Pakistan Bureau of Statistics, Bhowana Tehsil has a predominantly rural population, reflecting the agricultural importance of the area. The project

location map showing the spatial distribution of these revenue villages is presented below;

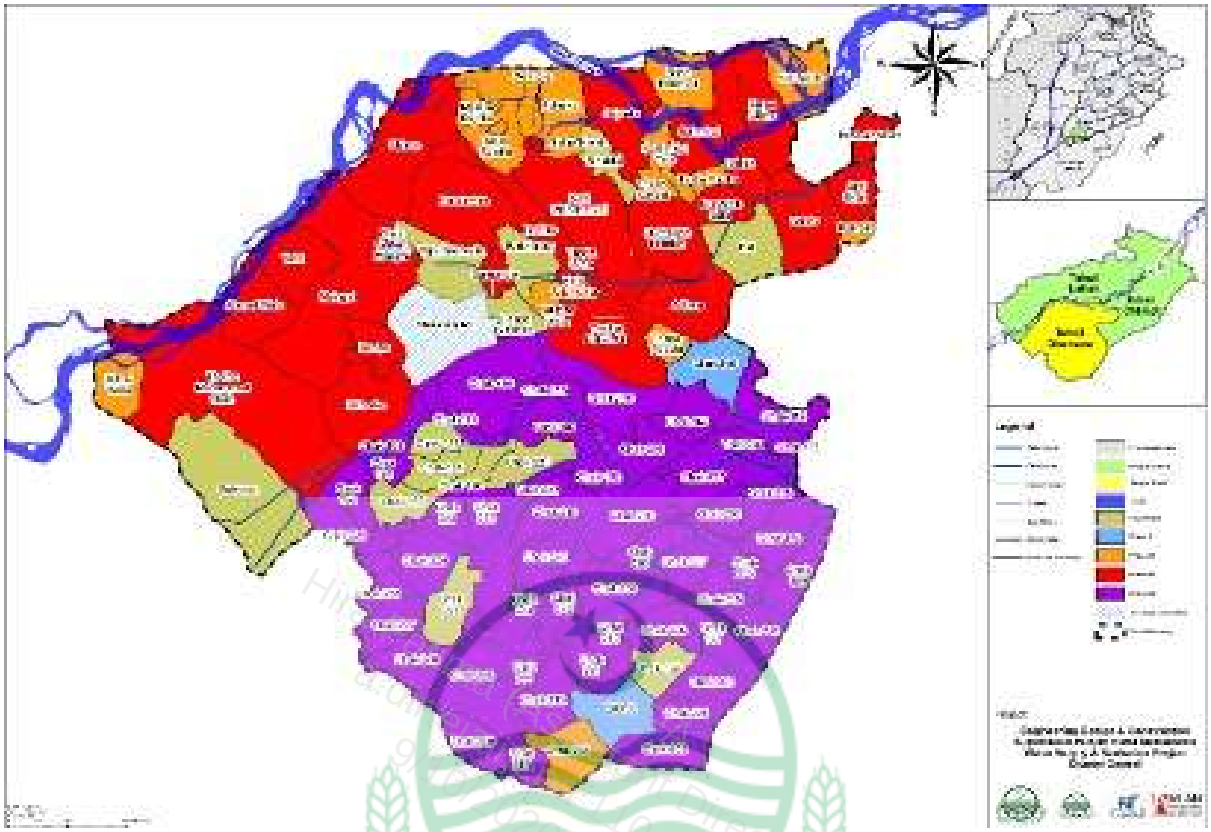


Figure 5-3, Project Location Map

5.10.1 Components of Water Supply System

Water supply system can be characterized by following main components:

- Water Source
- Distribution System

The water source determines the treatment that is necessary to obtain a clean, safe potable water that does not endanger public health. The two main sources that are used in water supply schemes are groundwater and surface water. In general groundwater has a better quality and needs little treatment. In the following sections the various components of water supply systems will be discussed in greater detail.

5.10.2 Water Source

The principal source of drinking water for the majority of the people in Pakistan is groundwater.

Number of tube wells for water supply system are proposed after assessment of total water demand of the project areas and where sustainable ground resources are available. The design criteria for tube wells is discussed in the following sections;

5.10.3 Design Criteria for Tube wells

General

An appropriate well design is a blend of hydraulic and economic efficiencies of the tube well over its life span. It includes the selection of the depth, diameter, construction materials (well casings, screens, filter pack etc.), pump and prime mover in consonance with the local hydro-geological conditions and the design capacity. All these major factors depend upon the "design capacity" which in turn is governed by the aquifer's geometry and parameters.

Capacity of the tube well is based upon the maximum day water requirements (for villages / settlements with households > 300), for the served area, with design operational duration (working hours) of 6 hours per day.

Capacity of the tube well is based upon the average day water requirements (for villages with households <300), for the served area, with design operational duration (working hours) of 6 hours per day.

Design Factors

In order to design the well, the following major factors are considered:

- Design, construction details, water quality of the existing tube wells;
- Depth to water table under existing and future conditions;
- Groundwater quality;
- Aquifer parameters.

Tube Well Design

Information required before design completion includes:

Aquifer location

- Depth to water bearing strata
- Thickness of strata (aquifer thickness)

Aquifer nature:

- Consolidated or unconsolidated material
- Hard or friable rock,
- Confined or unconfined,
- Leaky or with delayed yield, etc.

Aquifer parameters

- Hydraulic conductivity,
- Transmissivity,
- Storativity,
- Grain size,

Tube Well Screen

Lower well casing and screen is used;

- To give the formation support (prevent well collapse)
- To prevent entry of the fine aquifer material into the well
- To reduce loss of drilling fluids
- To facilitate installation or removal of other casing
- To aid in placing a sanitary seal
- To serve as a reservoir for a gravel pack

For well screen design, following points are considered:

- Minimum entrance velocity
- Maximum open area of screen
- Correct design of slot to fit aquifer or gravel pack material
- Periodic maintenance
- Selection of screen material for corrosion resistance

Screen Length and Location

The optimum length of well screen for a specific well is based on aquifer thickness, available drawdown, stratification within the aquifer, and if the aquifer is unconfined or confined. Criteria for determining the screen length for homogeneous and heterogeneous, confined and water table aquifer wells are described in the succeeding paragraphs.

The basic design principle is to screen the whole aquifer as a first assumption. This approach is inefficient in:

- **Very thick aquifers -** use existing developments to have some guidelines (either local "rules of thumb" indicating a certain length of screen per unit discharge or data to use in equations to calculate optimum screen length for a specified discharge)
- **Shallow unconfined aquifers -** upper well casing is likely to occupy much of the aquifer thickness. The relative dimensions of the upper and lower parts of the well will be dependent upon the relative importance of well efficiency max. yield

Length of the screen shall be determined by using the following equation:

$$L = Q/(\pi * d * p * v)$$

Where:

L = length of the screen in ft

Q = discharge of the tube well in cusec

V = entrance velocity in ft/sec

d = diameter of the screen in ft

p = open area of screen in %

π = 3.14159

Maximum Entrance velocity of water through the well screen should not accede 0.05 ft/sec. Open area of screen varies between ranges of less than 8% to more than 10%. Fiberglass screens have a maximum of 10% open area, where as Brass screens usually used for water supply wells in Pakistan have open area of about 8%.

Pump Housing Casing

Length of the pump housing casing in a tube well design is selected keeping in view present static water level, specific drawdown, seasonal fluctuations of water level and pumping water levels under the present and future conditions. The diameter of the pump housing casing is required to accommodate the pump and ensure enough clearance for installation and efficient operation of the pump.

Diameter of Borehole

The diameter of upper well casing required is that needed to accommodate the pump, with some margin for clearance around the unit. Manufacturers of pump will recommend a "minimum" casing. The diameter is Large enough for the pump to be a comfortable fit, making allowances for non-verticality of the Borehole.

Bail Plug

Tube well has been sealed at the bottom. Bottom piece of the screen will include a 10 ft section of blank casing sealed at the bottom to be used as sand trap.

Gravel Pack

The gravel pack adjoining the screen consists of larger sized particles than the surrounding formation, and hence larger voids are formed at and close to the screen allowing water entry nearly free from head loss. Necessary conditions for a gravel pack are:

- Sand-free operation after development,
- Highest permeability with stability (low resistance),
- Low entrance velocities,
- Efficient service life, i.e., resistant to chemical attack.

Uniformity coefficient Ratio of the D60 size to D10 size of the material (low coefficient indicates uniform material) is the proposed well. The Gravel Pack is:

- Strainer gravel pack thickness should not be less than 5 inches on all side
- Clean
- Have well-rounded grains.

- Free from water soluble compounds such as carbonates (siliceous sands and gravels)
- Be well graded ensure its function as designed.

5.10.4 Pumping Facilities

General

Pumps are devices used to transfer water (or other liquids) from point A to point B with pressure to overcome the resistance along its path. It is important to understand the different types of pumps, their applications, design differences and the procedures used to operate and maintain them.

Considerations In Pump Selection

- Total Dynamic Head

  In order to accurately predict the performance of a pump in a specific application, the total head losses are considered. These losses include, but are not limit ed to:

  - Total static head;
  - Losses due to pipe size, length, and material;
  - Losses due to pipe appurtenances

  Accurately predicting the discharge and pressure for a given pump in a specific application requires tedious calculations as well as patient trial and error.

  Total Dynamic Head= static head + friction or dynamic head

  Static Head = (Depth of W.T) + (draw dawn) + (height of OHR top) + (difference in elevation between TW and OHR) + FOS

  Friction / Dynamic head = (head losses in pipe) + (losses in appurtenances)

5.10.5 Water Transmission System

The transmission system's function is to transport water from source to the reservoir, if any, and to the distribution point. Water conduits for the transmission system may be canals, aqueducts or tunnels, free-flow pipelines, or pressure pipelines. The transmission of water is either under gravity or pumping. Pressure pipeline is generally the type of water conduit used for water supply transmission systems.

A) Computing for Transmission Pipe Size

Normally, the sizing of the transmission main is dependent on the total storage capacity and the way the supply is transmitted to the distribution system. The main should have at least the carrying capacity to supply water at a rate equivalent to the maximum day demand of the system for a given design year.

Once the supply rate is determined and the plan and profile of the transmission pipeline route are plotted, the pipe diameter(s) could be determined using the Hazen's William head loss formula.

B) Head Loss in Pipes & Fittings

The head loss in the pipelines shall be calculated by using Hazen & William formula. This formula, is the most widely used and relates the velocity of the flow, hydraulic mean radius and hydraulic gradient. In terms of head loss due to friction, the formula is:

$$h_L = \frac{10.67\ L \times Q^{1.852}}{C^{1.852} \times D^{4.87}}$$

Where:

h_L = head loss due to friction
L = distant between sections or length of pipes (m)
D = internal diameter of pipe (m)
C = Hazen Williams factor C-Value
Q = Pipeline flow rate (m^3/s)

1. Coefficients of Friction (C)

The C-value is a carrying capacity factor that is sometimes referred to as the roughness coefficient, which varies depending on the pipe material being considered. Higher C values represent smoother pipes and lower C-values are for rougher pipes. Higher C values indicate higher carrying capacities. C-values increase with pipe size but decrease with pipe age. Although C-values are affected by changes in flow rates, the effect is negligible. Thus, network designers usually assume uniform C-value for different flow rates. Recommended C-values for various pipe materials are as follows:

- Galvanized Iron (GI) = 120
- High Density Polyethylene (HDPE) = 120
- Unplasticized Polyvinyl Chloride (uPVC) = 120
- Asbestos Cement (AC) = 110
- Mild Steel (MS)/GI = 100

C) Water Hammer

Especially, in rising mains of longer lengths and bigger diameter, water hammer becomes quite critical and must be examined and evaluated during design of rising mains.

This process is generally referred to as surge analysis.

Water hammer is referred as 'the pulsation of pressure above and below operating pressure'. The possible reasons may be:

1. Quick opening/closing of valve
2. Sudden starting/stopping of pump

In simple cases, formulae given in American Water Works Association (AWWA) manual for steel pipes may be used [15]. The procedure to find water hammer is illustrated as under:

a = pressure wave velocity

$$a = \frac{12}{\sqrt{\frac{w}{g}\left(\left[\frac{1}{k} + \frac{d}{Ee}\right]\right)}} \quad fps$$

Water Hammer pressure $= \frac{av}{g} \quad ft$

D) Design Pressure

The pipe material is selected to withstand the highest possible pressure that can occur in the pipeline. The maximum pressure of the transmission pipe will be computed by the use of hydraulic computer software.

5.10.6 Water Reservoirs

This section discusses the factors that have been taken into account in the design of reservoirs and illustrates the basic design of a distribution reservoir.

Introduction

In distribution systems, whether water is obtained by gravity or by pumping, distribution reservoirs are usually necessary for the following reasons:

- To balance the supply and demand in the system. In small distribution systems, variations in demand may be three or more times the average hourly consumption.
- To maintain adequate and fairly uniform pressure throughout the distribution system.
- To avoid the total interruption of water service when repairing pipes between the source of supply and the reservoir.
- To allow pumps to be operated uniformly throughout the day. Such pumps may be much smaller than would otherwise be required.

Overhead Water Reservoir (OHR)

Overhead Reservoirs (OHRs) are also key component of water distribution system. In water supply system OHRs serve the following functions:

- Store water for use during electric load-shedding and during maintenance works of tube-wells/ pumps.
- Provide balancing of flow and pressure during peak hours.

As per "Technical and Service Delivery Standards for Water Supply and Sanitation Sectors" Storage Capacity of Overhead reservoirs should be based on around 1/6th of average day demand.

5.10.7 Water Distribution System

The purpose of a distribution network is to distribute the potable water from the storage reservoir over the area to be provided, and deliver it to the individual consumer in such a way that at any tap point and at any time sufficient water of good quality can be withdrawn.

Looped System

A distribution network is looped when there are only few or no pipe dead-ends, such that water can move through the system freely. The advantages of a looped system are;

- The lower water velocities in the main reduce head losses, resulting in greater capacity.
- Ma in breaks can be isolated, minimizing serv ice interruptions to consumers.
- Usually, better chlorine residual content is achieved.

5.10.8 Sewerage System

A) Design Criteria

The intent of these guidelines / criteria is to provide a basis for the design of sewerage systems for the selected localities of the project area. The design criteria / standards discussed in this section are dynamic and subject to periodic updates and revisions, as and when necessary, to conform with the latest regulations.

This design criteria is based on Standards set forth under the Water and Sanitation Agency (WASA), PHED, Lahore criteria and past design experiences of similar projects.

Design Criteria Objectives

The main objectives of the design criteria are as follows:

i. To develop a sewerage system, that can be operated with minimum operation and maintenance cost;

ii. To collect sewage efficiently and safely to prevent diseases and nuisance; and

iii. To proposed efficient treatment system which will deliver an effluent that will meet the Punjab Environmental Quality Standards (PEQS)

B) Sewage Flow Estimation

The most fundamental factor for planning and designing sewerage systems is the estimation of the sewage flow. Otherwise, sewers may prove inadequate resulting in overflow or may prove too large in diameter, which may make the system uneconomical and hydraulically inefficient. Sewage flow calculations are based on the following parameters;

1. Domestic Sewage Flow

For the project area, **80%** of the water demand has been taken as sewage generation.

2. Peak Factor & Flow

The capacities of the sanitary sewer are sufficient to carry peak flows, rather than the average flow because the rates of flows for any design point will vary substantially depending on the local water use customs, climate conditions, the day of the week, the hour of the day etc. So, waste water collection system has been designed to handle peak flows. The peak flow will be calculated by following formula:

Peak flow = Avg. daily flow * Peak factor

Peak Factor depends upon the population; it decreases with an increase in population. Peak Factor shown in the Table below will be taken for the computation of peak flows;

Population	Peak Factor
<5000	4.00
5,000-10,000	3.50
>10,000	3.00

3. Non-Domestic Sewage Flow

The non-domestic sewage flow has been taken as 80% of average non-Domestic water consumption that will cover institutional, commercial and small industrial discharges.

4. Infiltration Rate

The infiltration quantity of 5% is added due to groundwater seepage in to sewers through faulty joints or cracks formed in the pipes. The quantity of the water depends upon the height of the water table above the sewer invert level and permeability of the ground soil. If water table is well below the sewer invert level, the infiltration can occur only after rain when water is moving down through soil.

PHED Criteria has been followed for infiltration rate for the selected localities of the project area.

5. Storm Water Allowance

Keeping in view the project area, 50% of peak sewage flow has been taken as storm water allowance.

6. Total Sewage Flow

Total sewage flow is the sum of all the above flow and sewers / conduits has been designed on this total sewage flow.

Total flow = Peak sewerage flow + Infiltration + Storm water Allowance

C) Manholes

1. Location

Manholes will be located according to conventional sewer network design i.e., starting point, junctions between sewers and change in direction and grades etc.

2. Manhole Spacing

Following manhole spacing are adopted for the design of sewerage system;

Table 5-3, Manhole Spacing

Pipe Size	Interval
9 inches	50 Feet
12 inches	100 Feet
15 inches	150 Feet
18 inches	200 Feet
24 inches	250 Feet
30-42 inches	250 Feet
48-60 inches	250 Feet
Above 60 Inches	250 Feet

3. Manhole Dimension

Following manholes dimensions are adopted for sewerage systems of project area;

Table 5-4, Manhole Diameter

Sewer Size	Manhole Internal Diameter
9-18 inches	04 Feet
24-30 inches	05 Feet
36-42 inches	6.5 Feet
48-54 inches	7.5 Feet
60-66 inches	8 Feet
72 inches	9 Feet

4. Change in Sewer Diameter in Manhole

To minimize the risk of blockage in sewers, the diameter of the outgoing sewer is not less than the diameter of the largest incoming sewer. The top of smaller sewers entering a manhole will normally be at the same level as that of the outgoing sewer.

5. Slope of Channel Within Manhole

All manhole invert levels used in the sewer calculations has been the centre of the manhole and all distances and slopes has been calculated between canters of manholes.

6. Drop Manholes

The drop connections to manholes have been provided if the difference in pipe invert level is greater than 3.0 ft otherwise no drop manholes will be provided.

7. Manhole Steps

Ductile Iron and Malleable Cast iron steps etc. are usually used in the manholes. Keeping in view the project area and current practices malleable cast iron steps shall be used in the manhole.

5.10.9 Sewage Disposal Stations

Sewage lift / pump station are required to pump sewage collected from various sewage zones to the disposal point. The details of Sewage lift / pump station will be discussed in the following sections.

A) Sewage Lift Station

Lift station has been provided when sewer reaches a depth where excavation is no more practically and economically possible. It consists of a wet well and a dry well to accommodate non-clogging centrifugal pumps while only wet well would be required for submersible pumps.

B) Sewage Pump Station

The sewage pump station pumps the sewage collected from the entire sewage zone. Types of sewage pumping stations installations either wet-well or wet / dry-well along with screening chamber are studied keeping in view the site circumstances.

C) Anaerobic Baffled Reactor (ABR)

Proposed Sewage Treatment plant consists of Screening Chamber, Wet Well, Dry Well with Pumping Machinery and Sewage Force main up to Proposed STP. Anaerobic Baffled Reactor (ABR), which has chambers divided by baffles, provides a mechanism for both primary and secondary sedimentation. The majority of solids are removed by the ABR's first chamber, which also has low sludge formation and high SRT. The bulk of shock loads may be handled by the technology with ease. The system's ease of construction makes it perfect for wastewater treatment. The anaerobic process reduces the formation of sludge biomass, the particles in the effluent are reduced due to significant sedimentation in the baffled chambers, and most importantly, the ABR has lower capital and operating costs than aerobic processes. Another significant benefit is that this technique works best in semi-arid and tropical environments.

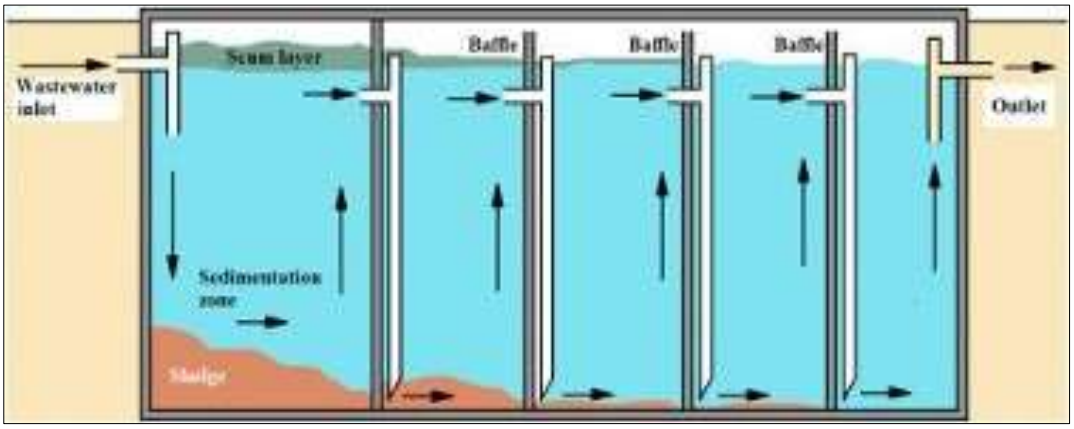


Figure 5-4, Process Flow Diagram of STP / WWTP / ABR

Typical details / figures / diagrams of project components are attached as annexure.

Hira Fatima (Assistant Director (EIA)-2)
EPA

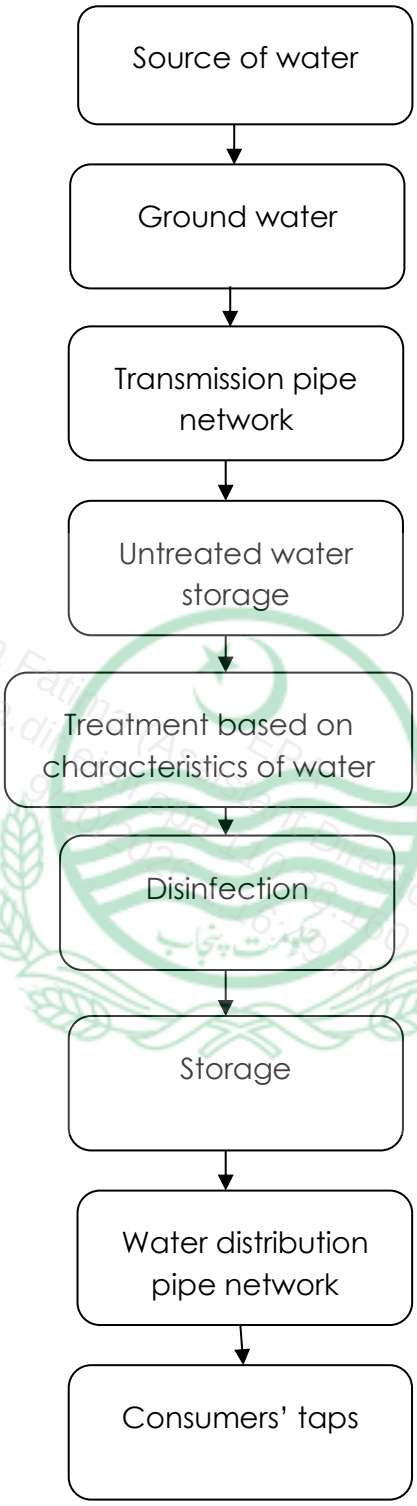


Figure 5-5, Process Flow Diagram of Water Supply

5.11 Water Consumption & Wastewater Disposal

Ground water will be the main source of water during construction phase. In constructional phase, 1,500 gallons/day water will be used for each village. During operation 300 gallons/day water will be used for domestic purpose for each village. Wastewater produced will be domestic wastewater.

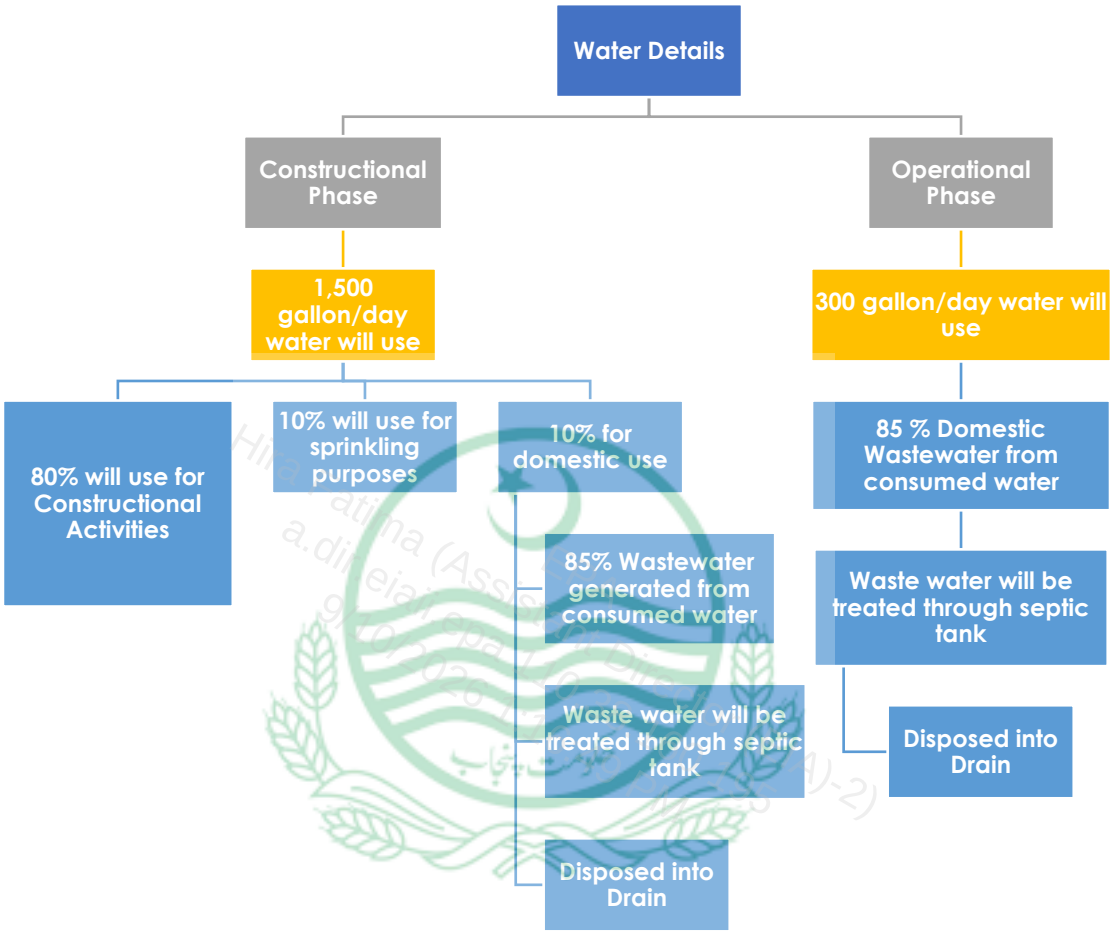


Figure 5-6, Estimated Water Balance for Each Village

5.12 Solid Waste

The amount of solid waste produced during construction phase will be 13.5kg/day for each village. In constructional phase, all waste materials such as landscape and land clearing debris, gravel and aggregate products, concrete, masonry scrap and rubble (brick, concrete masonry, stone), and plastics and paper from cement bags will be recycled during the construction activities and maintenance purposes. Solid waste generated during construction phase will be placed in separate bins. During operation phase, the amount of solid waste will be 2.7 kg/day for each village. Only domestic waste will be produced that will be handed over to local waste contractor.

5.12.1 Waste Management and Disposal

The main types of waste expected to be generated and requiring disposal include:

a) Fuel, oils, and chemicals;
b) Sewage;
c) Campsite waste;
d) Medical waste;
e) Demolition waste;
f) Packing waste; and,
g) Excess construction material.

Table 5-5, Waste Management Collection and Disposal Techniques

Activity	Best practices
Generation of construction material	• Implement resource conservation, and encourage staff (through training) to reduce waste, reuse waste and recycle waste wherever possible • Prohibit staff from fouling the site
Disposable of recyclable waste	• Sell recyclable waste to local vendors
Disposal of construction material	• Do not burn materials which may lead to the release of toxic or hazardous substances • Do use burn on site when surrounding vegetation is dry and combustible.
Disposal of hazardous	• Handover to specialized and certified disposal contractor
Generation of construction waste	• Reduce construction waste by reusing waste as a fill material (prior to testing to confirm

5.13 Sources of construction material

Construction material will be acquired from the nearest possible / local sources through approved vendor / contractors of the government.

5.14 Machinery & Equipment

It is estimated that the equipment / machinery given below will be required to complete the different project engineering activities:

Table 5-6, Required Machinery / Equipment

Sr. No.	Equipment / Machinery	Sr. No.	Equipment / Machinery
1.	Bore hole drilling machine	2.	Excavator
3.	Trucks	4.	Total Station and ancillaries
5.	Pipe jacking equipment	6.	Rock breaker
7.	Back Hoe Excavator	8.	Water bowser
9.	Jack hammer	10.	Pipeline pressure testing equipment
11.	Compressor	12.	Butt fusion equipment
13.	Generator	14.	Water pumps

Contractor will use well-tuned machinery to minimize air pollution and noise. Contractor will never park his machinery on the working area to avoid obstacles in the mobility of commuters. Machinery with poor exhaust and making nuisance will not be allowed to work on-site.

5.15 Storage of Materials

50,000/- is annually paid to the owner of the land to whom land is rented out as per defined local government rates. As this project is of short duration, henceforth, land will be rented out with due mutual discussion between owner of the land and the contractor.

5.16 Description of Work Activities

Following activities are involved during the execution of work.

- Excavation
- Boring/Drilling/Jetting
- Construction of Room
- Plastering & Whitewash
- Installation of Machinery
- Backfilling
- Laying & Fitting of Pipes
- Jointing of Pipes
- Installation of valves
- Disinfection of Installed Water Pipe
- Consumer connections
- Construction of storage tank
- Construction of WWTP

5.17 Construction / Labour Campsite

Location of the construction camps should be at areas which are acceptable from environmental, cultural or social point of view. Location of construction camps should be away from communities in order to avoid social conflict with the surrounding communities. Contractor will submit to PRMSC for approval of a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective. The Contractor's staff quarters and labour camps shall be provided with all necessary services for drainage, lighting,

roads, paths, parking places, fencing, sanitation, cook-houses, fire prevention and firefighting equipment. All labour camps, workshops and storage areas shall be built on hard compacted ground with sufficient bunding and spill kits so as to prevent the loss or infiltration of leaked or spilt fluids into surrounding soils, ground water or water courses. Traffic signage shall be maintained in the camps. The Contractor shall establish a drainage network, including end discharge, to drain storm water away from camps and settlements.

5.18 Restoration and Rehabilitation Plans

All possible precautions will be taken to prevent an untoward incident in terms of life and property losses. On completion of the project, solid waste will be removed from the site in order to maintain aesthetics of the area. All measures will be undertaken for ensuring occupational safety, security and clean environment during the working hours. Plantation and landscaping will also be done by the proponent after the completion of project.

5.18.1 Details of Restoration and Rehabilitation at the End of Project Life

At the end of the life of the project, it will be duly dismantled with special precautions to avoid / minimize pollution and at the same time taking all safety precautions to protect human life and property around the building. The materials capable of recycling / reuse will be either sold in the market or to be reused for other suitable purposes. Existing utilities being affected by the project activities will be rehabilitated to its original state.

5.19 Government & Local Approvals:

The proponent will apply for all relevant approvals from government departments and submit all the NOCs to EPA as received.

5.20 Land Requirement & Land Acquisition

As per design criteria, for the construction of design components, following land area is required;

Proposed Intervention	Land Parel Required
Wastewater Treatment Plant	12 marla
OHR (10,000, 15,000, 20,000, 30,0000) Gallons	(5, 5.6, 6.2, 7.4) marla
Tube-well	1.4 marla
Stand-Post Type-II	2.1 marla
Stand-Post Type-I	1.5 marla
Septic Tank Type-I, II, III, IV, V, VI, VII, X)	(1.59, 2, 2.62, 3.04, 3.42, 3.42, 4.24, 6.40) marla

Project will be executed on government land. If private land has to be acquired as per design criteria and feasibility, owner of that land must be consulted and land should be acquired through VLD process as per ESMF by PRMSC, and for government land; PRMSC must apply for NOC.

5.21 Labor Health & Safety

Contractor will ensure implementation of on-site safety measures to sub-protect area for any mishap / incident / accidents. Contractor will install safety signages to aware public about on-going construction activities. Contractor will also provide information about diversion routes with safety cautions / flagmen. Contractor will also provide personal protective equipment (PPEs) to workers as per nature of their jobs.

5.22 Traffic Management

Contractor will disseminate information about on-going construction activities by installing safety signage for pedestrians as well as traffic. Contractor will install diversion routes sign boards on-site. Flagmen will also be deployed to direct traffic and avoid any mishaps / accidents. Contractor will develop traffic management plan, submit to PRMSC for approval before the initiation of the project.

5.23 Existence of Utility Services within RoW

Already existing infrastructure like road / brick soling will be disturbed during the project execution. Contractor will be bound to restore and rehabilitate the site to its original state after the completion of construction works. No tree will be cut. In any case / mishap / misfortune, if a tree has to be cut, utmost efforts will be made to transplant the tree to the nearby open spaces and in case of unavoidable circumstances, for each tree cut, 10 new plants of at least 06 ft. height will be planted. Contractor will be liable to compensate damage to any utility.

5.24 Vegetation Removal / Tree Cutting

Contractor will make utmost efforts to transplant the trees to be cut in nearby open spaces. In case of unavoidable circumstances, for every tree cut, 10 new plants of at least 06 ft. height will be planted. More plantation will be done to make the sub-project more environment friendly.

5.25 Area of Impact

The project area is rural in nature. The area of impact would be 100 meters in the periphery of the project. The construction activities are very much limited to reduce impacts on the surrounding area and public.

5.25.1 Direct Impacts

- Project will be temporary hindrance in the movement of transport during its construction phase.
- Project will generate construction waste which can generate solid waste problems temporarily till it will be disposed of on daily basis.
- Mismanagement of construction activities / materials & equipment can directly impact inhabitants along with the alignment of the project.
- Project construction activities may hinder traffic movement along with the alignment.
- Movement of students / commuters across the project alignment will be affected.

5.25.2 Indirect Impacts

- Privacy of women may be disturbed.
- Routine of employees / workers passing through / along the sub-project area might be changed.

SECTION - 6: DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE

6.1 Overview

This section describes project area and its surroundings to establish baseline, which are expected to be affected by the sub-project. The baseline description includes physical, ecological and socio-economic aspects of the project area.

Multiple site visits were conducted to collect primary data on physical, ecological and socio-economic aspects. Environmental surveys, interviews with general public and various governmental and non-governmental organizations were carried out to collect the baseline data. Furthermore, sensitive receptors of potential subproject impacts were identified. Secondary data was collected from available literature and District Census Report (DCR) etc.

6.2 Purpose of Environmental & Social Baseline

Baseline data collection is performed to serve two purposes. First, it helps to understand the current conditions of the area, and how the sub-project needs to be implemented considering these conditions. Second, it helps to assess and predict the possible environmental changes that could occur, once the project is underway.

Baseline data are the data collected about various factors of the project study. This includes;

- Physical - the area, the soil properties, the geological characteristics, the topography, watershed properties, etc.
- Chemical - water, air, noise and soil pollution levels, etc.
- Biological - the biodiversity of the area, types of flora and fauna, species richness, species distribution, types of ecosystems, presence or absence of endangered species and / or sensitive ecosystems etc.
- Socioeconomic - demography, social structure, economic conditions, developmental capabilities, displacement of locals, etc.
- Cultural - location and state of archaeological and / or religious sites.

6.3 General Characteristics of Project Area

The project is for the improvement and development of water supply and sanitation services system in following revenue villages of tehsil Bhowana, district Chiniot.

The project consists of the improvement and development of water supply and sanitation systems in the villages located within Tehsil Bhowana, District Chiniot. The project area is primarily accessible through the Bhowana–Chiniot Road, Bhowana–Jhang Road, Bhowana–Faisalabad Road, and Chiniot–

Chak Jhumra Road, along with other existing link roads and minor rural roads within and around the project area.

6.4 Physical Resources

6.4.1 Geography, Geology, and Soils

District Chiniot are broadly divided into three physiographic regions: the riverine belt, canal irrigated plain and Thal-desert area. The riverine belt lies along the River Chenab bordering Faisalabad, Jhang, Sargodha and Hafizabad districts, and is irrigated through seasonal canals, flood channels and tube wells, with occasional monsoon flooding. The canal irrigated plain is fertile and extensively cultivated through the Lower Chenab Canal Project and Jhang Branch Canal system. The soils are mainly alluvial, ranging from sandy loam to clay loam, and are highly suitable for wheat, sugarcane, cotton and rice cultivation. According to GIS-based land use mapping and secondary statistics from the Pakistan Bureau of Statistics (PBS), agriculture is the dominant land use and the major economic activity of the district.

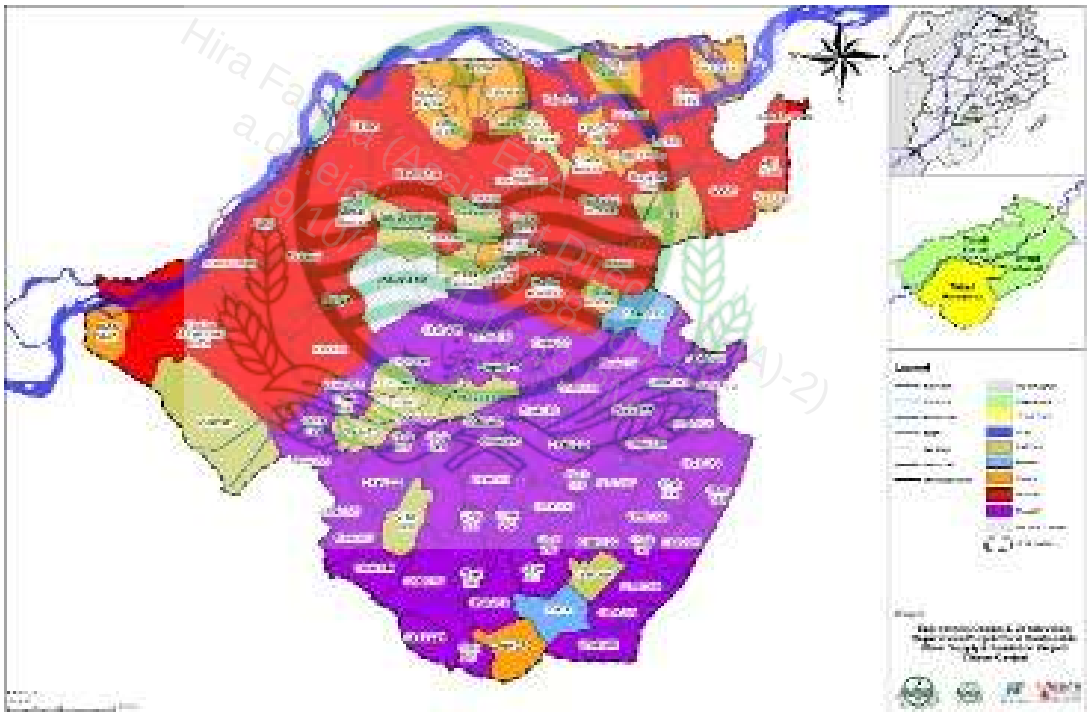


Figure 6-1, Administrative Map of Bhowana

The Lower Bari Doab Canal (LBDC), which is one of the major irrigation canals of Punjab, irrigates almost all areas of District Chiniot, including Tehsil Bhowana, through an extensive network of distributaries, minors and watercourses. The canal system plays a vital role in supporting agricultural productivity, sustaining irrigation-dependent cropping patterns and contributing to groundwater recharge across the district.

6.4.2 Topography

Bhowana area topographically can be divided into three parts i.e., the river bed area, the abandoned flood plain of River Chenab and the sandy-desert

area of Thal Bhowana. Bhowana City is located between the Lower Chenab Canal system and local irrigation minors on the left bank of the River Chenab, which flows from the north-east to south-west direction. The elevation of Bhowana ranges from 1082.68 ft to 1351.71 ft (330 m – 412m) above mean sea level. The topography of the district is generally flat with a gentle slope towards the south-west, supporting irrigated agriculture and natural drainage patterns. According to GIS-based terrain analysis, Survey of Pakistan topographic sheets, and secondary statistics from the Pakistan Bureau of Statistics (PBS), the area predominantly consists of fertile alluvial plains with localized sandy tracts associated with the Thal region.



Figure 6-2, Topography of Bhowana

6.4.3 Climate and Temperature

District Bhowana has a very hot and dry climate in summer. The maximum temperature touches 37°C and can go as high as 42°C in the area. The climate in winter is very dry and cold. The minimum temperature recorded was 7°C. Wind and storms are quite common during the summer. The average annual rainfall in the tehsil is 44.5 mm.

Table 6-1, Bhowana Climate Summary

Country	Pakistan
Average Annual Precipitation	44.58 mm (1.75 in)
Warmest Month	May (42°C / 113°F)
Coldest Month	January (4°C / 44.6°F)
Wettest Month	July (126mm / 4.96in)

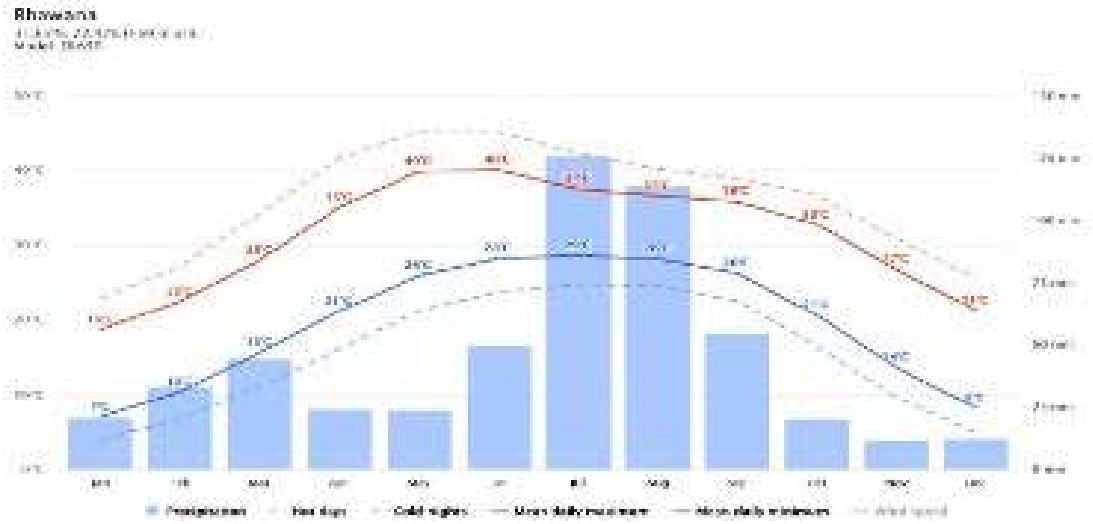


Figure 6-3, Maximum and Minimum Temperature

6.4.4 Rainfall

The climate of Bhowana is characterized by semi-arid conditions with predominantly sunny and partly cloudy weather throughout the year. According to the climatic data and climate interpretation, fully overcast conditions remain very limited in all months, while sunshine duration stays relatively high during most of the year.

The monsoon season mainly occurs during July and August, which are the wettest months of the year. During this period, the area receives approximately 20–21 precipitation days per month, accompanied by increased cloud cover and comparatively reduced sunshine. July and August record only about 6–8 sunny days, while partly cloudy conditions dominate for nearly 23–24 days per month. Rainfall activity begins to decline in September, when precipitation decreases to nearly 12 rainy days, although partly cloudy weather still remains significant.

A moderate pre-monsoon rainfall period occurs during May and June, mainly associated with convective activity and seasonal weather disturbances. During these months, the area experiences around 11–14 precipitation days per month. Sunny conditions remain comparatively high, particularly in May, with nearly 19 sunny days, while partly cloudy conditions account for approximately 11–13 days.

Winter rainfall is limited and mainly confined to January and February, when the area experiences around 6–8 precipitation days along with mostly partly cloudy weather. March and April show a gradual increase in rainfall activity, recording approximately 9–10 rainy days per month, while sunny days also increase steadily during the spring season.

The driest and clearest period extends from October to December. October is the sunniest month, recording nearly 26 sunny days with only about 7 rainy days. Similarly, November and December remain predominantly dry, receiving only about 3–4 precipitation days per month along with mostly sunny weather conditions.

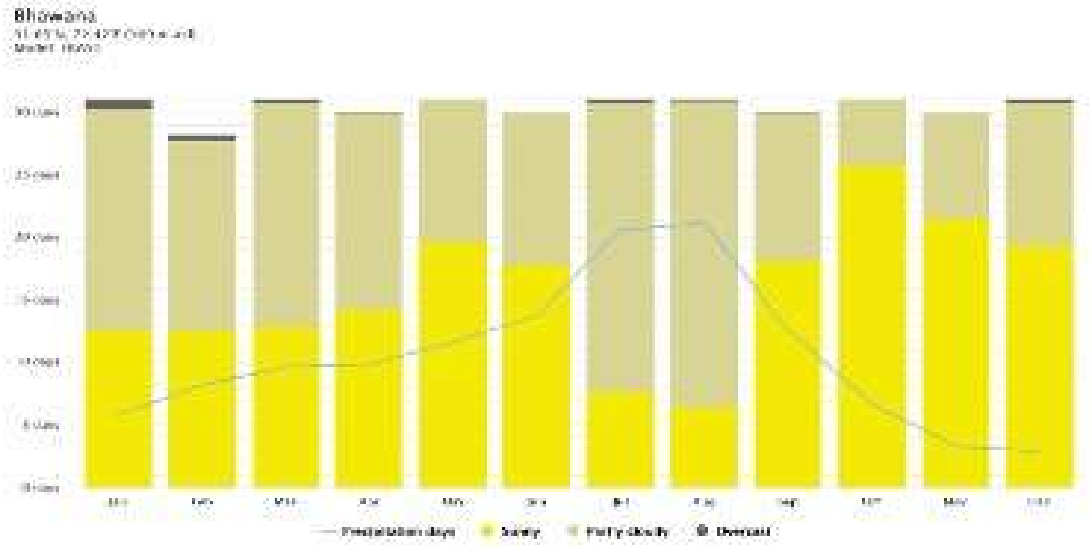


Figure 6-4, Annual Precipitation

6.4.5 Wind Speed and Direction

Wind conditions in Tehsil Bhowana remain generally moderate throughout the year, with wind speeds of 10–20 km/h dominating during most months. The windiest period occurs from May to July, particularly in May and June, when 20–30 km/h winds become more frequent due to pre-monsoon and monsoon activity. In contrast, calmer conditions prevail during October to January, when light winds of 2–5 km/h and 5–10 km/h are more common as shown in Figure 6-5. wind speeds exceeding **30 km/h** are extremely rare, indicating overall stable wind conditions in the area throughout the year as shown in Figure 6-6.

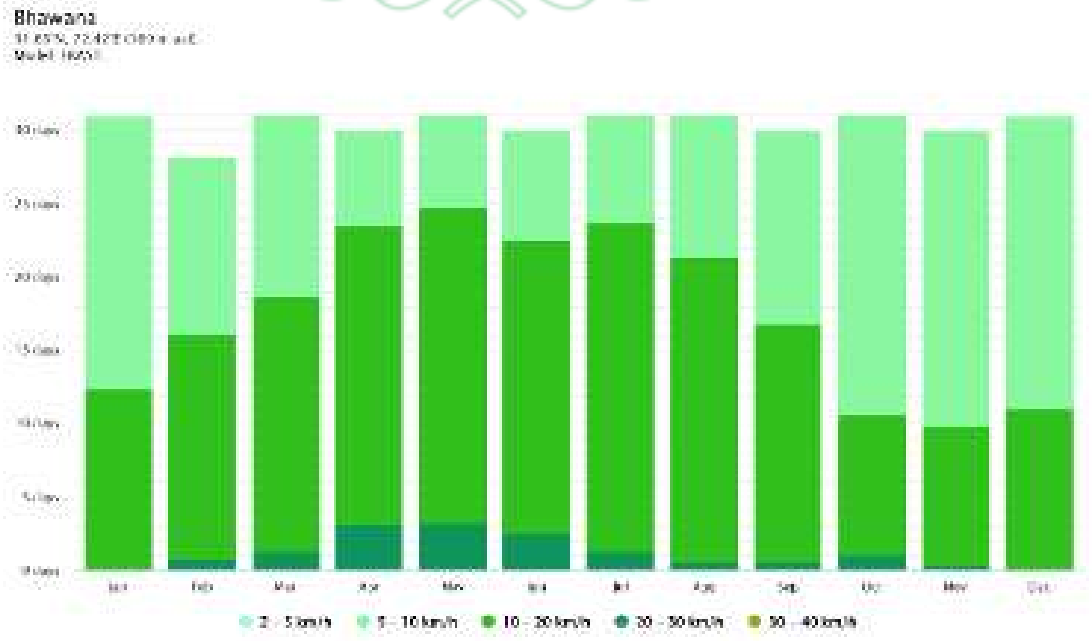


Figure 6-5, Wind Speed

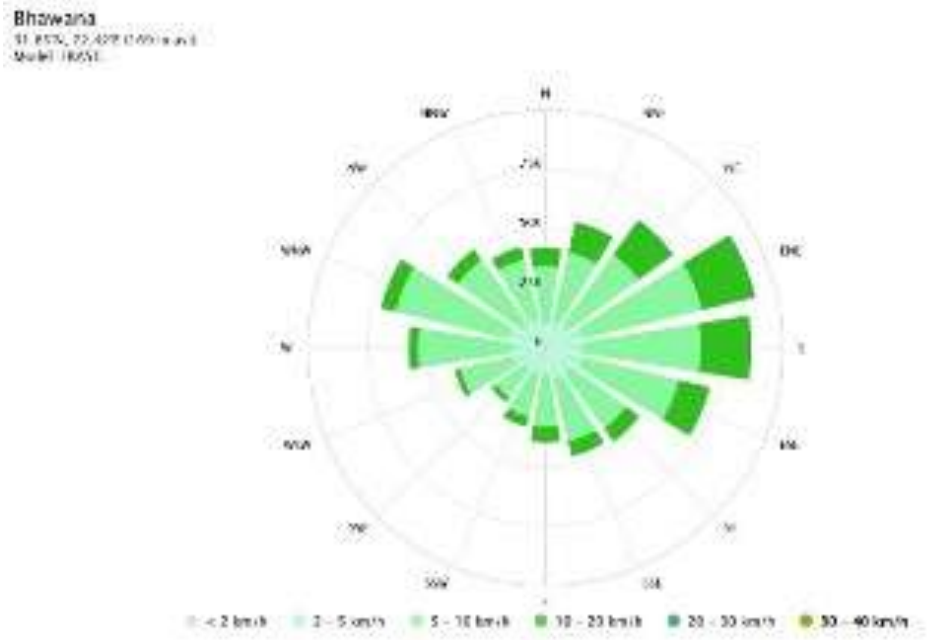


Figure 6-6, Wind Rose

6.4.6 Seismicity

According to Seismic Zoning of Pakistan, the subproject area lies in Zone 2A and represents minor to moderate damage due to earthquakes.

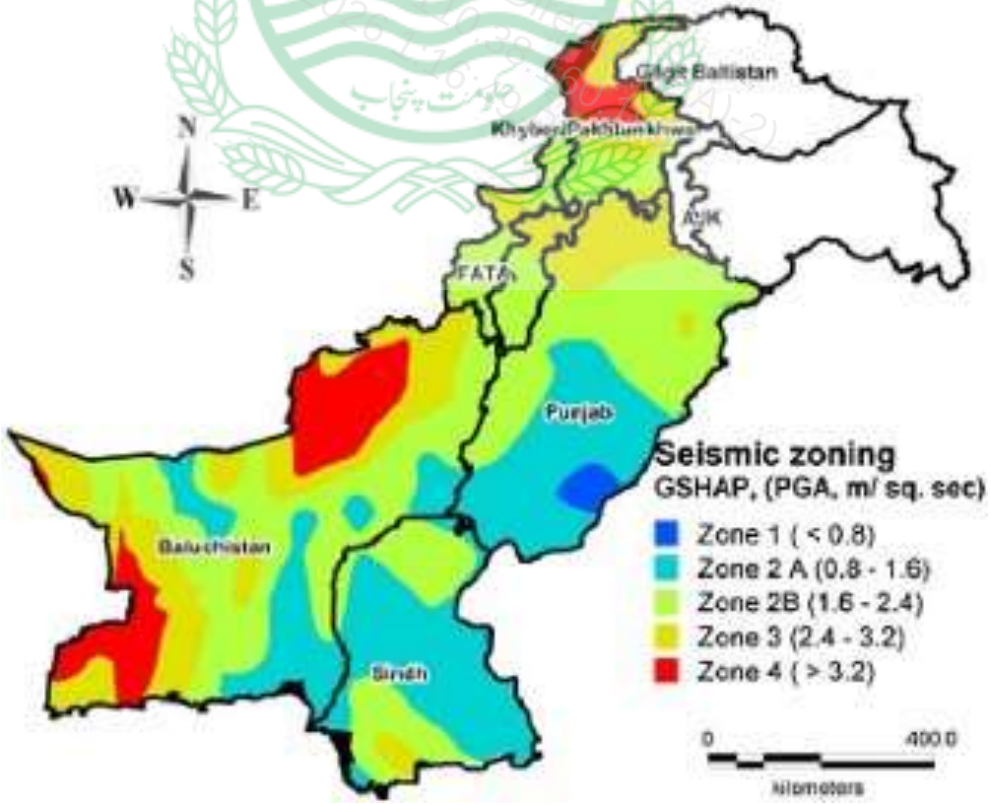


Figure 6-7, Seismic Zones of Pakistan

6.4.7 Ground Water and Water Supply (District Chiniot)

In Tehsil Bhowana, groundwater is the major source of potable and irrigation water for the local population. According to the Pakistan Social and Living Standards Measurement (PSLM) Survey and secondary data sources, approximately 20–30% of households have access to piped water supply connections within their houses, while the majority of the population, estimated at around 65–75%, depends on hand pumps, electric pumps, tube wells, and other groundwater extraction systems for domestic water use. A very small proportion of households, less than 5%, utilize water obtained from open wells and other traditional sources. Irrigation in the area primarily depends on canal water supplied through distributaries linked with the Lower Chenab Canal system originating from the Chenab River; however, canal supplies remain seasonal and often insufficient during dry periods. Consequently, agriculture in Bhowana heavily relies on groundwater abstraction through tube wells installed in both private and public sectors. The region contains a large number of privately owned tube wells supporting irrigation activities, particularly for wheat, cotton, sugarcane, rice, and fodder cultivation. Studies indicate that more than 70% of irrigated agriculture in Punjab directly or indirectly depends on groundwater resources due to increasing pressure on canal supplies. The current project pertains to the Improvement and Development of Water Supply & Sanitation Services System in the revenue villages of Tehsil Bhowana. To evaluate the existing groundwater quality conditions within the project area, groundwater samples were collected by field officers of Asian Environmental Services Private Limited – an EPA Certified Laboratory, during field investigations and analyzed for various physio-chemical and bacteriological parameters. The laboratory analysis indicated that groundwater quality in several locations is moderately affected by salinity and elevated Total Dissolved Solids (TDS), which is a common issue in the semi-arid regions of central Punjab. The detailed groundwater quality analysis results of the project area are provided below:

Table 6-2, Ground Water Analysis Results of Point 01 in Tehsil Bhowana (Coordinates; 31°38'43"N 72°48'46"E)

Ground Water Analysis Results					
Parameter	**Analysis Method**	**PEQS**	**Result**	**MU (CL95%)**	**Remarks**
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	336	± 1.40	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	402	± 2.77	Optimal

Ground Water Analysis Results					
Parameter	**Analysis Method**	**PEQS**	**Result**	**MU (CL95%)**	**Remarks**
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.50	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500-Cl^- B	< 250 mg/L	17	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	BDL	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.19	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3^-) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	1.43	± 0.05	Optimal
Nitrite (NO_2^-) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2-0.5 at consumer end 0.5-1.5 at source/1.0 mg/L	0	N.A.	Optimal
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.038	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

Table 6-3, Ground Water Analysis Results of Point 02 in Tehsil Bhowana (Coordinates; 30°22'32"N 73°31'60"E)

Ground Water Analysis Results					
Parameter	**Analysis Method**	**PEQS**	**Result**	**MU (CL95%)**	**Remarks**
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	516	± 10.70	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	668	± 8.78	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.39	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500-Cl^- B	< 250 mg/L	50	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.165	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.44	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3^-) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	5.41	± 0.05	Optimal
Nitrite (NO_2^-) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2-0.5 at consumer end 0.5-1.5 at	0	N.A.	Optimal

Ground Water Analysis Results					
Parameter	**Analysis Method**	**PEQS**	**Result**	**MU (CL95%)**	**Remarks**
		source/1.0 mg/L			
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.042	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

6.4.8 Surface Water (District Bhowana)

The Chenab River flows along the southern side of Tehsil Bhowana and serves as the main surface water source of the area. The river primarily depends on seasonal monsoon rainfall, glacier melt from the Himalayan catchments, and upstream water releases from Mangla and Marala water management systems under the regional river management system. During the monsoon season (July to September), the river experiences high flow conditions which may cause flooding in adjacent low-lying areas and riverine settlements. A network of irrigation canals and distributaries originates from the regional irrigation system connected with the Chenab River through the Khanki Headworks and Lower Chenab Canal system, providing irrigation water to extensive agricultural lands of Tehsil Bhowana. These canals support the cultivation of major crops including wheat, rice, sugarcane, cotton, and fodder crops. Seasonal nullahs and drainage channels also contribute to surface water availability during monsoon periods and help convey excess runoff from agricultural fields. The surface water system of the area plays a vital role in agriculture, groundwater recharge, and local livelihoods; however, excessive upstream releases and intense monsoon rainfall may increase the risk of flooding, waterlogging, and soil salinity in different parts of the tehsil. According to climate records and GIS-based assessments, central Punjab including Bhowana is moderately vulnerable to monsoon flooding and seasonal water stress due to climatic variability and increasing irrigation demand.



Figure 6-8, The Khanki Headworks

6.4.9 Air Quality

Air quality in most of the subproject area appears good based on observation during the study period. Emissions should be controlled at source under the EIA. There will be a few items of powered mechanical equipment to be used in the construction and rehabilitation works that may give rise to complaints of dust and other emissions; however, these should be minor and easily dissipated. Domestic sources of air pollution, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households, are minor.

The primary source of air pollution is the vehicular emissions, industries such as rice mills and the key pollutants likely to be found at subproject proposed locations are Carbon Monoxide (CO), Oxides of Nitrogen (NOx), Sulfur Dioxide (SOx) and Particulate Matter (PM).

The monitored parameters included Carbon mono-oxide (CO), Nitrogen oxides (NOx), Sulphur oxides (SOx), Particulate Matter (PM_{10}). The monitoring was carried out at two designated points / locations by the filed officers of Asian Environmental Services Private Limited on December 16 to 17, 2025 at one location and December 17 to 18, 2025 on second location for the period of 24 hours at each location to determine the baseline ambient air quality of the area and results are presented in Table 6-4 and Table 6-5. Reports are attached as Annexure.

Table 6-4, Ambient Air Monitoring Results of Point 01 in Tehsil Bhowana (Coordinates; 31°33' 54" N 72°38'35" E)

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24 Hours	1.00	7.82	80.0 µg/m³	Optimal
Nitrogen Oxide (NO)*	µg/m³	24 Hours	1.00	10.26	40.0 µg/m³	Optimal
NO_x*	µg/m³	24 Hours	1.00	16.36	NGVS µg/m³	-
Sulphur Dioxide (SO_2) *	µg/m³	24 Hours	1.00	27.56	120.0 µg/m³	Optimal
Carbon Monoxide (CO)*	mg/m³	24 Hours	0.01	0.76	05.0 mg/m³	Optimal
Ozone (O_3) *	µg/m³	01 Hour	1.00	18.5	130 µg/m³	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24 Hours	1.00	139	150.0 µg/m³	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24 Hours	1.00	31.5	35.0 µg/m³	Optimal
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	321	500.0 µg/m³	Optimal

Table 6-5, Ambient Air Monitoring Results of Point 02 in Tehsil Bhowana (Coordinates; 31°34' 0" N 72°38'59" E)

Parameters	Method of Measurement	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24 Hours	1.00	22.67	80.0 µg/m³	Optimal
Nitrogen Oxide (NO)*	µg/m³	24 Hours	1.00	11.56	40.0 µg/m³	Optimal
NO_x*	µg/m³	24 Hours	1.00	34.23	NGVS µg/m³	-
Sulphur Dioxide (SO_2) *	µg/m³	24 Hours	1.00	48.60	120.0 µg/m³	Optimal
Carbon Monoxide (CO)*	mg/m³	24 Hours	0.01	1.59	05.0 mg/m³	Optimal
Ozone (O_3) *	µg/m³	01 Hour	1.00	20.72	130 µg/m³	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24 Hours	1.00	115	150.0 µg/m³	Optimal

Parameters	Method of Measurement	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Particulate Matter ($PM_{2.5}$) *	µg/m³	24 Hours	1.00	33	35.0 µg/m³	Optimal
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	148	500.0 µg/m³	Optimal

6.4.10 Noise

Noise from vehicles and other powered mechanical equipment is intermittent. There are also the occasional calls to prayer from the PA systems at the local mosques but there are no significant disturbances to the quiet rural setting. However, the construction from the proposed power expansion will use powered mechanical equipment. Subjective observations were made of background noise and also of individual vehicle pass by events.

Noise level of the project area was monitored by field representative of Asian Environmental Services Private Limited on December 16 to 17, 2025 at one location and December 17 to 18, 2025 on second location for the period of 24 hours at each location to determine the baseline noise levels at project site using digital sound meter and the results are presented in Table 6-6 and Table 6-7 and reports are attached as Annexure.

Table 6-6, Noise Level Monitoring Results of Point 01 in Tehsil Bhowana (Coordinates; 31°33' 54" N 72°38'35" E)

Sr. No.	Time	Noise dB(A)		PEQS
1	13:00	62	Day Time	55
2	14:00	62		
3	15:00	61		
4	16:00	61		
5	17:00	60		
6	18:00	59		
7	19:00	58		
8	20:00	56		
9	21:00	54		
10	22:00	52	Night Time	45
11	23:00	49		
12	00:00	48		
13	01:00	47		
14	02:00	45		
15	03:00	44		

Sr. No.	Time	Noise dB(A)		PEQS
16	04:00	43		
17	05:00	41		
18	06:00	42		
19	07:00	44	Day Time	55
20	08:00	47		
21	09:00	49		
22	10:00	52		
23	11:00	55		
24	12:00	58		

Table 6-7, Noise Level Monitoring Results of Point 02 in Tehsil Bhowana (Coordinates; 31°34' 0" N 72°38'59" E)

Sr. No.	Time	Noise dB(A)		PEQS
1	13:00	59	Day Time	55
2	14:00	57		
3	15:00	56		
4	16:00	54		
5	17:00	52		
6	18:00	50		
7	19:00	49		
8	20:00	47		
9	21:00	45		
10	22:00	43	Night Time	45
11	23:00	41		
12	00:00	39		
13	01:00	37		
14	02:00	36		
15	03:00	35		
16	04:00	34		
17	05:00	35		
18	06:00	36		
19	07:00	38	Day Time	55
20	08:00	41		
21	09:00	42		
22	10:00	44		
23	11:00	46		
24	12:00	48		

6.5 Biological Resources

The project area is rich in biodiversity due to its diverse landscape and unique geographical location. A wide range of ecosystems exists within the area, providing habitat for various floral and faunal species. The following section describes the biological environment of the project area.

6.5.1 Wildlife, Fisheries and Aquatic Biology

Avifauna is extremely common especially along the banks of the Chenab River and associated wetlands of Tehsil Bhowana. Common Myna (Acridotheres tristis), House Crow (Corvus splendens), Cattle Egret (Bubulcus ibis), Black Drongo (Dicrurus macrocercus), and Indian Roller (Coracias benghalensis) are among the commonly observed bird species of the area. Other bird species recorded in the district and adjoining agricultural landscapes include Red-vented Bulbul (Pycnonotus cafer), House Sparrow (Passer domesticus), White-throated Kingfisher (Halcyon smyrnensis), Indian Pond Heron (Ardeola grayii), Parakeet (Psittacula krameri), Eurasian Collared Dove (Streptopelia decaocto), Barn Owl (Tyto alba), Black Kite (Milvus migrans), Little Egret (Egretta garzetta), Common Hoopoe (Upupa epops), Pied Bush Chat (Saxicola caprata), Baya Weaver (Ploceus philippinus), and Common Sandpiper (Actitis hypoleucos). Seasonal migratory bird species are also reported near riverine and wetland habitats during winter months due to the ecological significance of the Chenab floodplain. According to secondary data from the Punjab Wildlife and Parks Department, regional forestry records, and biodiversity assessments, the avifauna diversity of central Punjab is largely supported by agricultural fields, canal networks, wetlands, and riverine ecosystems which provide suitable feeding and nesting habitats for both resident and migratory birds.



Crow (5WZ^][[XTMVLMV[)



Cattle Egret (4]J]TK][⇩J⇩[)



Common Myna (Acridotheres tristis)



Common Hoopoe (Upupa epops)

Figure 6-9, Fauna in Bhowana

6.5.2 Vegetation Cover and Trees

The Tehsil Bhowana, District Chiniot vegetation primarily consists of commonly reported agro-ecological and riverine species of central Punjab, including Shisham (Dalbergia sissoo), Kikar/Babul (Acacia nilotica), Safeda/Eucalyptus (Eucalyptus camaldulensis), Mulberry (Morus alba), Neem (Azadirachta indica), Ber (Ziziphus mauritiana), Poplar (Populus deltoides), and Simbal (Bombax ceiba).

Various herbs and grasses can also be found, including Doob grass (Cynodon dactylon), Kans grass (Saccharum spontaneum), and Khar grass (Desmostachya bipinnata). These species are commonly reported in the irrigated plains, canal command areas, and riverine ecosystems of central Punjab and are important for timber production, fuelwood supply, fodder availability, soil conservation, and biodiversity conservation.

6.5.3 Wetlands

There are no major natural wetlands located directly within the immediate project site; however, seasonal wetlands, irrigation ponds, canal-side marshy areas, and agricultural waterlogged patches are present in the wider Bhowana region.

6.5.4 Wildlife Sanctuaries

The nearest wildlife sanctuary to the Bhowana Plantation area is the Chichawatni Plantation Wildlife Sanctuary, located 65–70 km from the project site. Another important protected area in the vicinity is the Depalpur Plantation Wildlife Sanctuary, situated at a distance of about 110–120 km. These wildlife sanctuaries are notified protected areas under the Punjab Wildlife Protection framework and provide habitat for various mammals, reptiles and bird species including jackal, wild boar, Indian hare, jungle cat, mongoose, peafowl and partridge birds. According to the Punjab Forestry, Wildlife and Fisheries Department, the Chichawatni Plantation Wildlife Sanctuary covers about 11,500 acres, while the Depalpur Plantation Wildlife Sanctuary extends over approximately 7,000 acres.

6.5.5 Wildlife Parks

There is no designated wildlife park or protected wildlife reserve located within Tehsil Bhowana or the immediate project area. However, the region supports common mammalian and avifaunal species associated with agricultural lands, canal networks, wetlands, and riverine habitats along the Chenab River.

6.5.6 Forests

Chiniot Plantation Reserve Forest, the nearest significant forest plantation near Bhowana, is located at an approximate distance of about 20–30 km from the Bhowana city/project area. The forest vegetation mainly comprises Shisham (*Dalbergia sissoo*), Kikar (*Vachellia nilotica*), Safeda (*Eucalyptus camaldulensis*), Ber (*Ziziphus mauritiana*), Jand (*Prosopis cineraria*), and Neem (*Azadirachta indica*) as common floral species. These irrigated plantations contribute significantly to biodiversity conservation, soil stabilization, carbon sequestration, microclimatic regulation, and ecological balance within the district.

6.5.7 Game reserves

The nearest protected game reserve near the project area in Tehsil Bhowana is the Border Belt Game Reserve, located 70–100 km from the project site along the Pakistan – India border belt region. A small portion of this reserve extends into Chiniot District and adjoining districts, providing habitat for wildlife species including wild boar, jackal, jungle cat, hare, mongoose, partridge, and migratory birds. The reserve is managed by the Punjab Wildlife & Parks Department for biodiversity conservation, habitat protection, and regulated wildlife management purposes.



C]NIQLI "7]KITaX\][KIUITL]TMV[Q[#



>MMU "3bILQZIKP\IQVLQKI#



Jand (@ZW[WX\[K\VMZ I Z\ I)



Ber (Ziziphus mauritiana)

Figure 6-10, Flora in Bhowana

6.6 Social and Cultural Resources

6.6.1 Population Communities

According to the 2023 Population Census, the total population of Chiniot District is 1.56 million, while the total population of Bhowana Tehsil is about 428,617 persons. The tehsil comprises both rural and urban administrative units, including Amin Pur QH, Bhowana QH, Kurk Mohammadi QH, Mangoana QH, Bhowana MC, Chak No. 10 JB, Chak No. 12 JB, Chak No. 15 JB, Chak No. 18 JB, Chak No. 22 JB, and adjoining rural settlements. Among these, Amin Pur QH has the highest population with 122,704 persons, followed by Mangoana QH with 109,437 persons, while Bhowana MC has the lowest population of 39,270 persons. The census data indicates that the tehsil has a predominantly rural population, with agriculture serving as the main source of livelihood and economic activity in the area.

6.6.2 Gender Status

At the time of the 2023 Census, Bhowana had a total population of 1,136,892, with a gender ratio of approximately 104 males per 100 females.

6.6.3 Land-use

The land use pattern in Chiniot District is predominantly agricultural with rural settlements, semi-urban residential areas, commercial centers, and public infrastructure. The district covers approximately 308,600 acres of land, of which about 248,000 acres are cultivated area, indicating extensive agricultural activity in the region. Out of the total cultivated land, approximately 235,000 acres are irrigated, while only a small portion remains rainfed, reflecting the highly developed irrigation network of the district.

Agriculture is the dominant land use due to the fertile alluvial plains and irrigation system associated with the Chenab River and the canal network of Lower Chenab Canal and Rakh Branch Canal. Major crops grown in the district include wheat, cotton, rice, maize, sugarcane, and fodder crops. Irrigation is supported through canals, tube wells, and canal-tube well systems. According to Punjab Development Statistics, approximately 35,000

hectares are irrigated through tube wells, while nearly 60,000 hectares receive irrigation through canal-tube well systems, indicating intensive conjunctive use of surface and groundwater resources.

Residential land use is concentrated in Chiniot city, Bhowana, Lalian, and adjoining rural settlements. According to the 2023 Population Census, Chiniot District has a population of approximately 1,369,000 persons, including nearly 72%–74% rural population and 26%–28% urban population, reflecting the predominantly rural character of the district where agriculture remains the principal source of livelihood. The population comprises approximately 699,000 males and 670,000 females.

Commercial activities are concentrated in central bazaars and along major transportation corridors, including grain markets, retail shops, agro-based industries, rice mills, cotton factories, workshops, sugar mills, and small trading centers. Public land uses include government offices, educational institutions, healthcare facilities, mosques, graveyards, parks, and community buildings distributed throughout the district.

Open spaces in the district include agricultural fields, playgrounds, vacant lands, seasonal floodplains, low-lying areas, and scattered plantation zones. Increasing population growth, urbanization, and road infrastructure development are gradually expanding residential and commercial land use along major highways and transportation corridors, particularly around Bhowana city and Lalian town.

6.6.4 Languages

Punjabi is the main language spoken by the people of Bhowana. Saraiki is the second most commonly spoken language after Punjabi. Urdu is also widely understood and spoken in urban and educational areas of the tehsil.

6.6.5 Literacy Rate and Education Facilities

The literacy ratio in Chiniot District increased from about 61.0% in 2017 to 66.3% in 2023. The literacy rate for males is 73.5%, while for females it is 58.7%, showing a significant gender gap in education.

Several government and private educational institutions are present in Bhowana, including Government High School Bhowana, Punjab School Bhowana, The Educators Bhowana, and Allied Schools. The district also has around 15–20 notable colleges, most of which are government institutions, including Government College of Technology Chiniot, Government Graduate College Bhowana, and various affiliated degree colleges for boys and girls.

Table 6-8, Demographic Data

Tehsil	Area (sq.km.)	Population 2023								Population 2023	2017-2023Avg. annual growth rate (%)
		All sexes	Male	Female	Trans-gender	Sex ratio	Population density/sq.km.	Urban proportion	Avg. HH size		
Chiniot District	2,643	1,563,024	790,731	772,126	167	102.41	591.38	31.46	6.00	1,368,659	2.24
Bhowana Tehsil	879	428,617	217,050	211,539	28	102.61	487.62	9.16	6.10	373,841	2.31

Hira Fatima (Assistant Director (EIA)-2)
EPA

6.6.6 Health Facilities

District Headquarters (DHQ) Hospital Chiniot is the main public healthcare facility in the district, while Tehsil Headquarters (THQ) Hospitals are functional in Bhowana, Lalian and Chiniot tehsils to provide secondary healthcare services. In addition, several Rural Health Centers (RHCs), Basic Health Units (BHUs), dispensaries, and maternal healthcare centers are distributed throughout the district to serve rural communities. A number of private healthcare facilities, including Al-Rehman Hospital, Hassan Medical Complex, private clinics, diagnostic laboratories, and small medical centers, are also available to meet the healthcare needs of the growing population of Chiniot District, Bhowana Tehsil.

6.6.7 Health Problems

The most common diseases in these areas are including typhoid, cholera hepatitis, diarrhea, intestinal worms and malaria. These diseases largely occur due to unhygienic living conditions, lack of sanitation and safe drinking water facilities, malnutrition, and lack of ready access to proper healthcare, including preventive healthcare facilities.

6.6.8 Decision-making Method and Conflict Resolutions System

The methods for decision-making about social conflicts in the AOI are "Panchayat" (an assembly of wise and respected elders), court, "Jirga" (traditional assembly of leaders that make decisions by consensus), caste groups and others (method constituted on the spot considering major issues and scope of the conflicts).

People prefer "Panchayat" in the AOI compared to court or other legal system because this method is more effective. "Panchayat" provides timely justice while other methods are complex and require time as well as money.

The people have a tradition to help each other in the hour of need. Common conflicts arise from time to time which are solved by the community at the local level. Generally, in case of a conflict between two individuals, only the families or closest friends take sides of the conflicting rivals so there are rare chances that personal conflict will transform into an ethnic dispute.

6.6.9 Household Information

According to the 2023 Population and Housing Census, the population of Bhowana remains predominantly Muslim, following the overall demographic pattern of Punjab where Muslims constitute approximately 97.75% of the population, with Christians being the second-largest religious community accounting for nearly 1.93% of the province's total. Other religious groups, including Hindus, Ahmadis, Scheduled Castes, Sikhs, and others, collectively represent less than 1.0% of the total population.

The city of Bhowana is historically associated with the rich agricultural and cultural heritage of Central Punjab and serves as an important urban center within District Chiniot. The town derives its identity from its strategic location on the fertile plains between the Chenab River and the agricultural hinterland

of Chiniot District. Historically, Bhowana has functioned as a regional trading and service center for the surrounding rural communities, supporting agricultural production, livestock rearing, and local commerce. The city is recognized for its strong social cohesion, traditional Punjabi values, and community-oriented lifestyle, reflecting the cultural traditions and rural character of Central Punjab. The residents of Bhowana are widely known for their hospitality, agricultural expertise, and active participation in social and economic activities, contributing significantly to the development and prosperity of the region.

6.6.10 Settlement of Respondents

The majority of the population in Bhowana Tehsil is native to the area, while only about 2% – 4% of the population is migrant according to the 2023 Census, indicating low migration trends in the tehsil.

6.6.11 Family System

Majority of the community live in joint family arrangements while some younger population prefers living in separate family units. In the joint family system, the eldest male member takes care of all the family members and is the final decision-making authority particularly for issues regarding the public domain. This system also provides social security for family members during periods of individual un-employment and financial crisis. These communities believe that the joint family system is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives who are unable to work.

6.6.12 Source of Livelihood and Income

According to the Pakistan Labour Force Survey (2023-24), 95.8% of the economically active population in Pakistan was employed, while the unemployment rate was about 4.2%. In Chiniot District, including Tehsil Bhowana, agriculture remains the dominant source of employment due to its predominantly rural economy and fertile agricultural land. Nearly 42% of the employed labour force was engaged in the agriculture sector, while about 23% was associated with industry and 35% with the services sector. Significant variations were observed in labour force participation across gender and between rural and urban populations, with males and rural residents showing comparatively higher economic participation rates. The district economy is primarily dependent on agriculture, livestock, agro-based industries, small businesses, trade activities, and public services.

6.6.13 Agricultural Land Status

Wheat, rice, sugarcane, and fodder crops are the major agricultural crops of Chiniot District and Bhowana Tehsil. Among the fruits, citrus, guava, and mango are also important sources of income for the agricultural community. Besides, maize, vegetables, and oilseed crops are also grown in the tehsil in minor quantities. Agriculture is the backbone of the economy of Bhowana Tehsil and District Chiniot, where approximately 533,034 acres of land are

cultivated, supported by the fertile alluvial plains and extensive irrigation network associated with the Chenab River and canal systems. The district has a high cropping intensity due to canal irrigation and tube well facilities, making agriculture the primary source of livelihood for the rural population.

6.6.14 Horticulture

The main fruits grown in Bhowana, Chiniot are mango, citrus (kinnow), guava, watermelon, and melon, while dates, falsa, and jamun are also cultivated in some areas. The district is widely known for sugarcane, wheat, rice, and fodder production, along with limited cotton cultivation in suitable agricultural zones. Fertile alluvial soils and canal irrigation from the Chenab River irrigation system support intensive agriculture in the tehsil. Approximately 3,000 – 5,000 acres of land are under horticulture and fruit gardens in canal-irrigated areas of Chiniot.

6.6.15 Road and Rail Network

District Chiniot, including Tehsil Bhowana, is well connected through an extensive road network comprising provincial highways, farm-to-market roads, metaled canal roads, and local roads developed by the Communication & Works (C&W) Department, Local Government & Community Development Department (LG&CD), District Councils, and other local bodies. All tehsil headquarters and major towns are linked through blacktop/metaled roads, facilitating transportation, agriculture, and trade activities throughout the district. Chiniot is connected with nearby districts through the Chiniot–Jhang Road, Chiniot–Faisalabad Road, Chiniot–Sargodha Road, and Bhowana–Painsra Road networks. However, Bhowana is not directly located on the main national railway corridor; therefore, residents of the tehsil have limited direct railway access to major cities such as Lahore, Karachi, and other urban centers through branch railway connections. Railway facilities are available at Chiniot Railway Station, Chenab Nagar Railway Station, and nearby adjoining districts. District Chiniot is also not directly connected by air transport. The nearest major airport is Faisalabad International Airport, located approximately 50 km – 60 km from Bhowana, while Allama Iqbal International Airport Lahore is situated about 170 km – 180 km away, providing national and international connectivity to the region.

6.6.16 Energy Sources

In Tehsil Bhowana of District Chiniot, a large majority of households still depend on traditional biomass fuels for cooking purposes. According to recent census and socio-economic statistics, more than 70% of households use wood as the primary source of cooking fuel, while approximately 25% rely on natural gas/LPG for cooking. A very small proportion of households, around 1%–3%, use kerosene oil or coal, whereas the use of other alternative energy sources remains negligible at less than 1%. This indicates that fuel wood continues to be the dominant cooking energy source in rural and peri-urban areas of Tehsil Bhowana due to limited gas availability and economic constraints.

6.6.17 Community Based Organization (CBOs) and NGOs

There are several NGOs in District Chiniot such as education and student welfare organizations, women skill development organizations, health and patient welfare organizations, human rights and legal aid organizations, child and youth welfare organizations, and community development organizations, etc. In Tehsil Bhowana, these NGOs mainly operate under community development and social welfare initiatives with a total of around 20–30 registered NGOs in the jurisdiction, focusing on education, health, women empowerment, livelihood improvement, and poverty alleviation.

6.6.18 Local Government and Administration

In Tehsil Bhowana, local government institutions play an important role in community development and public administration. The tehsil comprises 16 Union Councils where elected representatives, including Chairmen, Vice Chairmen, and councilors, actively participate in local-level development activities, public service delivery, and community welfare initiatives. Key local government bodies operating in the tehsil include the Municipal Committee Bhowana, the Tehsil Council Bhowana, and the Town Committee Bhowana, each responsible for civic administration and development within their respective jurisdictions. District-level development and administrative functions are supervised by the District Council Chiniot under the leadership of the Deputy Commissioner Chiniot, who serves as Administrator of the District Council under the prevailing Punjab Local Government Act.

6.6.19 Law and Order Situation

The law-and-order situation in Tehsil Bhowana, Chiniot district, including the subproject area, is normal and under the control of the district administration and law enforcement agencies (police).

6.6.20 Community Awareness about Subproject Works

The communities residing at subproject area are well aware about the proposed subproject works and implementation. During screening and development of EIA, public consultations were held regarding subproject activities.

6.6.21 Community Demands

During public consultations and baseline data collection activities on subproject for the improvement of water supply and sanitation system, basic priority needs of the communities were also determined which are as follows:

- Creation of jobs under the project
- Provision of clean and uninterruptable supply of water

6.7 Physical Cultural Resources

Sites of religious importance like mosques, graveyards and other sensitive receptors like schools have been found in revenue villages. The mitigation measures like operating the equipment with muffling devices, use localized

noise barriers, regular maintenance of machinery equipment and regular monitoring and reporting will be adopted to encounter the impacts near sensitive receptors.

6.8 Industries in Bhowana

There are an estimated 80–100 small and medium-scale industrial units operating in Tehsil Bhowana, including rice mills, ice factories, cotton ginning units, flour mills, and the Ramzan Sugar Mills, mainly based on the agro-economy of the area. According to consultations with the Tehsil administration and local communities, no industrial unit in Tehsil Bhowana discharges untreated industrial effluent into the River Chenab or the Lower Chenab Canal, and the area remains largely free from major industrial wastewater contamination due to the limited industrial base and the implementation of environmental compliance measures by major industrial establishments.

6.9 Suitability of Site

The project does not fall in any sensitive zone. The project is for the improvement and development of water supply & sanitation services system in revenue villages of tehsil Bhowana. Therefore, the site is suitable for the project. This section describes project area and its surroundings to establish baseline, which are expected to be affected by the project. The baseline description includes physical, ecological and socioeconomic aspects of the subproject area.

Multiple site visits were conducted to collect primary data on physical, ecological and socioeconomic aspects. Environmental surveys, interviews with general public and various governmental and non-governmental organizations were carried out to collect the baseline data. Furthermore, sensitive receptors of potential subproject impacts were identified. Secondary data was collected from available literature and District Census Report (DCR) etc.

SECTION - 7: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

7.1 General

This chapter identifies the potential impacts related with pre-construction, construction and operation phases of the project on the physical, ecological and socio-economic domains of the environment. Accordingly, mitigation measures have been proposed to mitigate the negative impacts and to enhance the positive impacts.

7.2 Approaches and Methodology

During the preparation for the project construction phase, the future contractors must be notified and prepared to cooperate with the executing agency, project management, supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must document the implement the EMP in full context and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the EMP will be prepared and must be audited and this will be considered as the most important part of planning. In this regard the proponent must fulfil the requirements of the law and guidance prepared by EPA on the environmental aspects of power projects and the recommendations already made for projects in this EIA and under EIA/IEE regulation and Punjab Environmental Protection Act (2012).

For impact identification, various EIA methodologies are available including the checklists, interaction matrices, networks and overlays. Among these four methods, following three are used in EIA of Improvement and Development of Water Supply & Sanitation Services System in Revenue Villages of Tehsil Bhowana, Punjab;

1. Project Interaction Matrix
2. Checklists
3. Overlays

Interaction matrix is a two-dimensional matrix wherein the project actions are placed along one axis (i.e., along y-axis) and on the other axis there are different environmental parameters likely to be affected by the proposed sub-project actions grouped into categories i.e., Physical, Ecological & Socio-economic Environment. Interaction matrix is used in this sub-project due to the following reasons:

- It provides cause-effect relationship between the project actions and resulting consequences impacts;
- It provides nature (+ve or –ve) and weighting of different impacts;
- It provides cumulative impacts of a project.

Matrix grouped project actions into temporal phases. For the impact assessment, sub-project interaction matrix is used by dividing the project action into different phases (Preconstruction, construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socio-economic domains. The environmental impacts of the project actions are identified and weighed into the following categories:

+3 = Extremely Beneficial
+2 = Potentially Positive
+1 = Slightly Positive
0 = Insignificant
-1 = Slightly Negative
-2 = Potentially Negative
-3 = Extremely Negative

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. It may be noted that the environmental parameters, which are not related to the implementation of the sub-projects, have not been considered in the matrix.

7.2.1 Checklist

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. The project Checklist has been developed for "without" and "with mitigation". It may be noted that the environmental parameters, which are not related to the implementation of the project, have not been considered in the matrix.

7.2.2 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 (for example, susceptibility to erosion). Information for an array of variables is collected for the standard geographical units within the study area, and recorded on a series of maps, typically one for each variable. These maps are overlaid to produce a composite. The resulting composite maps characterize the area's physical, social, ecological, land use and other relevant characteristics, relative to the location of the proposed development.

7.3 Characteristics of Impacts

The predicted impacts have been characterized; various aspects of the impact characterized include:

- Nature (direct / indirect)
- Duration of impact (Short term, medium term, long term)
- Geological extend (local, regional)

- Timing (project phase)
- Reversibility of impact (Reversible / Irreversible)
- Likelihood of the impact (certain, likely, unlikely, rare)
- Impact consequence severity (major, moderate, minor)
- Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in **Table 7-1**.

Table 7-1, Impact Characterization

Nature	**Direct:** The environmental parameter is directly changed by the sub-project. **Indirect:** The environmental parameter changes as a result of change in another parameter
Duration of Impacts	**Short-term:** lasting only for the duration of the sub-project such as noise from the construction activities. **Medium-term:** Lasting for a period of few months to a year after the sub-project before naturally reverting to the original condition such as loss of vegetation due to clearing of campsite, contamination of soil or water by fuels or oil. **Long-term:** lasting for a period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical Extent	Local, regional (spatial dimension)
Timing	Construction and Operation
Reversibility of Impact	**Reversible:** when a receptor resumes its pre-sub-project condition. **Irreversible:** when a receptor does not or cannot resume its pre-sub-project condition.
Likelihood of the Impact	**Almost Certain:** Impact expected to occur under most circumstances. **Likely:** Impact will probably occur under most circumstances. **Possibly:** Impact may possibly occur at some time. **Unlikely:** Impact could occur at some time. **Rare:** Impact may occur but only under exceptional circumstances.
Impact Consequences severity	**Major:** When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora and fauna: has long term effects (period of years) on socioeconomic activities of significance on regional level. **Moderate:** When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or

	change in abundance or distribution over one generation of a population of flora or fauna: have short-term effects (period of years) on socioeconomic activities of significance on regional level. **Minor:** When an activity causes short-term (period of a few months), reversible damage to a unique environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socioeconomic activities of local significance. **Negligible:** when no measurable damage to physical, socioeconomic, or biological environment above the existing level of impact occurs.
	Categorized as High, Medium, Low Based on the consequence, likelihood, reversibility, geographical extent, and duration: level of public concern: and conformance with legislative of statutory requirements.

The impact characterization due to Design, Location, Construction and operational phase is given in their respective sections.

7.4 Environmental Impacts and their Mitigation During Pre-Construction Phase

7.4.1 Environmental Impacts Regarding Project Location

The project is for water supply & sewerage system that will be improved / developed in revenue villages of tehsil Bhowana given in Table 1-1. For the construction / installation of project components like tube-well, OHRs, WWTPs etc., locations will be selected as per design, feasibility and availability of the land.

Impact Significance: High

Mitigation: All the relevant stakeholders must be consulted. NOCs / Consent letters must be obtained before execution of the project and private land should be acquired through VLD (as per guidelines given in ESMF of the project) after detailed consultation with private land owners.

Residual Impact: The impact of project location will be low adverse in nature after taking the above-mentioned mitigations.

7.4.2 Environmental Impacts Regarding Project Design

The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS). Efforts will be made to save the trees present in project area / villages.

Impact Significance: Medium

Mitigation: Project design should be modified in order to save trees that may come in the right of way of the project. The design is made by taking in consideration that minimum impact will occur on the nearby surface water bodies.

Residual Impact: The impact of project design will be low adverse in nature after taking the above-mentioned mitigations.

7.5 Environmental Impact and their Mitigation During Construction Phase

7.5.1 Physical impacts

A) Soil contamination

Soil Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the project site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites.
Construction site will generate solid waste from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a negative impact on the physical environment of the project area.

Impact Significance: Medium

Mitigation: Good engineering practices will help in controlling soil erosion at construction sites. Following measures will be adopted as per site conditions:

- Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining the construction vehicles as well as generators;
- The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste;
- Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination;
- Ground shall be leveled to avoid slopes;
- Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.

Residual Impact: The impact of soil contamination will be low adverse in nature after taking the above-mentioned mitigations.

B) Contamination of Surface and Groundwater Resources

Sewage and sanitary waste water generated from the construction site may contaminate groundwater, if not disposed of properly. The tube wells proposed on the embankment of canal, have the proximity to contaminate the surface water bodies during construction activities such as excavation activities (trenching) and associated run-off, oil leaks, accidental spilling of fuel oils and unintentional disposal construction / material.

Mitigation Measures of Impacts on Water Resources: Sewage from construction camp will be disposed-off using septic tank which has been designed properly keeping in view the following parameters:

- Soil stratigraphy at site
- Depth of groundwater table
- Discharge of sewage from construction camp

The septic tank has been designed by the Design Consultant according to the relevant standards. The example of the septic tank is shown in Figure below;

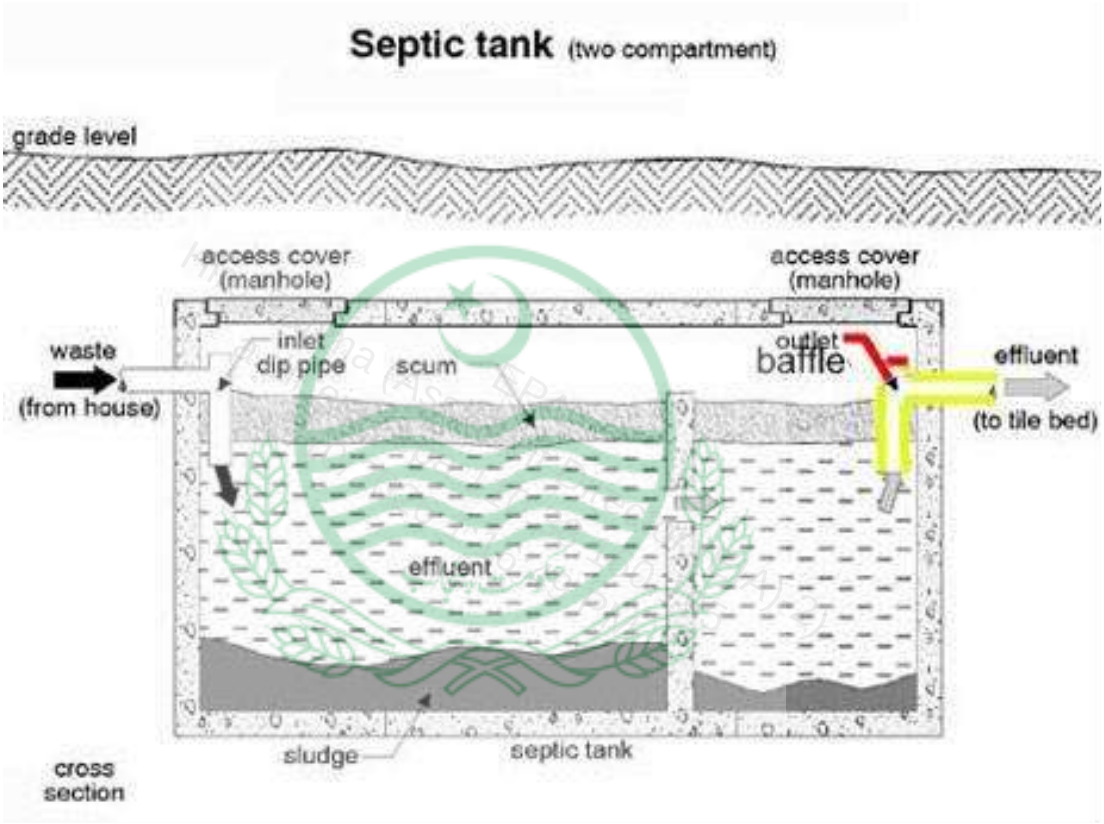


Figure 7-1, Septic Tank

- Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard.
- Construction site effluent drainage should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents.
- Efforts will be made to make sure that the surface water quality is not disturbed in any way during the construction activities and contingency plans will be made to ensure that.

Residual Impact: The impact of Surface and ground water quality will be low adverse in nature after taking the above-mentioned mitigations.

C) Impact on Ambient Air Quality

The impact on air quality is expected within the area of the working corridor. The impact on air quality is expected as a result of construction works, specifically excavation of the trenches which will generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works.

It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc.

Further, the sub-project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery. Trenches will be about 1 metre in depth and therefore the amount of spoil material will be minimal with the backfilling using the same spoil material undertaken within 3-5 days of excavating. Sources of air pollutants from the construction works will include traffic in and out of the site emitting and earth works at site during the excavation of trenches.

Impact Significance: High

Mitigation Measures of Impacts on Ambient Air Quality

- Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM10;
- Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions.
- Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin.
- The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water-by-water trucks will be done.
- As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.

Residual Impact: The impact of Ambient air quality will be low adverse in nature after taking the above-mentioned mitigations.

D) Impact on Ambient Noise Levels & Vibration

During the implementation of the sub-project a large amount of equipment and construction machinery will be utilized for construction. The equipment would include excavators, concrete mixer, trucks and other machinery and

vehicles. The operation and movement of such equipment will increase the noise and vibration in the project Area and Neighbourhood residential may be disturbed by the noisy activities. The impact will be significant when compared to the without project situation.

During excavation activities (trenching), noise sources will include, vehicles used to transportation of materials and equipment to the site. The construction and more specifically excavation of the trenches for the pipelines will be through the use of hand-held equipment (manual labor) with very limited use of mechanized machinery which would be sources of noise and vibration.

Impact Significance: High

Mitigation Measures of Impacts on Noise & Vibration

- During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary.
- For the construction machinery generating noise level in excess of that prescribed in PEQS and WHO limits, Contractor will make arrangements to bring the noise level within applicable limits (including proper tuning of vehicles and mufflers/silencers). Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality. Truck drivers should be instructed not to play loud music especially night and stop use of horn.
- As well as the temporary boundary wall made of wood planks will be constructed that will act as barrier.
- Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective / mitigation measures applied where necessary.

Residual Impact: The impact of Ambient Noise and vibration will be low adverse in nature after taking the above-mentioned mitigations.

E) Disposal of Construction Debris & Garbage

During construction phase of the Sub-project, large quantity of construction waste will produce, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas.

Construction materials including concrete waste, wood, steel, packaging plastics etc. could be dispersed that may result in the blockage of drainage channels if not disposed of at approved disposal sites.

Impact Significance: High

Mitigations

- A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of

appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site.

- The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping.
- Arrangements should be made for regular garbage collection and removal of sewage from the construction site.
- A barrier between surface water bodies and the active construction zone should be made to make sure that no construction debris is disposed-off intentionally or unintentionally in the canals.

Residual Impact: The impact of construction Debris and Garbage will be low adverse in nature after taking the above-mentioned mitigations.

F) Traffic Annoyance

The construction activities will occur in certain sections in populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little room for pedestrian access.

Impact Significance: Medium

Mitigation:

- During the construction phase traffic control measurement will be implemented. All raw materials will be transported to the site at night time due to at night time traffic flow very low in the sub-project area.
- The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during construction, including need for diversions (if necessary).
- The construction method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorized equipment like excavators.
- The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.

Residual Impact: The impact of traffic annoyance will be low adverse in nature after taking the above-mentioned mitigations.

G) Impact on Utilities

The utilities (ground / road / brick soling etc.) along the project area that may be damaged as a result of the excavation for the pipelines include fibre optic cables, sewerage lines, existing water pipelines and in exception cases electricity lines. Damage to these utilities due to excavation may cause

interruptions to services associated with the same.

Impact Significance: High

Mitigation: Already existing infrastructure like roads / brick soling and others will be disturbed. Contractor will be bound to restore and rehabilitate the site area to its original state after the completion of construction works. Contractor will be responsible to restore any damage to any existing utility.

Residual Impact: The impact on utilities will be low adverse in nature after taking the above-mentioned mitigations

7.5.2 Ecological Environment

A) Impacts on Ecological Environment

Impact on Flora

Tree cutting may be envisaged as per project requirement.

Disturbance to Fauna:

No impacts on fauna is envisaged.

Impact significance:

High

Mitigations

In this project, low impact is expected on vegetation and any fauna in the area since the pipeline routes are devoid of significant unique floral and faunal life.
The clearing of sub-project sites through excavations for the pipelines (reservoir) will not adversely affect flora and fauna and all the impacts caused by construction work on flora and fauna are of temporary and reversible in nature and can be mitigated by appropriate good working practices that are prescribed in this EIA.
Contractor will make efforts to protect trees. But in case of unavoidable circumstances, 10 new trees of almost 06 ft. will be planted for each tree cut.

Residual Impact: The impact on flora and fauna will be low adverse in nature after taking the above-mentioned mitigations

7.5.3 Socio Economic Environment

A) Impacts to Occupational Health and Safety

Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety(H&S) issues, the workforce may suffer injury or death.

Impact Significance: High

Mitigations Measures of Impacts to Occupational Health and Safety

Occupational health and safety impacts during construction are considered to be of moderate insignificance. The construction activities will use a mix of hand-held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained personnel will be engaged in operating equipment.

Heath safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.

Residual Impact: The impact to Occupational Health and Safety will be low adverse in nature after taking the above-mentioned mitigations

B) Impacts on Local Population

No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of the said project.

The population residing in and the surroundings of the project area will be affected during the construction phase as follows:

- There is potential hazard risk from open trenches in the vicinity of populated areas during the construction
- Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase
- Community may face the noise and dust problems during the construction activities.
- Theft problems to the community by the Contractor's workers and vice versa.

Impact Significance: Medium

Mitigations Measures of Impacts on Local Population / Workforce

- The potential hazard risk from open trenches in the vicinity of populated areas should be mitigated by appropriate warnings and fencing.
- Contractor should select specific timings for heavy machinery operation so as to cause least disturbance to the population considering their peak movement hours.
- Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust.
- Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to help contain the construction materials being transported to the specific site.

- The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring labor/workers, Contractor has to ensure that the workers should be of good repute/character.
- Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized.
- The contractor will prepare an Occupational Health and Safety Plan for minimizing occupational and community health and safety impacts.

Residual Impact: The impact on Local Population / Workforce will be low adverse in nature after taking the above-mentioned mitigations

C) Impacts on Public Health and Safety Hazard

- Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for local residents.
- The storage of all solid waste shall be practiced so as to prevent the attraction, harborage or breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odors, unsightliness or public nuisance.

Impact Significance: Medium

Mitigation Measures of Impacts on Public Health and Safety Hazards

- Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62 will be ensured by the Contractor.
- The active construction zone must be cordoned off to avoid injuries due to accidents.

Residual Impact: The impact on Public Health and Safety Hazard will be low adverse in nature after taking the above-mentioned mitigations

D) Public Health Diseases

There is a potential induced impact during construction causing increased incidence of HIV / AIDS and communicable diseases due to new entrants in communities for employment. There is a potential induced impact when increased income in the communities, from construction worker salaries, leads to domestic abuse in the home. Both these impacts can be mitigated by the HIV / AIDS and sensitivities awareness programs set out in the EIA.

E) Resettlement Impacts

No person will be displaced due to the project activities. Therefore, there is no need for the development of a resettlement action plan.

F) Gender Based Violence

Gender-Based Violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (i.e., gender) differences between males and females. It includes acts that inflict physical, sexual or mental harm or suffering, threats of such acts, coercion, and other deprivations of liberty. These acts can occur in public or in private. The construction of the highway is likely to exacerbate any of the various forms of GBV described below and could be perpetrated between workers themselves, between bosses and workers and between workers and the community members.

The term GBV is used to underscore systemic inequality between males and females (which exists in every society in the world) and acts as a unifying and foundational characteristic of most forms of violence perpetrated against women and girls. The 1993 United Nations Declaration on the Elimination of Violence against Women defines violence against women as "any act of gender- based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women." The nine core types of GBV are;

- Rape
- Sexual Assault
- Sexual Harassment
- Sexual Exploitation and Abuse
- Sexual Favors
- Physical Assault
- Forced Marriage
- Denial of Resources, Opportunities or Services
- Psychological / Emotional Abuse

The Contractor will ensure the relevant Code of Conduct already included as part of the bidding documents is signed at the corporate and individual workers levels in regard to observing GBV aspects of the project.

G) Child Protection

Violence Against Children (VAC) is defined as physical, sexual, emotional and / or psychological harm, neglect or negligent treatment of minor children (i.e., under the age of 18), including exposure to such harm that results in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power. This includes using children for profit, labour, sexual gratification, or some other personal or financial advantage. This also includes other activities such as

using computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography.

The Contractor will ensure the Code of Conduct is signed at the Corporate and individual workers levels in regard to observing Child Protection aspects of the project. This will be complied with under the supervision of the PRMSC and Supervision Consultant.

H) Labor Influx and Recruitment

The project will involve recruitment of labourers which may lead to influx of persons looking for work in the project area. The significance of labour influx is expected to be low or moderate and mostly unskilled in nature. The Contractor will comply with the national labour laws and develop a code of conduct and submitted to PRMSC before commencement of construction.

Residual Impact: The impact will be low-adverse in nature after taking the above-mentioned mitigations.

7.6 Environmental Impacts and Mitigation Measures during the Project Operation

7.6.1 Consumption of Contaminated Water

Consumption of (untreated) contaminated domestic water could lead to health impacts on the consumers of the water from the pipeline. The maintenance of the pipelines requires excavations and unblocking the pipe which could lead to contamination of the water during the process.

Impact Significance: High

Mitigation Measures

The water supply will be closed down during construction phase ensure that no polluted water gets into water supply.

Residual Impact: The impact of Consumption of contaminated domestic water will be low adverse in nature after taking the above-mentioned mitigations.

7.6.2 Solid Waste Generation

Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others:

- Excavated soil
- Cement storage bags and other packets from materials used during repair and maintenance
- Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes.

Impact Significance: Low

Mitigation Measures

- The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labour which would reduce wastes associated with oil spills, repair and maintenance.
- The soil excavated during maintenance will be used as backfill and thereby reducing the generation of spoil material and related waste pollution concern.
- There will be limited hazardous wastes generated from this sub-project including the cement bags, grease and oil.
- All wastes including will be disposed in an approved waste disposal site. The operator will develop a Waste Management Plan (WMP) to guide the disposal of all types of wastes emanating from the sub-project

Residual Impact: The impact of solid waste generation will be low adverse in nature after taking the above-mentioned mitigations.

7.6.3 Visual Impacts

Visual related impacts mainly include re-opening the trenches where the pipelines are laid to facilitate repair and maintenance which could be an eye-sore and a health hazard. This impact is not considered to be significant and will be experienced for a short period of time because of the immediate backfilling of the trenches by the excavated soil / spoil.

Impact Significance: Medium

Mitigation

The trenches should be backfilled immediately and excess spoil material is disposed of as soon as possible.

Residual Impact: The visual impact will be low adverse in nature after taking the above-mentioned mitigations.

7.6.4 Impacts to Occupational Health and Safety

Operation and maintenance of the pipeline and other project components will involve workers whose safety may be at risk as a result of operation of equipment among others.

Mitigation Measure

- The construction activities will mostly use hand held tools in digging the trenches with very limited use of excavators.
- Experienced and trained personnel will be engaged in operating equipment.

Impact Significance: Medium

Residual Impact: The impact to Occupational Health and Safety will be low adverse in nature after taking the above-mentioned mitigations.

7.6.5 Impacts on Community Health and Safety

No specific serious adverse impacts on community health and safety are expected as a result of operation activities of Water Supply System. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks should be mitigated by appropriate warnings and fencing. Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized during the operation phase with respect to repairs and maintenance.

7.6.6 Impacts on Traffic

The maintenance and repair activities will occur in certain sections in densely populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little room for pedestrian access.

Impact Significance: Medium

Mitigation

- The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during repair and maintenance activities including need for diversions (if necessary).
- The method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorised equipment like excavators.
- The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.

Residual Impact: The impact of traffic will be low adverse in nature after taking the above-mentioned mitigations.

7.6.7 Impact on Air Quality

The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route only. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and may generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works. It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are

implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc.

Further, the sub-project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.

Residual Impact: The impact of vibration will be low adverse in nature after taking the above-mentioned mitigations.

7.6.8 Noise and Vibration Emission Impacts

Noise emission and associated impacts during repairs and maintenance is expected to be low and will emanate from motorized equipment.

Mitigation Measure

Experienced only in cases where motorized equipment is used. The repair and maintenance works will mainly be carried out during the daylight working hours with no night working expected unless it is an emergency e.g., pipe burst or blockage. Mitigation measures will prescribe daylight working hours in the most affected zones.

Impact Significance: Low & Short term

Residual Impact: The impact of noise and vibration will be low adverse in nature after taking the above-mentioned mitigations.

7.6.9 Assessing Impacts

Planning for environmental assessment depends upon reliably predicting project impacts on resources and managing those impacts to achieve the greatest gain or the smallest loss. The basis of the prediction is the knowledge of the proposed project and of local resources with which it is expected to interact. Two types of information are, therefore, needed: a comprehensive description of all resources likely to be affected by each of the sub-project components, and an understanding of the sub-project component itself. The baseline information given in the previous section includes all resources, natural and human and all aspects of those resources that may be expected to be touched, directly or indirectly, by the project. Conversely, project information will include all aspects of construction or operation that might affect the environment.

7.6.10 Approach to Assessment

Various components of the sub-project will interact with local resources in different ways. Therefore, it is useful to divide the project into units small enough that the interactions may be examined individually as well as collectively. The main construction components of the sub-project are Excavations, Concrete, Mixing, Finishing. Each of these is in effect a sub-project itself. Various aspects of each component are treated separately. They are examined both in terms of construction period and much longer

period of project operation.

Some component of the project has positive and some have negative impact on environment and on the different factors like socio-economy of the community.

7.6.11 Negative impact

This project has no potential negative impacts on environment as well on the socio-economic feature of community. Anyhow it has some impacts which have discussed as well as their mitigatory measures have well defined in the previous section.

7.6.12 Positive Impacts

The positive impacts of the project are given as under-:

- The project is in the villages of tehsil Bhowana, there will be demand for workers, both skilled and unskilled. This will include opportunities for local people, both directly on the construction site and also indirectly in related service work.
- Safe drinking water in adequate amount will be provided to community during operation. As new pipeline and tube-wells will be installed that will reduce the wastage of drinking water due to leakage and its contamination.
- Sanitation services will be improved as sewerage system will be developed / improved in the villages.

7.7 Cumulative and Induced Impacts

The cumulative impact assessment (CIA) examined the interaction between the project's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The projects potential cumulative effects were considered with respect to valued components (VCs) in environmental and socioeconomic categories, in four areas:

of any potential residual project effects that may occur incrementally over time;

i. consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
ii. potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed sub-project;
iii. and future developments that are reasonably foreseeable and sufficiently certain to proceed.

The project has identified the VCs as air quality, noise, water quality, socioeconomic and socio-community components, and human health. There are no foreseeable projects that will overlap with the project. The spatial boundary of the project is the area / villages within tehsil Bhowana and areas where transmission lines are to be installed, the temporal boundary can be considered as the whole selected village of tehsil Bhowana.

Key VCs identified included air quality, water quality and noise that can impact public health, access to livelihood opportunities. The overall perception of stakeholders in the long-term perspective was highly positive and they considered it as an important development for the local economy. While the project will meet the Punjab Environmental Quality Standards (PEQS) for air quality, mitigation of noise will be required to meet at least the baseline levels within the corridor of impact.

7.8 Potential Environmental Enhancement Measures

Besides the concrete measures to be adopted as described above, the quality of environment will further be enhanced through the running of sub-project in complete accordance with the 5Rs Principles; Reduce, Reuse, Recycle, Refurbish and Retrofit. Good housekeeping practices will be the order of the day.

SECTION - 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PROGRAM

8.1 Objective

The purpose of Environmental and Social Management and Monitoring Plan (ESMMP) for improvement and development of water supply & sanitation services system in revenue villages of tehsil Bhowana is to ensure that all necessary identified measures have been adopted in order to protect the environment and social situations and to comply with country environmental legislation and applicable World Bank Core Principles. Environmental and social screening checklists were used to assess the potential impacts of sub-project on the basis of its scale / size, nature and significant negative impacts.

8.2 Institutional Arrangements

Administrative arrangements for the implementation of the project are following:

8.2.1 LG&CDD / PRMSC-HO

Local Government and Community Development Department (LG&CDD) and / or Punjab Rural Municipal Services Company (PRMSC), Government of Punjab is the Implementing Agency for Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSSP). The implementation of the sub-project will be done through Project Implementation & Management Unit (PIMU) at LG&CDD. The Project Director (PD) of PRSWSSP based at PIMU will be assisted with team of experts, officers and supporting staff to ensure execution of the sub projects as per action plan.

8.2.2 Service Delivery Units (SDU) at Tehsil Level (SDU-TO)

In the next step, there will be Service Delivery Units (SDU) at Tehsil level (SDU-TO). They will Support and coordinate with ESS and SSS throughout implementation of ESMP at district/field level developed by the consultant.

8.2.3 Consultants

The safeguard team of the consultants will be responsible for the on-field supervision and monitoring of the implementation of EIA / ESMMP being done by the contractor. The contractor will report the progress of EIA / ESMMP to the safeguard team of the consultants. And the safeguard team of the consultants will report the progress to SDU-TO. SDU-TO will then report to PMIU who will then formulate a comprehensive report to be submitted to World Bank regarding the progress of implementation of EIA / ESMMP.

8.2.4 The Contractor

The Contractor will be responsible for on-field implementation of EIA, ESMMP, ESMF and environmental protection liabilities under the Punjab Environmental

Protection Act (Amendment 2012) and World Bank's Environmental and Social Safeguard Policies. He will also be responsible for compliance of ESMP provisions keeping in view his contract with PRMSC. The Contractor will train his crews in all aspects for implementation of EIA, ESMMP & ESMF.

The ESMP will be an integral part of the contract document. The bid would include a detailed environmental mitigation budget as part of the engineering costs of the respective works. Contractor will engage environmentalist to fulfil the above requirements.

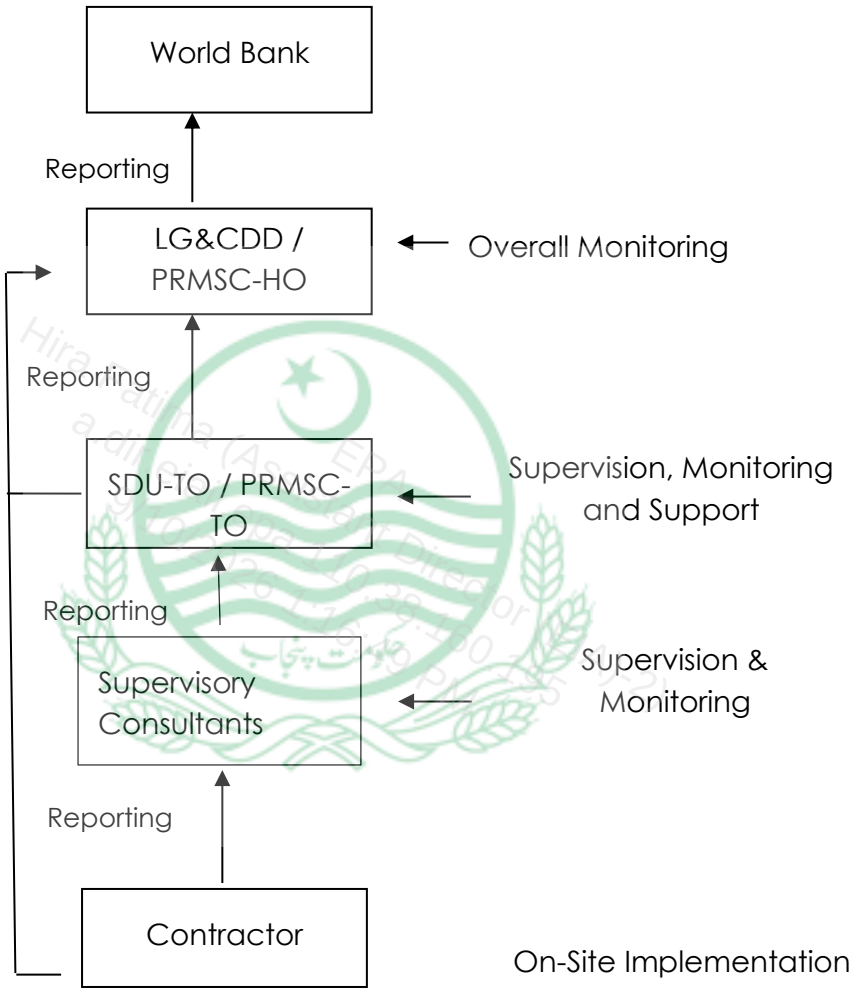


Figure 8-1, Institutional Mechanism

8.3 Mitigation Plan

The mitigation plan, being a key component of EIA includes measures to mitigate potential negative impacts and enhance its positive impacts during construction phase of the project. The Contractor is responsible for implementation of EIA, ESMMP & ESMF with the cooperation of executing and implementing agencies and local communities of the project.

8.4 Monitoring Plan

Monitoring Plan is also associated with mitigation plan during the different stages of the project. It ensures that mitigation measures are being effectively implemented. The monitoring of the project is very imperative for implementation of the ESMMP.

The PRMSC – Panchayt / Village Councils will carry out the monitoring at the field level on a continuous basis, SDU-TO will carry out the monitoring at tehsil level and PIMU at PIMU level.

=WV\WZVO 8ZIUM_WZS LM[KZJML V 7C=8 XZMXIZML NWZ @BCGCC@ _TT JM IXXKIJTM \PZW]OPW]\ \PM KW]Z[M WN []JXZWMK\&

8.5 Monitoring, Audit and Evaluation

PIMU will monitor the contractor to ensure complete and proper implementation of the works / services in accordance with the contract.

During this phase, environmental and social monitoring will be carried out to ensure that the mitigation measures given in EIA, ESMMP & ESMF are effectively implemented. The environmental and social monitoring will include the following:

- Environmental and social monitoring to ensure effective implementation of ESMMPs and SMPs particularly the mitigation measures included in these documents.
- The monitoring will be conducted with the help of checklists prepared on the basis of the mitigation plans included in environmental and social management instruments.
- Frequent site visits.
- Laboratory analysis will be conducted if so, specified in the ESMMPs.
- Photographic records will be maintained where applicable / useful.
- Preparation of monitoring reports.

8.6 ESMMP Monitoring Mechanism

ESMMP monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at three levels i.e.at the PIMU/SDU-HO level, at SDU-TO level and at project site level. Project

Implementation & Management Unit (PIMU) also referred as Service Delivery Unit, Head Office (SDU-HO), would serve as the lead implementing entity to monitor all project related functions with the support of line departments and field offices. Similarly, SDU-TO will be responsible for monitoring their respective project areas with the technical support of PIMU. The Environment Specialist of the consultant will monitor the progress of implementation of ESMP done by the contractor's environment specialist.

8.7 Reporting and Documentation

A robust reporting mechanism can enable sub-project progress to be followed up, any prevalent hindrances to sub-project implementation to be identified and rectification measures to be setup if so required. Such a system will allow the PIMU and LG&CDD to track the advancement of the sub-project and reconcile these with the overall objectives and targets of the sub-project. Regular and comprehensive reporting will be conducted throughout the implementation of the sub-project. ES & SSS-PIMU, Consultant and SDUs will ensure a constant surveillance of the sub-project progress and deliverables through preparation and submission of these reports provided in the following;

Table 8-1, Reporting Mechanism

Distribution of Periodic Reports Report	Prepared by	Reviewed by	Approval
Weekly	Contractor / SC / SDU-TO	SC / SDU-TO	SDU-HO / World Bank
Quarterly	Contractor / SC / SDU-TO	SC / SDU-TO	SDU-HO / World Bank
Annual	Contractor / SC / SDU-TO	SC / SDU-TO	SDU-HO / World Bank
Final	Contractor / SC / SDU-TO	SC / SDU-TO	SDU-HO / World Bank

8.8 Information Disclosure

The EIA will be uploaded on the project websites, once cleared by the World Bank, hard copies shall be sent to all institutional stakeholders and all Field offices. The ESMF will be disclosed internally within the World Bank. Before start of physical works on the project, the Executive Summary of the EIA will be translated in national / local languages and will be communicated to stakeholder communities and will be uploaded on the PIMU & LG&CDD websites.

8.9 Inclusion of EIA In Bidding / Contract Documents

The present EIA will be included in the bidding / contract documents and their implementation will be a contractual binding for the Contractors. In addition, the Contractor's guidelines prepared by PRMSC / safeguards procedures will also be made part of contracts.

8.10 Environmental and Social Non-Compliance

Any environmental and social non-compliance during first half of the reporting month will be considered as a "minor deviation". In case of non-compliance attains the status of "non-mitigation" during the second half of the reporting month, it would be considered a "moderate non-compliance". In case of non-compliance continues in the second month, it will fall in the category of "undone" and as such would be considered as a major non-compliance and eventually leading to serious action including the suspension of Contractor's payment or any other penalty as may be considered appropriate with the recommendation of PRMSC No payment will be made to Contractor against non-compliance and no arrears will be paid thereof.

Hira Fatima (Assistant Director (EIA)-2)
EPA

Table 8-2, Environmental & Social Management & Monitoring Plan

Contractor will be responsible to implement the mitigations given in EIA, ESMMP & ESMF.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
A. IMPACTS DUE TO SUB-PROJECT LOCATION								
Site Selection	The project is for improvement & development of water supply & sanitation services system in selected revenue villages of tehsil Bhowana, that will be developed on both; private land and government land.				All the relevant stakeholders should be consulted. Relevant NOCs / consents / VLDs will be obtained by PRMSC.	PRMSC	PRMSC	-
B. IMPACTS DUE TO SUB-PROJECT DESIGN								
Project design	The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS). Efforts will be made to save the trees during the project.				Project design will be modified in order to make the project environment friendly and socially sustainable. Trees will not be cut. In any case, if a tree has to be cut, contractor will plant 10 new trees of almost 6ft. height. The design is made by taking in consideration that minimum impact will occur on the nearby surface water bodies.	PRMSC	PRMSC	-
C. REPAIR / REHABILITATION / CONSTRUCTION PHASE								
Physical Impacts								
Labour camp management	• Campsites for construction workers are the important locations that have				• Labor camps should be at least 1km away from the residential areas.Provide	Contractor	PRMSC / SC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities. • There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. • Child labour and school drop out • Health Safety attributes				adequate health care facilities within construction sites.Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. Ensuring that children and minors are not employed directly or indirectly on the project. Children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labor Laws and Employment of Child Act (1977).Communication on hiring criteria, minimum age, and applicable laws.Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					properly by cleaning dirty ones and replacing them with the damaged ones. - Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job.			
Soil contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Sub-project Site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites. • Construction site will generate about 0.45 kg/person/day solid wastes from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a				Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining the construction vehicles as well as generators. The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste. Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination. Ground shall be leveled to avoid slopes. Proper solid waste management plan should be developed by the Contractor	Contractor	PRMSC / SC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	negative impact on the physical environment of the project area.				and implemented to avoid the litter and any other waste problems.			
Contamination of Surface and Groundwater Resources	• Sewage and sanitary waste water generated from the construction site may contaminate groundwater, if not disposed of properly. • The tube wells ae being constructed on the embankment of canal, therefore, proximity to surface water bodies may lead to contamination of surface water bodies during construction activities such as excavation activities (trenching) and associated run-off, oil leaks, accidental spilling of fuel oils and unintentional disposal construction/material.				Sewage from construction camp will be disposed of using septic tankAvoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard.Construction site effluent drainage should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents.Efforts will be made to make sure that the surface water quality is not disturbed in any way during the construction activities and contingency plans will be made to ensure that.	Contractor	PRMSC / SC	• Checking of septic tanks constructed for sewage. • Monitoring of surface water quality through EPA certified Lab
Ambient Air Quality	• The impact on air quality is expected within the area of the working corridor. The impact on air quality is expected as a result of construction works,				• Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM_{10} & $PM_{2.5}$. Equipment and vehicles powered with diesel should be well	Contractor	PRMSC / SC	Ambient air quality monitoring through EPA certified Lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	specifically excavation of the trenches which will generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works.				maintained to minimize particulate emissions.Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin. For the precautionary measure, sprinkling of water will be done.As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.			
Noise and vibration	• During the implementation of the sub-project a large amount of equipment and construction machinery will be utilized for construction. • The equipment would include excavators, concrete mixer, trucks and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the Sub-				During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary. For the construction machinery generating noise level in excess of that prescribed in	Contractor	PRMSC / SC	Noise level monitoring EPA certified lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	project Area and Neighborhood residential may be disturbed by the noisy activities. • During excavation activities (trenching), noise sources will include, vehicles used to transportation of materials and equipment to the site. • The construction and more specifically excavation of the trenches for the pipelines will be through the use of hand-held equipment (manual labor) with very limited use of mechanized machinery which would be sources of noise and vibration.				PEQS and WHO limits, Contractor will make arrangements to bring the noise level within applicable limits (including proper tuning of vehicles and mufflers/silencers). Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality. Truck drivers should be instructed not to play loud music especially night and stop use of horn.As well as the temporary boundary wall made of wood planks will be constructed that will act as barrier.Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/ mitigation measures applied where necessary.			
Disposal of Construction	1. During construction phase of the project, large quantity of				• A site waste management plan should be made the	Contractor	PRMSC / SC	Placement of solid waste

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Debris & Garbage	construction waste will produce, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas. 2. Construction materials including concrete waste, wood, steel, packaging plastics etc. could be dispersed that may result in the blockage of drainage channels if not disposed of at approved disposal sites				responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site. The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping. Arrangements should be made for regular garbage collection and removal of sewage from the construction site.A barrier between surface water bodies and the active construction zone should be made to make sure that no construction debris is disposed-off intentionally or unintentionally in the canals.			storage containers at camp sites. Collection and disposal into containers
Traffic annoyance	3. There construction activities will occur in certain sections in densely populated areas and				• During the construction phase traffic control measurement will be implemented. All raw	Contractor	PRMSC / SC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	along the existing Right of Way (ROW) where there is motorized and non-motorized traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little room for pedestrian access.				materials will be transported to the site at night time due to at night time traffic flow very low in the project area. The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during construction, including need for diversions (if necessary). The construction method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorized equipment like excavators. The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.			
Impact on Utilities	4. Project activities may result in disturbance of public utilities like roads / brick soling and others.				• All the public infrastructure / utilities that gets damaged / disturbed during the subproject execution, will be restored / rehabilitated to its original state.	Contractor	PRMSC / SC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Generation of wastewater & Solid waste	5. Construction activities can result in the generation of wastewater, oil spillage from machinery, domestic waste from labour camps and construction related solid waste.				• All the wastes including liquid & solid, will not be disposed-off without treatment.Services of waste contractor should be obtained			Waste Management
Emergency Response Plan	6. Uncontrolled releases of hazardous materials may result from small cumulative events, or from more significant equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment.				• Measures for fire prevention and firefighting.Indicators on site (for example, heavy rainfall) that will prompt the shutdown of specified areas of work.Procedure for shutdown of site, including transfer of plant, materials and personnel to safe areas (for example in the event of a flood).Emergency evacuation procedure for staff and members of the public likely to be impacted by an emergency event on site (for example: fire or blast).Where practicable, avoiding or minimizing the use of hazardous materials.Emergency lighting of adequate intensity should	Contractor	PRMSC / SC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					be installed and automatically activated upon failure of the principal artificial light source to ensure safe shut-down, evacuation etc.The contractor will prepare emergency shutdown procedures and evacuations to cover all staffs and affected members of the public in the event of any emergency incident (such as traffic accident and fire). The contractor will ensure emergency access routes are well-known and have appropriate signage.Identification of locations of hazardous materials and associated activities on an emergency plan.Training should incorporate information from Material Safety Data Sheets for hazardous materials being handled. MSDSs should be readily accessible to			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					employees in their local language.			
Ecological impacts								
Biodiversity (Fauna and Flora)	**Impact on Flora** A few trees and vegetation are present near the sites. However, no tree will be cut. **Disturbance to Fauna:** No negative impacts on fauna are envisaged.				• In this sub-project, low impact is expected on vegetation (small grass / shrubs) since the pipeline routes are devoid of significant unique floral and faunal life. The clearing of project sites through excavations for the pipelines (reservoir) will not affect flora and fauna. No tree will be cut.But, in any case / mishap / misfortune, any tree has to be cut then 10 new trees of almost 6ft. height will be planted.	Contractor	PRMSC / SC	Maintenance and monitoring of tree plantation
Social Impacts								
Sub-sub-project will have positive outcomes for the local communities as by the provision of good state of art infrastructure.								
Health and Safety Measures	7. Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and				Occupational health and safety impacts during construction is considered to be of moderate in significance. The construction activities will use a mix of hand-	Contractor	PRMSC / SC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death.				held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained personnel will be engaged in operating equipment.Heath safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.			
Job opportunities	• It will lead to an increase in economic activity and contribute to local area economic development.				• Priority will be given to local area inhabitants for skilled and unskilled labour jobs. Majority of labour need will be met from the sub-project areas. The sub-project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the workforce will be from the	Contractor	PRMSC / SC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					sub-project area while some 25% of labour (skilled) would be hired from outside the sub-project area. This labour influx may have a positive impact on social norms, culture and economy of the area.			
Impacts on Local Population	• No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of water supply & sanitation system in priority villages. • The population residing in and the surroundings of the Sub-project Area will be affected during the construction phase as follows: • There is potential hazard risk from open trenches in the vicinity of populated areas during the construction • Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase				• The potential hazard risk from open trenches in the vicinity of populated areas should be mitigated by appropriate warnings and fencing. Contractor should select specific timings for heavy machinery operation so as to cause least disturbance to the population considering their peak movement hours. Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust. Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to	Contractor	PRMSC / SC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	• Community may face the noise and dust problems during the construction activities. • Theft problems to the community by the Contractor's workers and vice versa.				help contain the construction materials being transported to the specific site. The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring labor/workers, Contractor has to ensure that the workers should be of good repute/character. Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized. The contractor will prepare an Occupational Health and Safety Plan for minimizing occupational and community health and safety impacts.			
Community Health and Safety	• Construction activities, particularly excavation and movement of haul trucks and machinery may prove				Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the	Contractor	PRMSC / SC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	dangerous for the safety of the workers as well as for local residents. • The storage of all solid waste shall be practiced so as to prevent the attraction, harborage or breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odors, unsightliness or public nuisance. • 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				safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62 will be ensured by the Contractor. The active construction zone must be cordoned off to avoid injuries due to accidents. 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; Proper Safety signage at construction sites will be displayed to give awareness among public; Timely public notification on planned construction works; Close consultation with local communities to identify optimal solutions for diversions to maintain			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	vibrational impacts on nearby community. The labour works with different transmittable diseases may cause spread out of those diseases in the local residents. The construction areas located near the residential, settlements, may cause accident for the people moving near to those areas.				community integrity and social links; Seeking cooperation with local educational facilities (school teachers) at each village along the route for road safety campaigns; Provision of proper safety and diversion signage, particularly at urban areas and at sensitive/accident-prone spots; Setting up speed limits in close consultation with the local stakeholders; and If identified, consider additional guard rails at accident-prone stretches and sensitive locations (schools);Construction Camp Management Plan (CCMP) and effective implementation of GRM may reduce this impact. The communicable disease of most concern during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, will be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					and providing health service; and Reducing the impacts of vector borne diseases will be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which include prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water.			
Gender issues	• 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				• 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	Contractor	PRMSC / SC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	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. 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. • Project activities may cause hindrance to mobility especially for women during construction stage. • Privacy of the community may be disturbed.				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; 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			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					completion. The portion of the contract price will be guaranteed by a performance security linked to environmental and social contractor performance. Workers would be trained to address privacy issues and ethically behaved. Labours would be strictly asked to cater the privacy issues. Staff's capacity-building			
Traffic Management	• Blocking of road may hamper public mobility due to increase in number of vehicles • Road Safety				Provision of alternative routes Water sprinkling at sub-project site at consecutive intervals Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience. Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local	Contractor	PRMSC / SC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					residents;In case of any complaint, focal person of GRC may contact (details will be highlighted at sub-project site).Contractor will be bound to restore / rehabilitate the existing infrastructure like roads / brick soling etc. to its original state.			
Economic Issues	• Economic issues may arise due to; • loss of land, • structures / assets • productive plants • livelihood • shopkeepers • vendors (Mobile/permanent)				• No land acquisition is involved No Public structures are found to be affected in the sub-project area because they are not falling in ROW No tree plantation is found No livelihood will be affected by project activity No shops were found to be affected as located out of ROW. No permanent vendors were observed during social and environmental assessment survey In case of any complaint, focal person of GRC may contact and his contact details will be provided at sub-project site.Contractor will be bound to nullify the damages to	Contractor	• PRMSC / SC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
					utilities. Contractor will be responsible not to disturb / damage any infrastructure If any kind of infrastructure is damaged / disturbed, contractor will be responsible to restore / rehabilitate that in its original state.			
D. OPERATION/MAINTENANACE PHASE								
Consumption of Contaminated Water	Consumption of (untreated) contaminated domestic water could lead to health impacts on the consumers of the water from the pipeline. Maintenance of the pipelines requires excavations and unblocking the pipe which could lead to contamination of the water during the process				The water supply will be closed down during maintenance phase ensure that no polluted water gets into water supply.	Contractor	• PRMSC	Monitoring of water quality through EPA certified lab
Solid Waste Generation	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others: • Excavated soil • Cement storage bags and other packets from materials used during repair and maintenance.				• The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would reduce wastes associated with oil spills, repair and maintenance. The soil excavated during maintenance will be used as	Contractor	PRMSC	Placement of solid waste storage containers at camp sites. ▪Collection and disposal into containers

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	• Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes.				backfill and thereby reducing the generation of soil material and related waste pollution concern.There will be limited hazardous wastes generated from this sub-project including the cement bags, grease and oil. All wastes including will be disposed in an approved waste disposal site. The operator will develop a Waste Management Plan (WMP) to guide the disposal of all types of wastes emanating from the sub-project			
Visual Impacts	Visual related impacts mainly include re-opening the trenches where the pipelines are laid to facilitate repair and maintenance which could be an eye-sore and a health hazard.				• This impact is not considered to be significant and will be experienced for a short period of time because of the immediate backfilling of the trenches by the excavated soil The impact significance is expected to be low in nature, short term and reversible if the trenches are backfilled immediately and excess spoil material is disposed of as soon as possible.	Contractor	• PRMSC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Impacts to Occupational Health and Safety	Operation and maintenance of the pipeline will involve workers whose safety may be at risk as a result of operation of equipment among others				• Occupational health and safety impacts during operation/maintenance and repair is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery. The construction activities will use hand held tools in digging the trenches with very limited use of excavators. Experienced and trained personnel will be engaged in operating equipment.	Contractor	• PRMSC	
Impacts on Community Health and Safety	No specific serious adverse impacts on community health and safety are expected as a result of operation activities of Water Supply System. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks				• Health and safety risks should be mitigated by appropriate warnings and fencing. Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized during the operation phase with respect to repairs and maintenance.	Contractor	• PRMSC	-
Impacts on Traffic	There maintenance and repair activities will occur in certain sections in populated areas and				• The contractor will prepare a detailed traffic management plan (TMP) which will	Contractor	• PRMSC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	along the existing Right of Way (ROW) where there is motorized and non-motorized traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little room for pedestrian access.				elaborate how traffic will be managed during repair and maintenance activities including need for diversions (if necessary). The method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorized equipment like excavators. The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.			
Impact on Air Quality	The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route only. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and may generate dust with motorized equipment also generating gases. The processes which will generate pollutants				• It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation	Contractor	• PRMSC	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	emission are: transport of material, movement of machinery and vehicles on site and excavation works.				measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc.Further, the sub-project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.			
Noise and Vibration Emission Impacts	Noise emission and associated impacts during repairs and maintenance is expected to be low and will emanate from motorized equipment. This impact is expected to be low in nature and short term, experienced only in cases where motorized equipment is used.				• The repair and maintenance works will mainly be carried out during the daylight working hours with no night working expected unless it is an emergency e.g., pipe burst or blockage. Mitigation measures will prescribe daylight working hours in the most affected zones.	Contractor	• PRMSC	-

Table 8-3, Environmental Monitoring & Analysis

Parameter	Details of Actions	Monitoring Frequency	Responsibility
Ambient Air Quality Testing	Air quality will be analyzed through EPD certified Lab.	Pre-Construction During Construction-Quarterly	• Contractor • PRMSC
Noise level Testing	Noise level testing with Digital Noise Level Meter	Pre-Construction During Construction-Quarterly	• Contractor • PRMSC
Water Testing	Water Quality will be analyzed through EPD certified Lab.	Pre-Construction During Construction-Quarterly	• Contractor • PRMSC
Vehicular Emission Testing	Dumpers, Asphalt Pavers, Road Rollers & other machinery	During Construction-Quarterly	• Contractor • PRMSC

Environmental monitoring & analysis will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented.

Table 8-4, ESMMP Implementation Budget for Each Village

Sr No.	Description	Amount PKR
1	ESMP cost for one Village	1,520,575
2	ESMP cost for 92 Villages	139,892,900
Grand Total in Million (RS.)		**139.9**

The ESMP budget consists of six main components:

i. Personal Protective Equipment (PPE)
ii. Health Safety Environment and Trainings,
iii. Environmental testing and monitoring,
iv. CESMP formulation Cost,
v. HSE Supervision Cost (staffing),
vi. Waste Management and Housekeeping

Table 8-5, Village-wise ESMP Cost

Sr. No.	ESMP Component	Cost (PKR)
1	PPE	581,950
2	HSE &Training	416,500
3	Env. Monitoring	286,125
4.	CESMP formulation Cost	50,000
5	HSE Supervision Cost	120,000
6.	Waste Management and Housekeeping	66,000
Total (One Village)		**1,520,575**

Breakup of each component of the ESMP cost is provided below:

8.11 Budget Estimate for PPE During the Construction Phases

Personal Protective Equipment cost is including in the ESMP Cost significantly for Health, Safety and Environment and divided into two categories according to the size of villages small & Large. Breakup of the estimate of the HSE cost for villages is provided in table 8-6. Which includes safety items ear plugs, helmets, safety shoes, protective goggles, Gloves, Masks and first aid kits.

Table 8-6, ESMP Implementation Cost - Village Wise

Sr. No.	Item Description	ISO / Standard Code / Description	PROPOSED FOR 1800 villages			
			Unit	Unit Rate (Rs)	Quantity (Per Village)	Amount (Rs)
Personal Protective Equipments						
1	Safety Jackets	EN ISO 20471: 360-degree visibility Fluorescent yellow/orange; retro-reflective strips; breathable mesh fabric; secure Velcro or zipper closure, provided in approriate sizes are required by Staff, PRMSC name and logo printed	Each	654	30	19620
2	Safety Helmets	EN-397 High-density polyethylene (HDPE) or ABS plastic; adjustable screw harness; Adjustable headbands, chin straps, and non-allergic sweatbands. color-coded (white for engineers, yellow for workers) PRMSC Brading and LOGO PRINTED with sr number mentioned on each helmet for ease of record keeping	Each	5668	30	170040
3	Safety Gloves	EN 388 : Nitrile-coated or leather palm; abrasion and cut-resistant; breathable back; conforms to EN388 safety ratings	Each	650	50	32500
4	Dust Mask (Dust proof mask)	ISO 16975: Disposable N95 or FFP2 class mask; elastic bands; nose clip for sealing; replace after use	Each	500	100	50000
5	Safety Shoes & Toes	EN ISO 20345, requiring a toe cap to withstand a minimum 200-joule impact and 15 kilonewtons (kN) of compression Steel toe cap; anti-slip, oil-resistant sole; leather	Each	8175	35	286125

Sr. No.	Item Description	ISO / Standard Code / Description	PROPOSED FOR 1800 villages			
			Unit	Unit Rate (Rs)	Quantity (Per Village)	Amount (Rs)
		upper; ankle support for shoes only				
6	Safety Harness Belt	ISO 10333: High-tenacity polyester webbing, minimum width 45mm; adjustable shoulder and thigh straps with metal buckles; dorsal D-ring for fall arrest, side D-rings for positioning; and chest strap with quick-connect buckle; Renowned Brand	Each	4905	3	14715
7	Protective Goggles	ISO 16321: Anti-fog, scratch-resistant; side shielding for wrap-around protection; adjustable strap	Each	545	10	5450
8	Ear Plugs	ISO 4869-1: Soft polyurethane foam; noise reduction rating (NRR) of 30 dB or more	Each	175	20	3500
Health Safety Environment Materials / Testing						
9	First Aid Kit	ISO 7010-E003: Painkiller, eyewash solution, antibiotic ointment, thermometer, plasters, sterile gauze, dressings, sterile eye dressings, triangular bandages, crepe rolled bandages, safety pins, disposable sterile gloves and tweezers), pain killers, burn creams, pyodine solution (big bottle), other medication as required by tehsil team is adequate size and quantity	Each	27250	1	27250
10	Warning / Safety Signs	ISO 7010: Weatherproof PVC or Plastic or aluminum signs; reflective print; standardized colors and pictograms (danger, caution, mandatory)	Each	500	25	12500

Sr. No.	Item Description	ISO / Standard Code / Description	PROPOSED FOR 1800 villages			
			Unit	Unit Rate (Rs)	Quantity (Per Village)	Amount (Rs)
11	Green Mesh	Green safety netting for site periphery; 50% shading; UV-stabilized HDPE material.	S.ft	40	200	8000
12	DCP Fire Extinguisher (Dry Chemical Powder)	ISO 7165: 6-kg; ABC type; The extinguishing agent is mono ammonium phosphate and ammonium sulphate powder and the discharge time of the agent is 13 second	No.	11990	1	11990
13	CO_2 Fire Extinguisher	ISO 7165: 5 kg; frost-free horn; suitable for electrical and liquid fires; discharge time of the agent in 13 second)	No.	14170	1	14170
14	Fire Alarm	ICS 13.030.10: Proper segregation, PPE for handlers, timely removal, recordkeeping per solid waste rules	No.	10900	2	21800
15	Trapuline	Waterproof tarpaulin sheet made from polyethylene or canva	Sq.ft	600	30	18000
16	Safety Cones	UV-resistant PVC or rubber material; at least 28 to 36 inches in height; high-visibility orange color with reflective collars (minimum 4-inch reflective band) for day and night visibility		3270	12	39240
17	Tree Plantation	5-6 feet height; Native species plantation; soil preparation and watering included	No.	545	100	54500
18	Barricading / Fencing (Reflective tape, poles, safety mesh/netting)	ISO 13857: Includes poles, reflective tape, plastic mesh netting; minimum 3 feet height; durable and visible	Rft	20	300	6000

Sr. No.	Item Description	ISO / Standard Code / Description	PROPOSED FOR 1800 villages			
			Unit	Unit Rate (Rs)	Quantity (Per Village)	Amount (Rs)
19	Trainings	HSE Training, Rescue Training, Labour Code of Conduct, Environmental Code of Conduct, Defensive Driver Trainings, Labour Laws and Labour Rights, GAP Training, C-ESMP Training and anyother as required by E&S wing	Quaterly	27250	4	109000
20	Water Sprinkling	Water sprinkling through tank mounted on tractor	Per Trip	1500	30	45000
21	Medical Screening for Workers	CBC, Anti HCV, HBsAG, HIV, RPR, LFTs, RFTs etc.	Persons	1635	30	49050
Environmental Testing and Monitoring						
22	Ambient Air Quality Monitoring	As per the parameters and methodology defined by EPA (Quarterly in every village	Each	27250	3	81750
23	Groundwater Quality Test	As per the parameters and methodology defined by EPA (Quarterly in every village	Each	21800	3	65400
24	Surface Water Quality Test	(As per the parameters and methodology defined by EPA (Quarterly in every village	Each	21800	3	65400
25	waste Water Quality Test	(As per the parameters and methodology defined by EPA (Quarterly in every village	Each	21800	3	65400
26	Noise Level Monitoring	(As per the parameters and methodology defined by EPA (Quarterly in every village)	Each	2725	3	8175
Site Specific / Contractors Environmntal and Social Management Plan						
27	CESMP Formulation	By an individual or firm as approved by PRMSC Environment Wing	per village	50000	1	50000
HSE Staff						

Sr. No.	Item Description	ISO / Standard Code / Description	PROPOSED FOR 1800 villages			
			Unit	Unit Rate (Rs)	Quantity (Per Village)	Amount (Rs)
28	HSE Supervisor	Bachelor's degree in Environmental Sciences / Engineering, NEBOSH or IOSH certification will be preffered, with over one year of experience in Occupational Health and Safety, one HSE person for 10-15 village, hiring of HSE staff will be approved by E&S prior to contract signing	Per month per village	10000	12	120000
Waste Management and House Keeping						
29	Handling and disposal of Hazardous Material	ICS 13.030.30: Safe storage, labeling, and transportation; spill kits and secondary containment as per MSDS	3 times per village for duration of contract	11000	3	33000
30	Handling and dispodal of Solid Waste Material	ICS 13.030.10: Proper segregation, PPE for handlers, timely removal, recordkeeping per solid waste rules	3 times per village for duration of contract	11000	3	33000
Note : Cost of ESMP implementation is village wise, PKR 1520575 will be multiplied with the number of villages in the civil work contract package to obtain total ESMP cost						
Total ESMP Implementation Cost per year (PKR)						**1,520,575**

8.12 Proposed EMP Reporting and Reviewing Procedure OF EPA

All the precautionary measures are suggested in EMP to minimize the pollution creating by construction and operation of project. Reporting and reviewing procedure is following:

- EIA Report & File Submission
- SIR Letter
- Review of EIA Report
- Issuance of Query Letters by EPA
- Submission of satisfactory replies of Query Letter
- Public Hearing
- Expert committee meeting and presentation
- DG EPA Meeting and Presentation
- NOC Issuance
- Proper Follow-up of case from submission to Issuance of NOC

8.13 Contractor's Training

In order to comply with the anticipated environment and social attributes as described in EIA of the said project, meetings will be held with the contractors to ensure the socially acceptable and environmentally sustainable situation during execution of the project.

The Contractor will also be briefed about procedures and methods for complying with environmental and social management conditions, and any specific conditions specified in an ESMMP; a description of specific mitigation measures that will be implemented in order to minimize adverse impacts; a description of all planned monitoring activities.

Trainings for contractors will be organized when the bidding process will be completed. Contractors shall be bound for environmental and social compliance.

Contractors have to comply with the following responsibilities:

- Observation of timings and make a schedule that the surrounding communities should not be affect from noise pollution, air emissions and disturbances in their routine work.
- Usage of machinery/equipment producing negligible/low noise.
- Ensure health, safety and protective measures including safety equipment, safe drinking water, first aid boxes etc. to the workforce as per nature of their jobs.
- Water sprinkling to avoid air pollution.
- Indicate alternate routes and provide indicators on suitable places during work timings.
- Local labor should be preferred to work.

- Child labor is strictly prohibited as per labor law. All labor should be more than 14 years of age individually.
- Proper disposal of wastes and garbage.
- Health, safety and protective measures for the labor.
- Notice board of emergency numbers should be placed on proper place.

Contractors shall also provide safety equipment i.e., PPEs, safe drinking water, first aid boxes etc. to the workforce as per nature of their jobs. By ensuring all these mitigation measures; not only their company profile shall boost up but also enable them to qualify and win the future projects.

Table 8-7, Framework for Trainings under PRSWSSP

Description	Aspects to be Covered	Participants	Responsibility	Frequency
Environmental and social sensitization/ awareness	• PRSWSSP Components • Key environmental and social issues associated with the PRSWSSP and subprojects • Subprojects Design and relevance with environmental and social impacts and mitigations • ESMF implementation procedures /Steps • ESMF instruments implementation costs and them inclusion in sub-project's cost - process and procedures	SDUs-TO, Panchayat/ Village Councils	PIMU	At the project briefing level
Environmental and social trainings	• Key environmental and social issues associated with the Project and subprojects • Environmental and social policies and procedures in PRSWSSP-WB and local laws and policies • ESMF implementation procedures /steps • Subprojects screening and categorization procedures • Subproject specific ESMPs, SMPs and other instruments and their components • Instruments implementation costs and their inclusion in sub-	SDUs-TO, Panchayat/ Village Councils	ESS &SSS - PIMU and WB team may be requested for these training/ sessions	Once at initial stage and then Quarterly

Description	Aspects to be Covered	Participants	Responsibility	Frequency
	project's cost procedures • Sub-projects mitigation measures compliance and monitoring requirements and monitoring Checklists uses in field • Site-specific mitigation plans compliance • Subprojects reporting and record maintaining at district level • GRM • Community consultation and disclosure of information • Entitlement Matrix and RPF implementation procedures			
Occupational Health and Safety (OHS)	• Use of PPEs • Go Punjab Safety SOPs in Pandemic • SOPs for Environment, Health & Safety for construction workers/labor (including women labor)	SDUs-TO, any contractor on-board	PD-PRSWSSP, ESS, Gender Specialist &SSS-PIMU or may be invited some external source	Biannually or need base
ESMPs/EMPs mitigation measures compliance in field- at subprojects site	Mitigation measure plan of relevant subproject	Panchayat/ Village Councils Contractors, Labor/ workers	SDUs-TO	Before execution of sub-projects and then need base
Awareness raising	• Sludge Management • Water Conservation • Wastewater Management • Community Mobilization • Animal Waste Management • Covid 19	Communities and local beneficiaries	VCs	Quarterly

SECTION - 9: STAKEHOLDER CONSULTATION

Timely and broad-based stakeholder involvement is an essential element for an effective environmental and social assessment. Stakeholder engagement during Environmental & Social Assessment contributes in the improvement of the project design, environmental compliance and social acceptability.

9.1 General

This section describes the outcomes of stakeholder and public consultation sessions held within project area / villages that can be affected by the project. The objectives of this process were to:

1. Share information with stakeholders on the improvement of the proposed subproject and expected impacts on the physical, biological and socio-economic environment of the project;
2. Understand stakeholder's concerns regarding various aspects of the subproject and the likely impacts of construction related activities and operation of the project;
3. Understand the perceptions, assessment of social impacts and concerns of the affected people / local community of the proposed project;
4. Provide an opportunity to the public regarding their valuable suggestions in a positive manner; and
5. Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.

In preparation for the EIA, two major groups of stakeholders were identified: (i) local communities who are the direct beneficiaries of the subproject interventions and therefore identified as the primary stakeholders (ii) institutions who have an important role in enabling the realization of the project interventions and therefore identified as the secondary stakeholders.

9.2 Proponent's Environmental Management Team

The Environmental and Social Management Team will be taking charge of the proposed project which consists of the following members;

1) Environmental & Social team of PRMSC – HO
2) Environmental & Social team of PRMSC – TO
3) The Contractor

9.3 Responsible Authority

Overall responsibility for Environmental Management and Monitoring will rest with PRMSC. E&S will provide support for managing environmental and social

aspects of the project and implementation of EIA.

The EPA shall be the responsible authority for reviewing, site inspection and provision of environmental approval for the project.

9.4 Project Stakeholders

Project stakeholders were engaged in the review and discussions on various project aspects social and environmental issues at the early stage of impact assessments for feedback. There are two categories of stakeholders in project.

Table 9-1, Project Stakeholders

Individual / community stakeholders	• All project affected persons, households and communities. • Project beneficiaries for instance, residents of the project area, users of the road, vulnerable and gender.
Institutional Stakeholders	• Forest department, Irrigation department, Environment department, Municipal Corporation, PRMSC, Highway Department. • The contractors, construction workers, financing institutions like the World Bank, mass media/civil society members, consultants and project advisors.

Public Disclosure of Information, which give high priority to public consultation and participation in designing and implementation of a socially and environmentally responsible project, is derived from various policy / legislative tools, as summarized in 9-1.

Table 9-2, Frameworks for Consultation

Legal/Policy Source	Regulations/Safeguard Policy requirements
Government of Pakistan	Environmental Protection Agency (EPA) 1997 Guidelines for Public Consultation requires public consultation and involvement in sub-project planning and implementation. The policy and procedures require proponents to consult with affected community and relevant NGO during preparation reports. The guidelines contain a number of references of need for Public Involvement Pakistan Environmental protection agency guidelines 2000
World Bank	OP.4.01, Clause 15 described that for all Categories A and B sub-projects proposed for IBRD or IDA financing, during the EA process, the borrower consults sub-project-affected groups and local nongovernmental organizations (NGOs) about the sub-project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. In addition, the borrower consults with such groups

Legal/Policy Source	Regulations/Safeguard Policy requirements
	throughout sub-project implementation as necessary to address EA-related issues that affect them.

9.5 Modes of Consultations

Consultations with the public and institutional stakeholders was already done. Scoping sessions were held with local communities. Local communities have been consulted about proposed project interventions during consultation process.

Methodology selected for selection of interviewee was Random Sampling / Focus Group Discussion. Details of the proposed project and related activities were explained to the local community and their responses were listened and addressed. Overall, the general public appeared to be convinced about the associated benefits of the proposed project. As a whole, public has very positive views about the proposed project and they are in support of it. However, they also raised some concerns during the sessions. The concerns raised by the stakeholders were considered in developing the EIA, in order to enhance project acceptability among the general public on social considerations.

9.5.1 Types of Stakeholders

There are two types of stakeholders related to the project i.e., primary and secondary stakeholders. Primary stakeholders are those which are directly affected by the project activities and secondary stakeholders are those which are affected indirectly.

A) Primary Stakeholders: Affected Wider Community

The project area is of both commercial and residential in nature. Project area inhabitants are direct beneficiaries of project interventions as it will resolve their long-standing issue of water supply and sanitation services system. Public Consulted / Attendance Sheet of public consultation meetings is given in Table 9-3. Figure 9-1 shows pictorial record of public consultation.

Table 9-3, Public Consultation / Attendance Sheet



B) Secondary Stakeholders: Department and Agencies

The project area lies within tehsil & district Bhowana, Chiniot. Several institutional stakeholders were engaged in the consultation process. The summary of institutional stakeholder consultation is given in Table 9-4 and

Figure 9-1 shows the representative pictorial record of institutional stakeholders' consultations.

Table 9-4, Institutional Stakeholders Consulted

Name	Department
Mr. Safiullah Gondal (Deputy Commissioner Chiniot)	Irrigation Department
Dr. Saqib Munir	Public Health Department
Dr. Mursaleen	EPA
Mr. Muhammad Rizwan	MEPCO / WAPDA
Mr. Naveed Ahmad	Agriculture
Mr. Tariq Mehmood	Highway Department

Findings of consultation meetings with community are summarized in Table 9-5, pictorial view of consultation meeting is shown in Figure 9-1.

Table 9-5, Findings of Consultation Meetings and Responses

Sr. No.	Concerns / Suggestions / Issues Raised by Stakeholders	Response
1.	Employment opportunities should be provided to the locals during the construction phase of the project.	It will be made sure that 75% of the workforce will be employed from the project area.
2.	GSTs or OHRs should be constructed as a part of this project.	OHRs will be constructed as a part of this project.
3.	Privacy of people should be upheld during construction phase of the sub-project.	Contractor will provide trainings to workers regarding gender and privacy issues.
4.	Will there be tree cutting?	Efforts will be made to protect as much trees / plants as possible.
5.	Will there be any closure of roads during construction phase?	In case of road closures, the nearby community will be informed beforehand and alternative routes will be provided.
6.	The greenery of the area should not be disturbed.	Efforts will be made to protect as much trees / plants as possible.
7.	Construction activities should be minimized during schools' opening and closing times.	Contractor will be bound to minimize construction activities during schools' opening and closing times.
8.	Most of the women have to go out to the watercourses for washing clothes.	This issue will be resolved by executing this project after the provision of water at the doorsteps.
9.	Will the issue of municipal solid waste be resolved through this	A comprehensive solid waste collection system will be

Sr. No.	Concerns / Suggestions / Issues Raised by Stakeholders	Response
	project?	developed and waste containers will be placed at appropriate locations in the villages. PRMSC will collect the solid waste through bins and will transport it to the designated disposal site.
10.	NOCs should be obtained if government land has to be utilized for said project components.	Duly noted, as it is mandatory to obtain the NOC from government department if government land has to be utilized for construction / installation of project components.





Figure 9-1, Representative Photolog of Stakeholder Consultation Meetings

9.6 Environmental Practitioners and Experts

Team of Asian Consulting Engineers Private Limited visited the project site, had discussion with stakeholders and consulted with the local people of nearby areas to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably. People were provided the massive information about the project and have positive remarks regarding the project development. AsCE team have endeavoured to hold consultative sessions with a number of prominent stakeholders (Project Proponent, Government departments, line agencies, and affected persons of Project Area) to evince their views on the project and their opinions, suggestions, understanding on various issues and concerns. The consultations aimed specifically at;

- Dissemination of project information through discussions, education and liaison;
- Eliciting the comments and feedback on the project;
- Documentation of information narrated by the stakeholders;
- Documentation of mitigation measures proposed by the stakeholders;

- Incorporation of public concerns and their addresses in the EIA.

9.7 Disclosure of Project Information

The project EIA will be uploaded on the project websites; hard copies shall be sent to all institutional stakeholder's offices. Before start of physical works on the project, the project EIA will be thoroughly briefed to the Contractor to implement EIA provisions in its letter & spirit. Contractor will keep copy of EIA on the site and will also brief his labor about its attributes. Contractor will also install project information boards on the project site. Contractor will implement EIA in its true essence.

9.8 Future Consultation Plan

The stakeholder consultation is a continuous process, and should be carried out throughout the life of project. The consultations carried out during the present EIA stage and reported are essential among the initial steps in this process. During the subsequent project phases as well, participation of the project stakeholders needs to be ensured. PRMSC will ensure time to time consultation with locals to get their feedback on project activities and their related complaints.

SECTION - 10: GRIEVANCE REDRESS MECHANISM

The Grievance Redressal Mechanism (GRM) will be consistent with the requirements of the World Bank safeguard policies to ensure mitigation of community concerns, risk management, and maximization of environmental and social benefits. The overall objective of the GRM is therefore to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the village level. The GRM will be accessible to diverse members of the community, including women, senior citizens and other vulnerable groups. Culturally-appropriate communication mechanisms will be used at all sub-project sites both to spread awareness regarding the GRM process as well as complaints management ESMF GRM will be integrated with the PRSWSSP overall project GRM hotline.

The Grievance Redressal Mechanism proposed in ESMF will be applicable throughout the course of project during the entire project implementation and will cater to both the directly and indirectly affected populations. The GRM is proposed as a requirement of WB GRM policy to address the public grievances regarding environmental and social issues that may emerge during and after PRSWSSP sub-projects implementation. It will also cater to manage any disconnects that emerge from the field level and that has significant implications for effective implementation of the project interventions.

> In an effort to deter fraud and corruption, the use of a dedicated mobile application has been proposed for reporting of grievances from field level to district and provincial headquarters. This will not only provide a coherent system of checks and balances but will also enable swift redressal and effective monitoring of complaints.

The PIMU at LG&CDD level will serve as the Secretariat for the Grievance Redressal Committee (GRC Directorate) that will be responsible for providing oversight on the entire GRM process at a strategic level and monitoring of complaints management.

10.1 Communication & Awareness

The final processes and procedures for the GRM will be translated in to local languages and disseminated at all project locations. These shall be made available (in both leaflet and poster format) to all subproject locations through the offices of each SDU. Dedicated male and female Grievance Focal Persons for each project location will play an instrumental role in spreading awareness regarding the GRM, including the use of information technology for reporting and monitoring of complaints.

10.2 Record & Maintenance

The Project Director's Office will maintain an electronic database at the PIMU that will provide a summary of complaints received and mitigations. The PD office will also provide an analysis of the grievances at each sub-project location using a pre-designed M&E template that will give insight in to the

type of complaints received and qualitative and quantitative review of grievance redressal. The PD's office will also be responsible for uploading the actions and results for each grievance for each sub-project location on a periodic basis to the Project website. The dedicated mobile application that will be used to communicate grievances will provide the basis for recording complaints both at the provincial and district levels.

Apart from the electronic database that will be maintained at the PIMU level, a manual register of all complaints and actions taken will be maintained by the Environmental and Social Focal Persons for each District at the Office of the SDU-TOs and a manual register of all day-to-day complaints and their grievance redressal details will be maintained by VOs their office.

10.3 Proposed Institutional Mechanisms

It is proposed to establish the following prior to commencing project implementation activities including pre-construction activities:

Tehsil Level-Public Complaints Center (PCC) in SDU-TO will be responsible to receive, log, and resolve complaints at site and in Village level. Complainant would be able to launch complaint on a toll-free number, app, message or call.

Teir 1: village level – Panchayt/Village Councils made under Punjab Local Government (Amendment) Ordinance 2021 will act as the 1st tier of GRM at village community level. Women participation of this committee should be ensured by consultant and PRMSC.

Teir 2: Grievance Redress Committee (GRC-Tehsil Level) in SDU-TO will be established for each district that will manage GRM aspects for all sub-project locations in each district including decisions to be taken, actions and monitoring of complaints resolution at sub-project level.

Teir 3: PIMU Level-GRC at PMIU (LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly review.

10.4 GRM Process Implementation

1. Through the envisaged system, complainant would be able to launch complaint on a toll-free number, app, message or call. (GRM will be accepted the anonymous grievances).
2. To handle the gender related issue a separate toll-free number will be provided to the community and contractor;
3. Gender related complaint will be confidential and directly shared with the management through toll free number;
4. Details of the complaints and the complainants will be entered in the system and a complaint number will be provided to the complainant through SMS.
5. In SDU a specific person will be designated to monitor the system and issue necessary instruction to relevant quarter for necessary action.
6. The GRM will provide an interface to complainants to check the

status of their complaint and a dashboard for SDU & PIMU to monitor the progress on the complaints.

7. The system will bridge the gap between the masses and the service provider.
8. Monitoring officers will precisely know the details of pending complaints in every SDU. Performance of the SDU could also be easily monitored through it.
9. The GRM will have a built-in escalation system for moving unresolved complaints to higher levels.

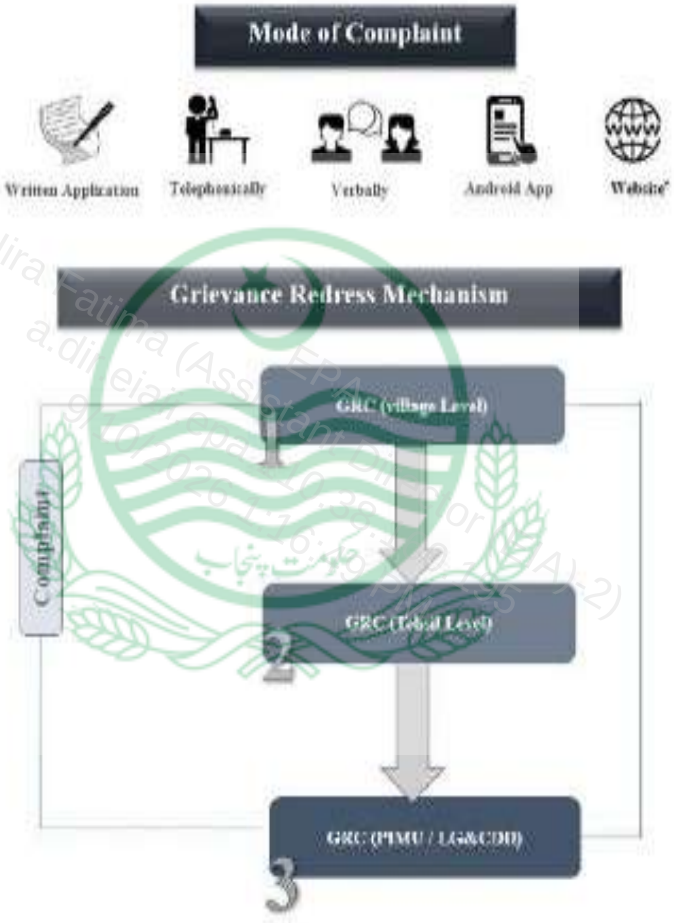


Figure 10-1, Mode of Complaint

10.5 GRM Procedures and Timelines

The tracking and documenting of grievance resolutions will include the following elements:

- Tracking complainant(s) from project sites (field and community level) to PIMU;
- Dedicated staff to update the database routinely;

- Promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism;
- Processes for informing stakeholders about the status of a case; and
- Procedures to retrieve data for reporting purposes, including the periodic reports form Village and Tehsil and document into the monthly progress reports at PIMU.

GR (Village level) will be responsible to receive, log, and resolve complaints at village level. The Grievance Redress Committee at the village Panchayts will review and identify actions to be taken to address the complaints at its weekly meeting. If not resolved timely then complaint would be referred to GRC-Tehsil Level (SDU-TO) within 3 days after receiving.

GRC-SDU-TO will try to resolve the complaints in a satisfactory manner anyhow, if not satisfactorily resolved by the village panchayts /councils and Tehsil level, then the grievance will be referred for consideration by GRC at the PIMU/LG&CDD level within one week.

Every effort will be made to address or resolve grievances within the following fixed timelines, which will be an indicator against the performance of the handling system. Acknowledgement of a written submission will be issued to the complainant within three working days.

If the complainant is not satisfied, the complaint will have the option to seek redress through court of law.

10.6 Types of Grievances

Environmental	Social	Occupational Safety
•Noise Pollution •Air Pollution •Fugitive Dust •Water Pollution •Solid Waste Management •House Keeping •Cutting of Trees •Borrow Areas Management •Protection of Wildlife •Campsite Management	•Accidental Insurance for labor •Non-Provision of PPEs to labor as per nature of their jobs •Loss of any public infrastructure • Protection of sensitive receptors •Compensation for any economic losses •Traffic Management •Labor grievance redressal •Gender discrimination •Security Arrangements •Impacts on livelihood •Irregular Traffic Movement •Obstruction in access •Intensive schedule of construction activities •Child Labor	•First Aid •Fire Safety •Workplace Safety •Tools Box Talks •Provision of PPEs •Work at Height Safety •Excavation Safety •Heavy Machinery Issues

SECTION - 11: CONCLUSION AND RECOMMENDATIONS

Based on the study conducted for Environmental Impact Assessment (EIA) for the subject project, the following conclusions are made:

11.1 Conclusion

The EIA study reveals that the project is economically viable and socially acceptable and the proponent will implement the project in the environment friendly manner. The proponent will adopt all the necessary measures to control any impact if resulting from the project. The proponent will provide safe drinking water, safe working environment, proper training and first aid facility to all workers and staff. The project will generate additional jobs during construction and operation phases.

11.2 Recommendations

In view of the comprehensive screening process and findings of the present study there is no need of conducting further investigations.

- Tree plantation inside and near the project area is recommended.
- The Management will continue to assist the local communities as a corporate social responsibility (CSR).
- Any seepage and leakage will be controlled through proper mitigation measures.
- Sound proof room should be constructed for generator to control its sound (If required).
- Use of narcotics and smoking must be prohibited during working, filling or handling of fuel.
- PPEs must be provided to workers such as gloves, masks, ear muffs etc.
- Proper solid waste management system must be adopted.
- Safety signs, safety board's etc. must be placed on site during various developmental stages.
- Machinery will never be left in running condition.
- First Aid measures, health & safety Equipment (PPEs) will be provided to workers.
- Fire Fighting station & system will be installed.
- The management of subject project will assist the local communities as a corporate social responsibility.
- Jobs and employment will be provided to the local area.

The present EIA report is enough to meet the administrative and legal framework. After the complete study of the project, it is concluded that project will not have significant adverse impacts on the nearby community and on environment. Overall, the project will have positive impacts on the local population and country as a whole. Therefore, it is requested for the environmental approval for the subject project.

ANNEXURES

ANNEXURE - A: REFERENCES

- https://www.epa.gov/sites/production/files/2015-10/documents/njmc-wpp-2.pdf
- Schedule I of Punjab Environmental Protection Act 1997 (Amended 2012)
- section 12 of Punjab Environmental Protection Act 1997 (Amended 2012)
- Pakistan Environmental protection act 1997
- Punjab Environmental Protection Act 1997 (Amended 2012)
- Guideline for the Environmental Assessment
- Regulations of Environmental Assessment, Regulations 2000
- National Conservation Strategy- Pakistan
- Guideline for the public consultation
- National Resettlement Policy and Ordinance
- National Environmental Quality Standards (Self-monitoring and reporting by the industry)
- Labor laws
- Canal and Drainage Act, 1873
- National Environmental Policy 2005.
- The Land Acquisition act, 1894
- The Punjab local Governmental ordinance, 2001.
- Meteorological data from meteorological department and website
- Pakistan Biosafety rules 2005
- Pakistan Environmental agency (review of IEE/EIA) regulation 2000.
- Punjab Portal (http://www.punjab.gov.pk/attock)
- Attock Chamber of Commerce Industries (http://www.acci.org.pk/Attock.html)
- Sectorial Guideline for environmental reports, industrial states
- Pakistan Environmental Protection ordinance (PEPO), 1983
- OSHAS 1800 for health and safety
- Census 2017

ANNEXURE - B: GLOSSARY

Words	Dictionary
Mitigation	The action of lessening in severity or intensity
Legislation	law enacted by a legislative body
Compliance	Acting according to certain accepted standards
Flora	All the plant life in a particular region or period
Fauna	All the animal life in a particular region or period
Demarcated	Separate clearly, as if by boundaries
Screening	The display of a motion picture
Substitutions	An event in which one thing is substituted for another
Regulations	An authoritative rule
Stakeholders	A person or organization with an interest or concern in something
Vulnerable	Susceptible to attack

Hira Fatima (Assistant Director (EIA)-2)
EPA

ANNEXURE - C: LIST OF ABBREVIATIONS

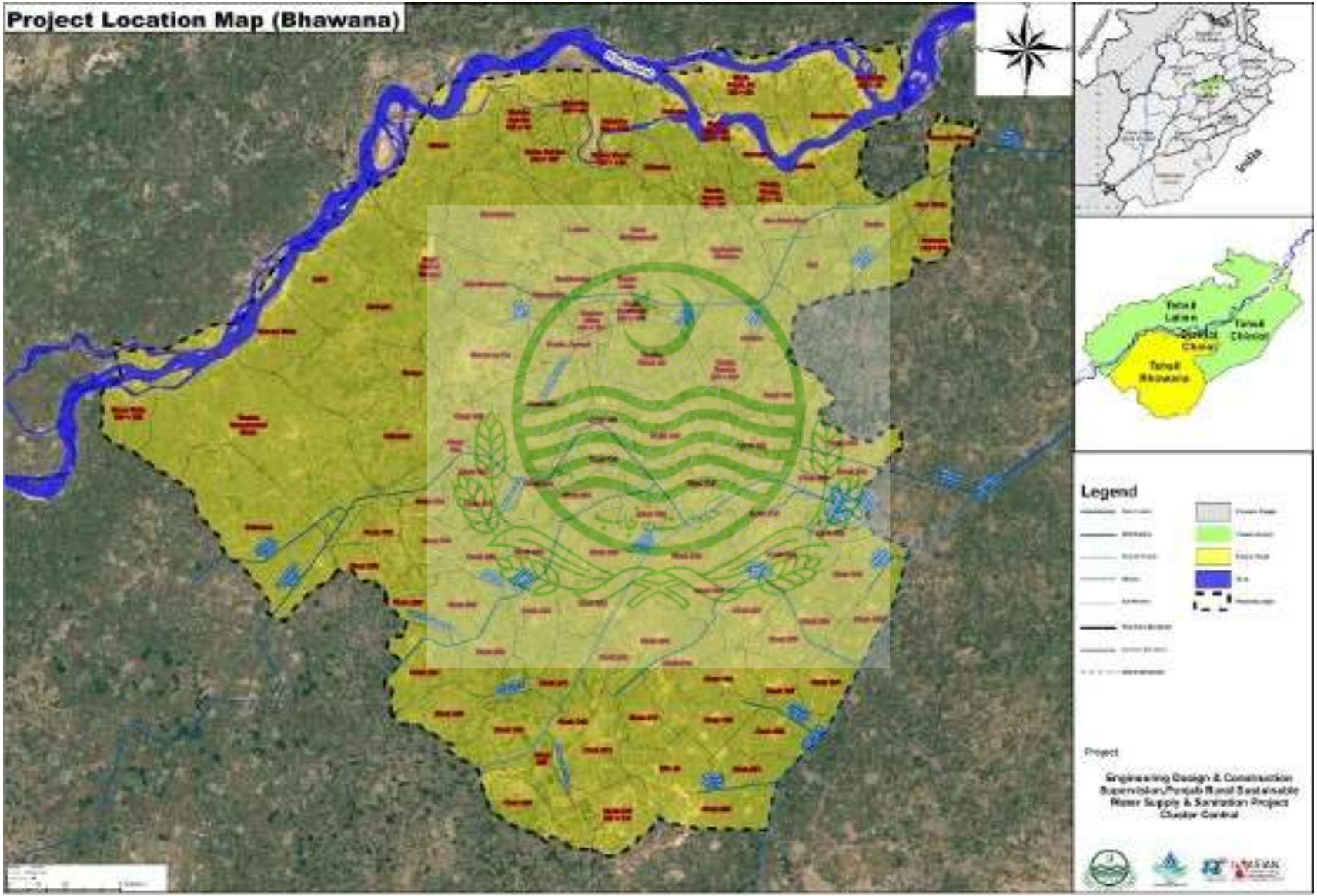
PRMSC	Punjab Rural Municipal Services Company
PRSWSSP	Punjab Rural Sustainable Water Supply and Sanitation Project
AsCE	Asian Consulting Engineers Private Limited - Consultants
WB	World Bank
ARAP	Abbreviated Resettlement Action Plan
ESMP	Environmental & Social Management Plan
APs	Affected Persons
BP	Bank Procedure
CCR	Community Complaints Register
KPT	Khairpur Tamewali
BHW	Bhowana
MC	Municipal Corporation
HO	Head Office
TO	Tehsil Office
EA	Executing Agency
HH	Household
GoP	Government of Punjab
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IM	Internal monitoring
IR	Involuntary Resettlement
LAA	Land Acquisition Act
M&E	Monitoring and Evaluation
NOC	No Objection Certificate
OP	Operational Policy
O&M	Operation and Maintenance
P&D	Planning & Development
PAD	Project Appraisal Document
PAP	Project Affected Person
PAPC	Project Affected Person Committee
PBS	Pakistan Bureau of Statistics
PD	Project Director
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
ROW	Right of Way
LG&CDD	Local Government and Community Development Department
sq.ft	Square Feet
SC	Supervisory Consultant

TM	Tehsil Manager
DM	Deputy Manager
AM	Assistant Manager
AOI	Area of Impact
ZOI	Zone of Impact
TORs	Terms of References

Hira Fatima (Assistant Director (EIA)-2)
EPA

ANNEXURE - D: GOOGLE SATELLITE MAP

Hira Fatima (Assistant Director (EIA)-2)
EPA


Project Location Map (Bhawana)
Legend
Project

ANNEXURE - E: EIA TEAM

Sr. No.	Name	Designation	Department
1.	Hussain Kamran	Environment Specialist	PRMSC-HO
2.	Haji Aman Ullah Saifi	Social & BCC Specialist	PRMSC-HO
3.	Asma Abdul Ghuffar	Gender Specialist	PRMSC-HO
4.	Hafiz Abdul Rasheed	Deputy Manager (I&S)	PRMSC-TO
5.	Muhammad Hussain	BCC Officer	PRMSC-TO
6.	Ehtisham Ali	Research Analyst	PRMSC-TO
7.	Aleem Butt	Environment Specialist	AsCE
8.	Noman Ashraf	Environment Specialist	AsCE
9.	M. Abbas	Environment Specialist	AsCE
10.	Ayesha Rasheed	Environment Specialist	AsCE
11.	Wahab Ali	Environmentalist	AsCE
12.	Eisha Mehmood	Environmentalist	AsCE
13.	Aftab Reham	Sociologist and Resettlement Specialist	AsCE
14.	Atif Hussain	Sociologist and Resettlement Specialist	AsCE
15.	Javeria Islam	Sociologist	AsCE
16.	Sidra Minhas	Gender Specialist	AsCE
17.	Muhammad Ibrar	Ecologist	AsCE
18.	Sajjad Hussain	Chief Chemist	AsCE

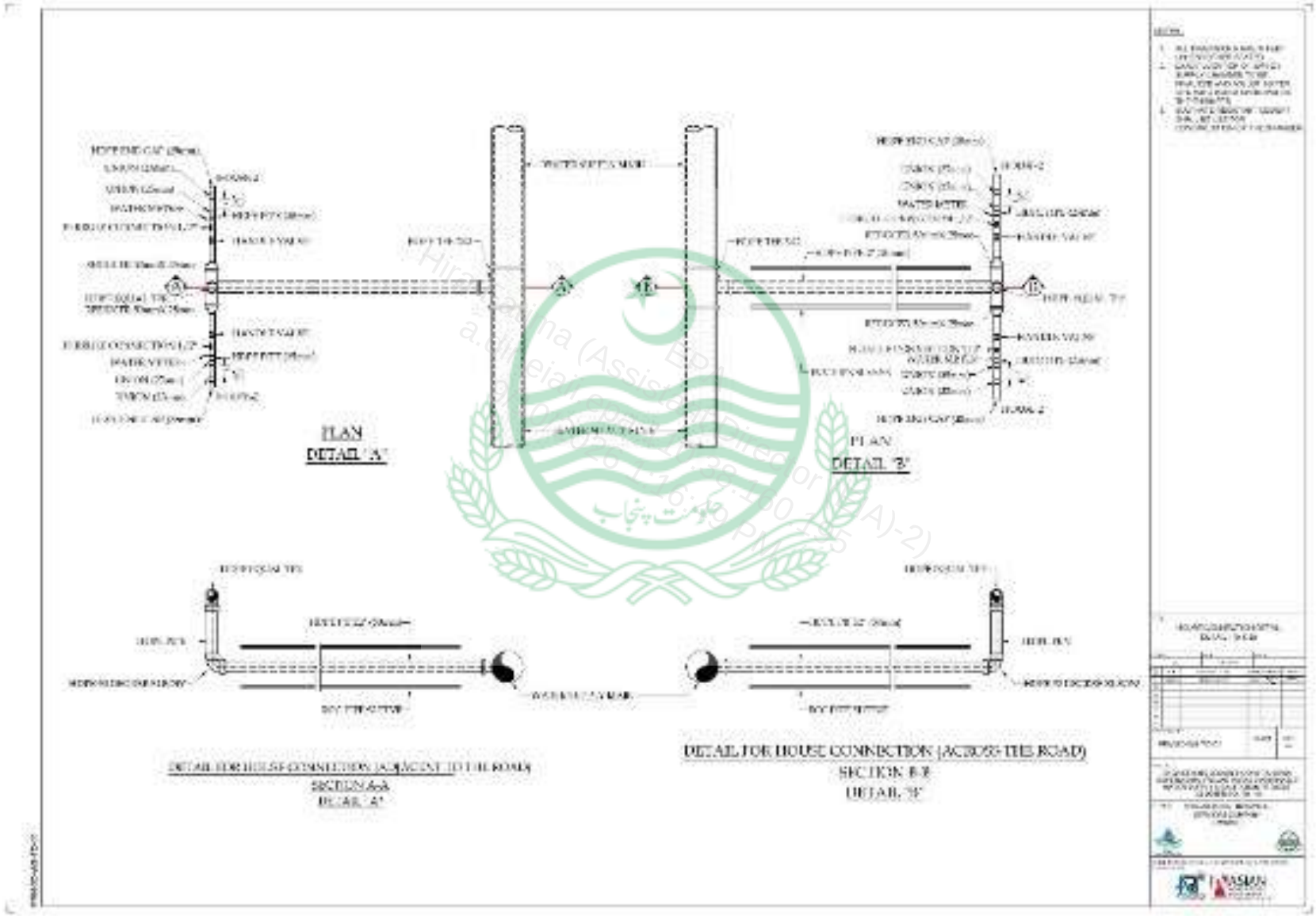
ANNEXURE - F: TYPICAL DETAILS / FIGURES / DIAGRAMS OF PROJECT COMPONENTS

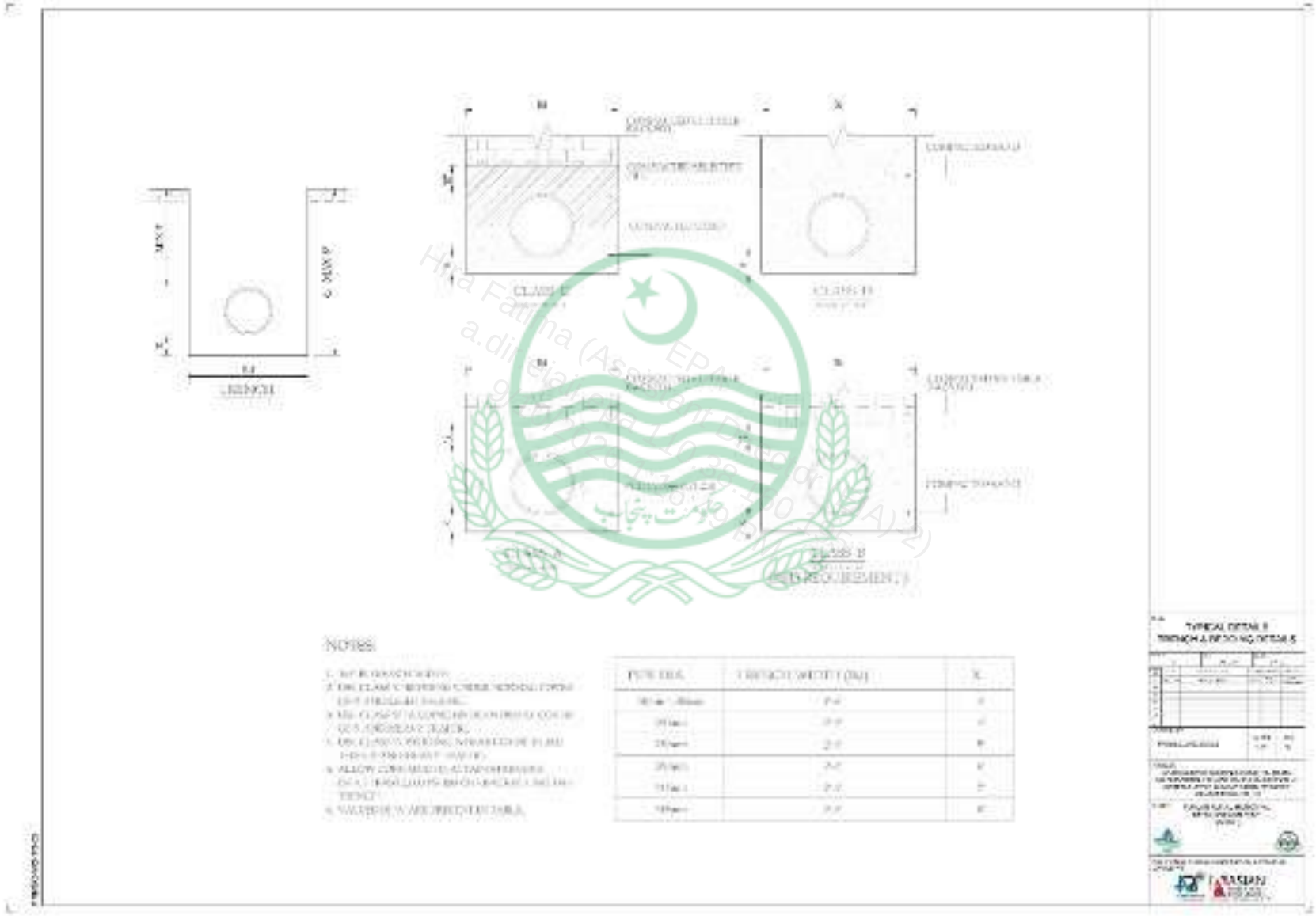
Hira Fatima (Assistant Director EPA
a.direia.epa@punjab.gov.pk 0[illegible]
Government of Punjab (EIA-2)

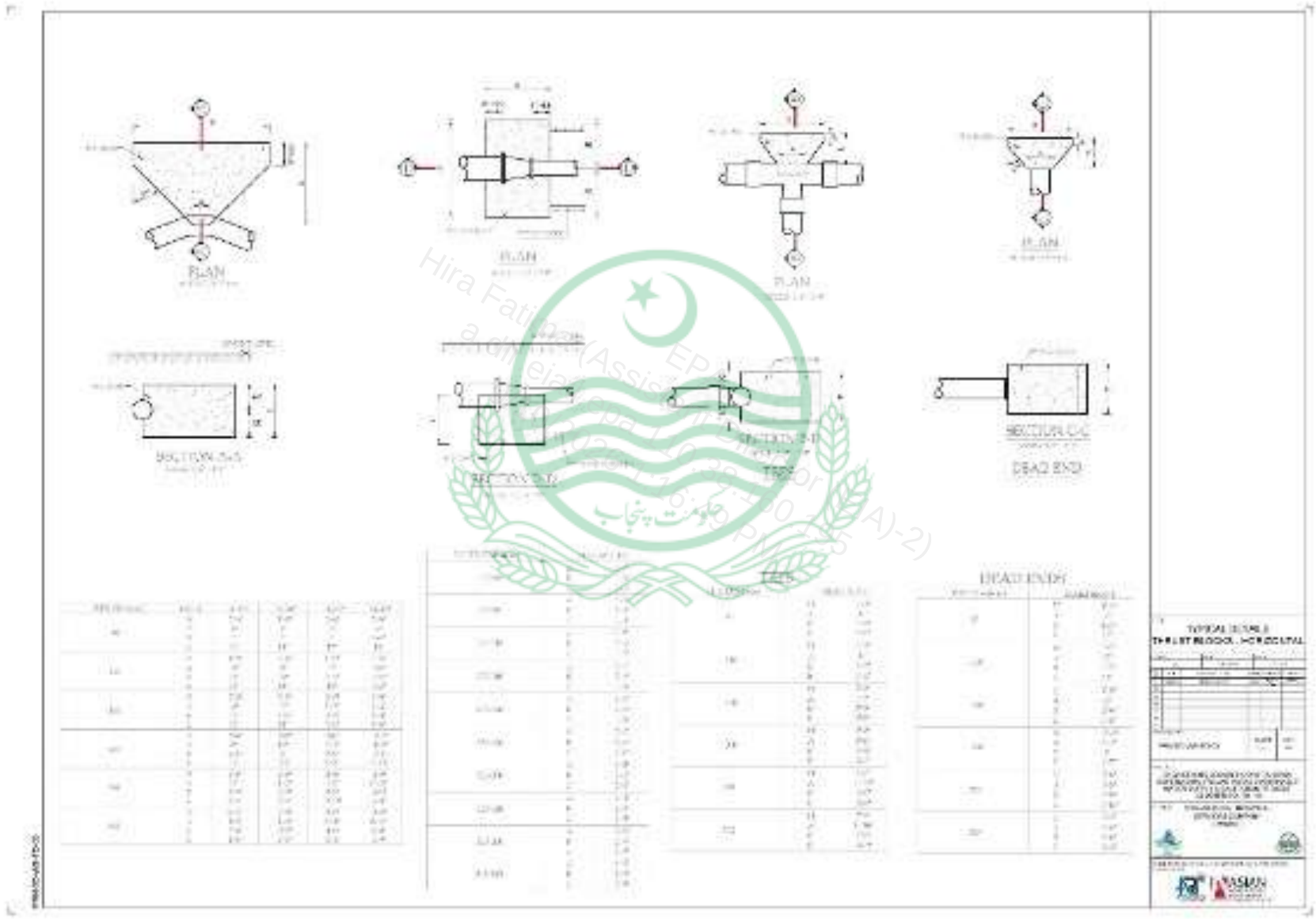
WATER SUPPLY SYSTEM

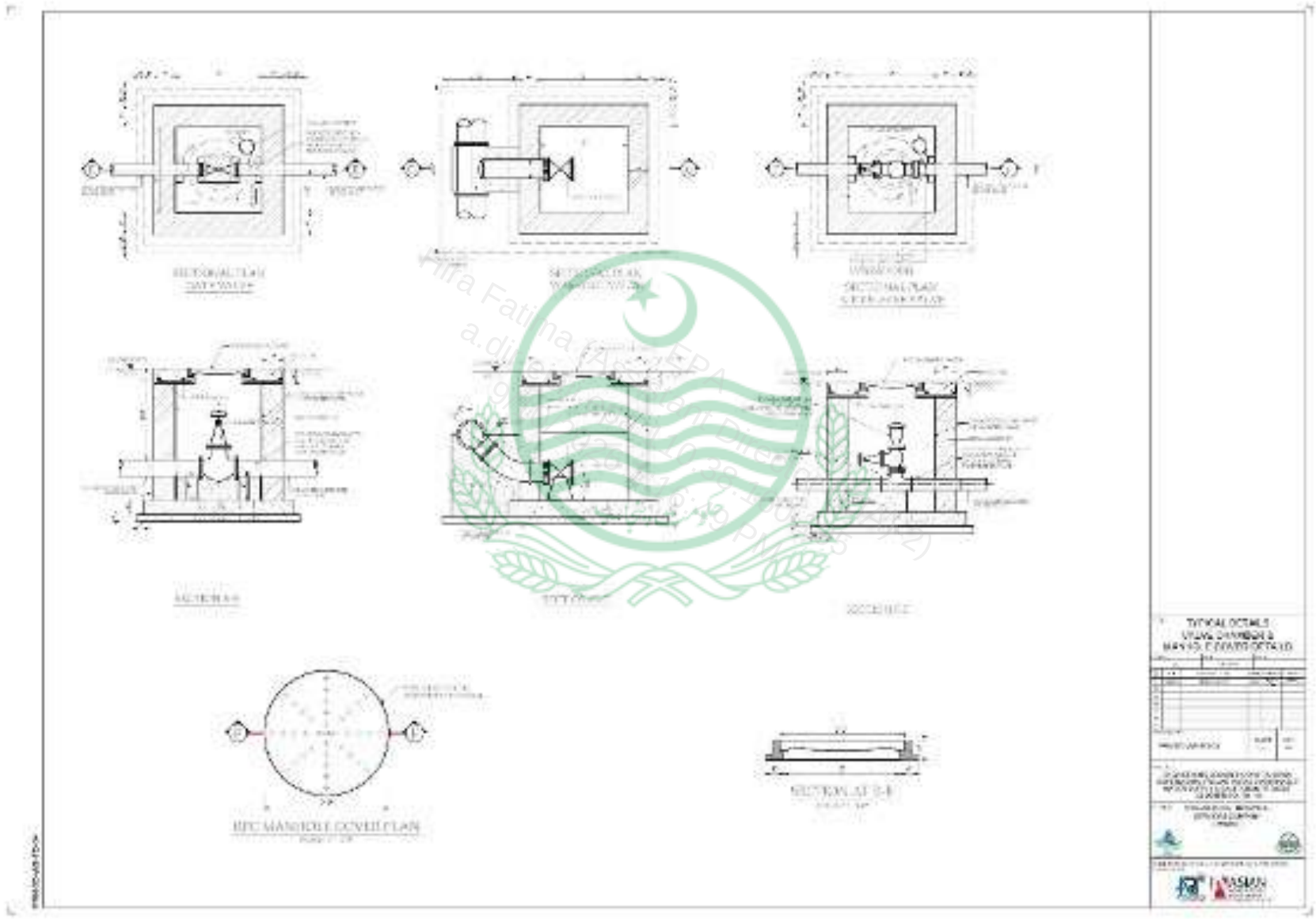
Hira Fatima (Assistant Director (EIA)-2)
EPA Punjab

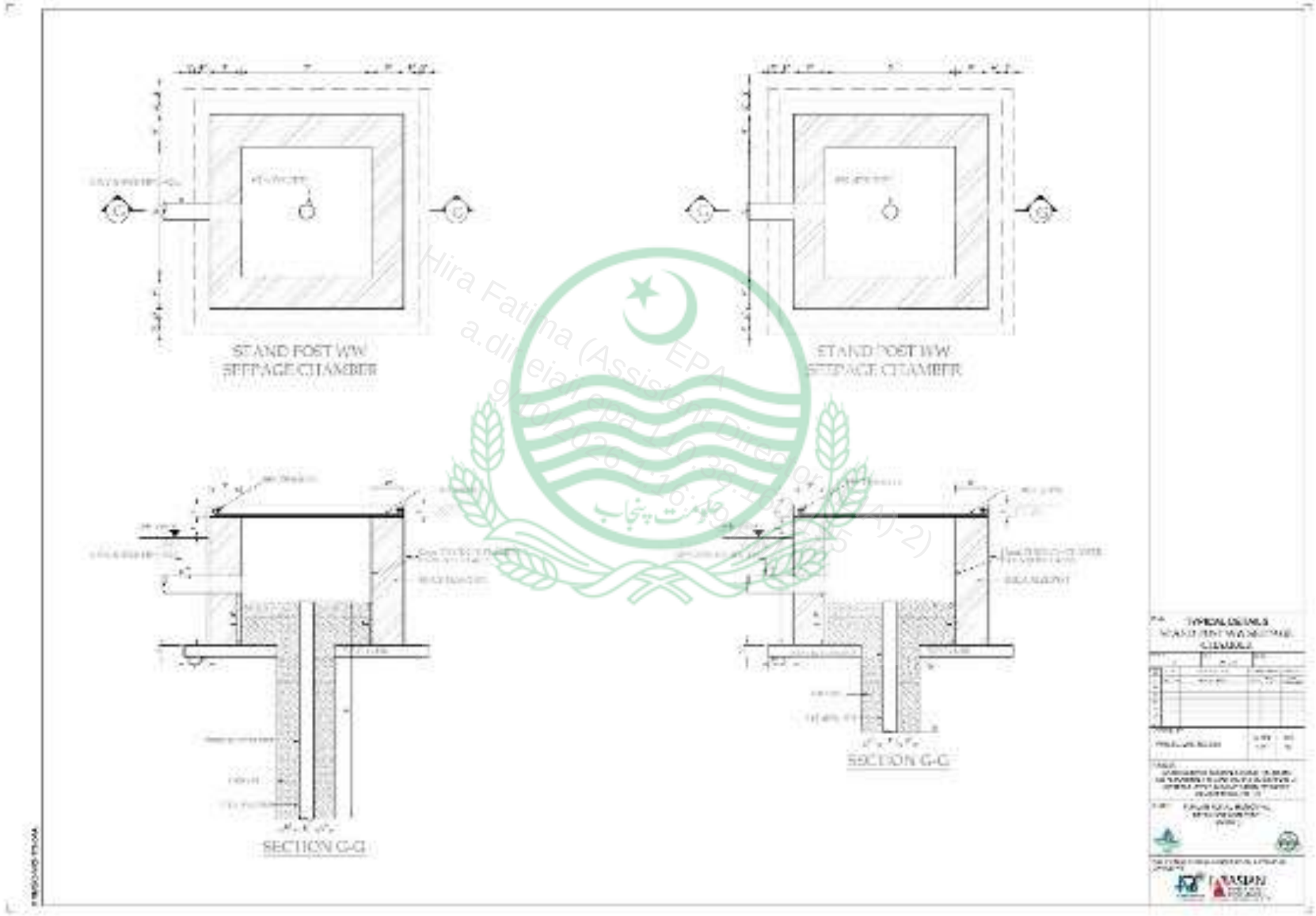
TYPICAL DETAILS


PLAN
DETAIL 'A'
PLAN
DETAIL 'B'
DETAIL FOR HOUSE CONNECTION (ACROSS THE ROAD)
SECTION B-B
DETAIL 'B'

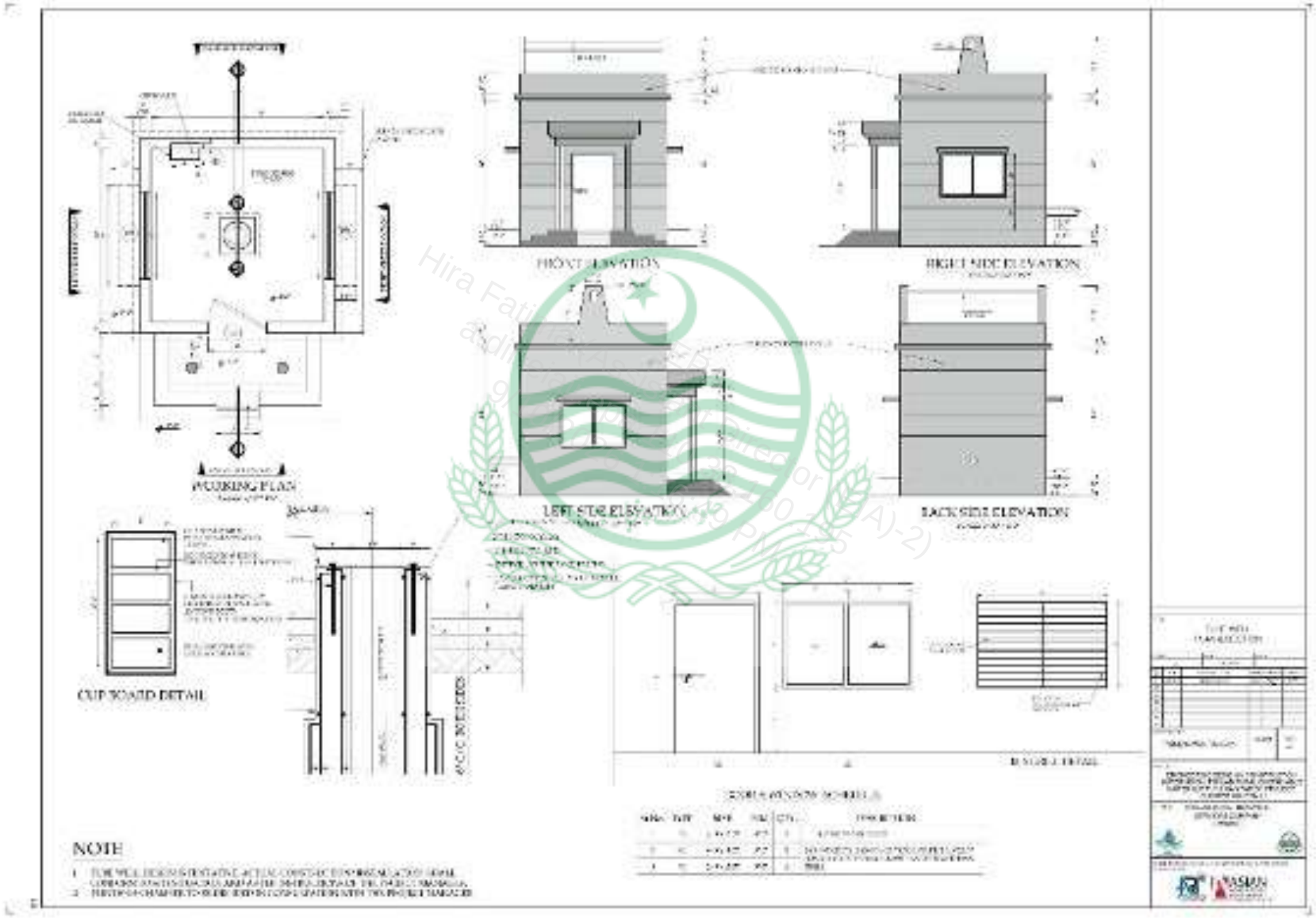


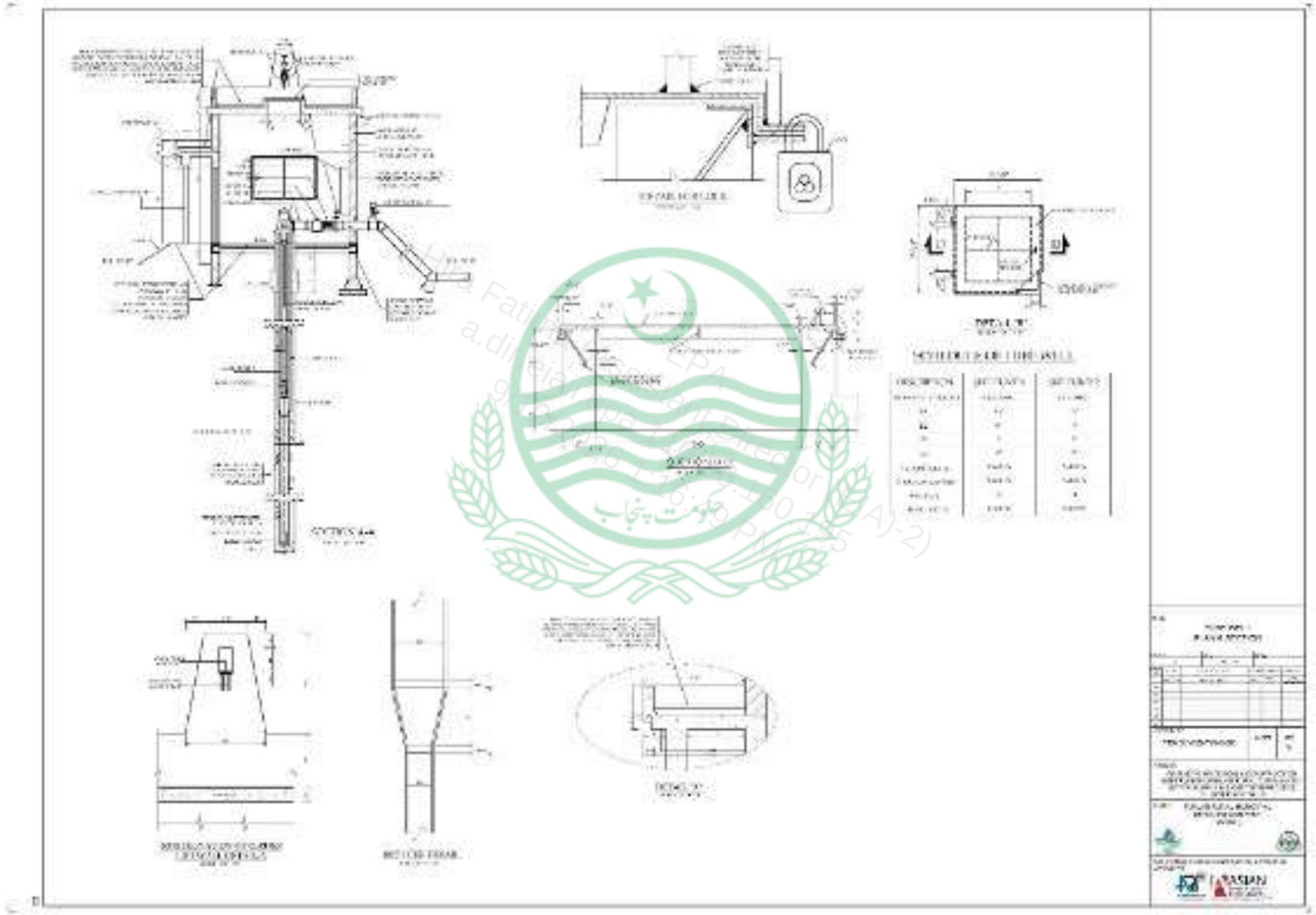

PLAN
PLAN
PLAN
PLAN
SECTION C-C
DEAD END

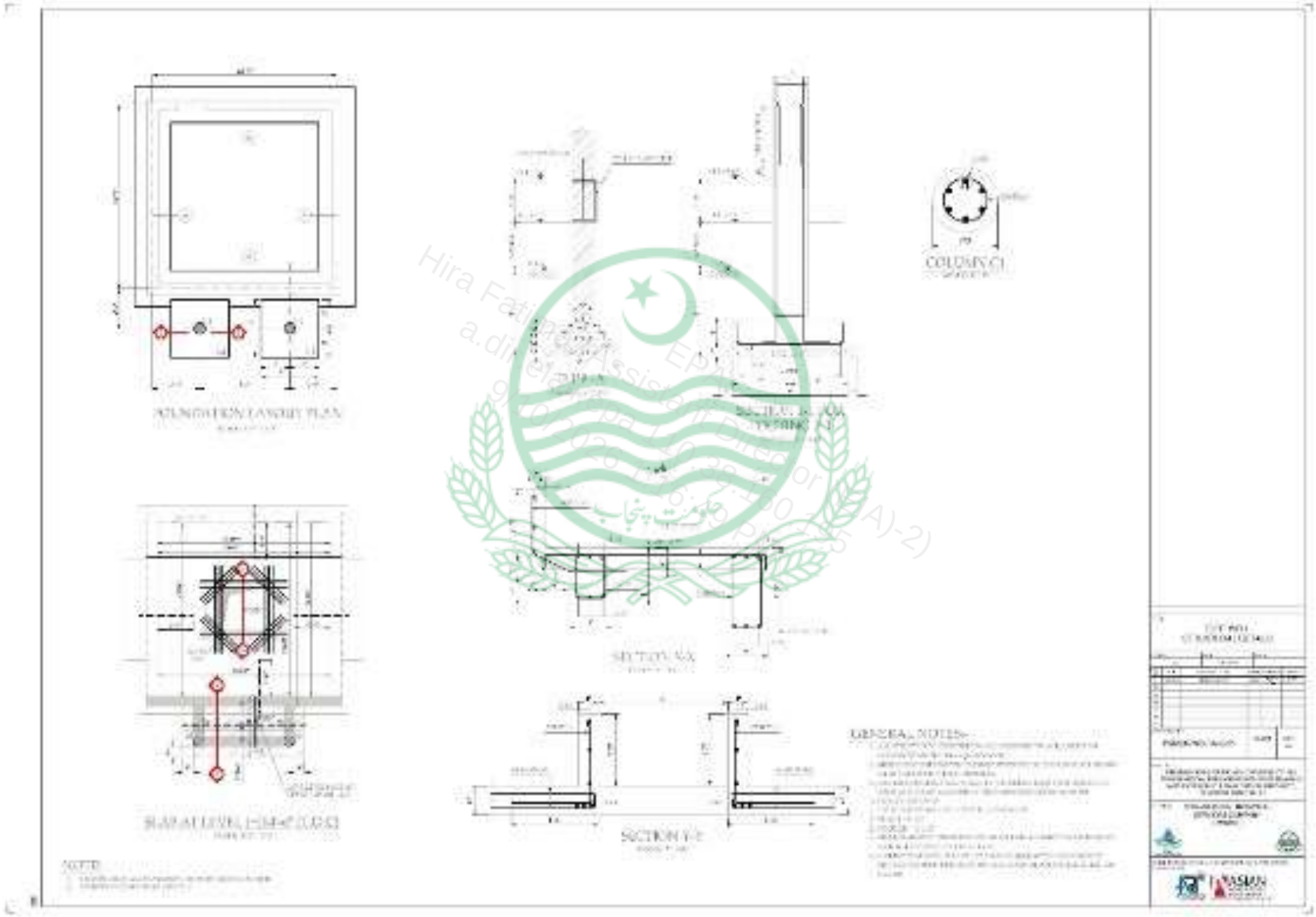


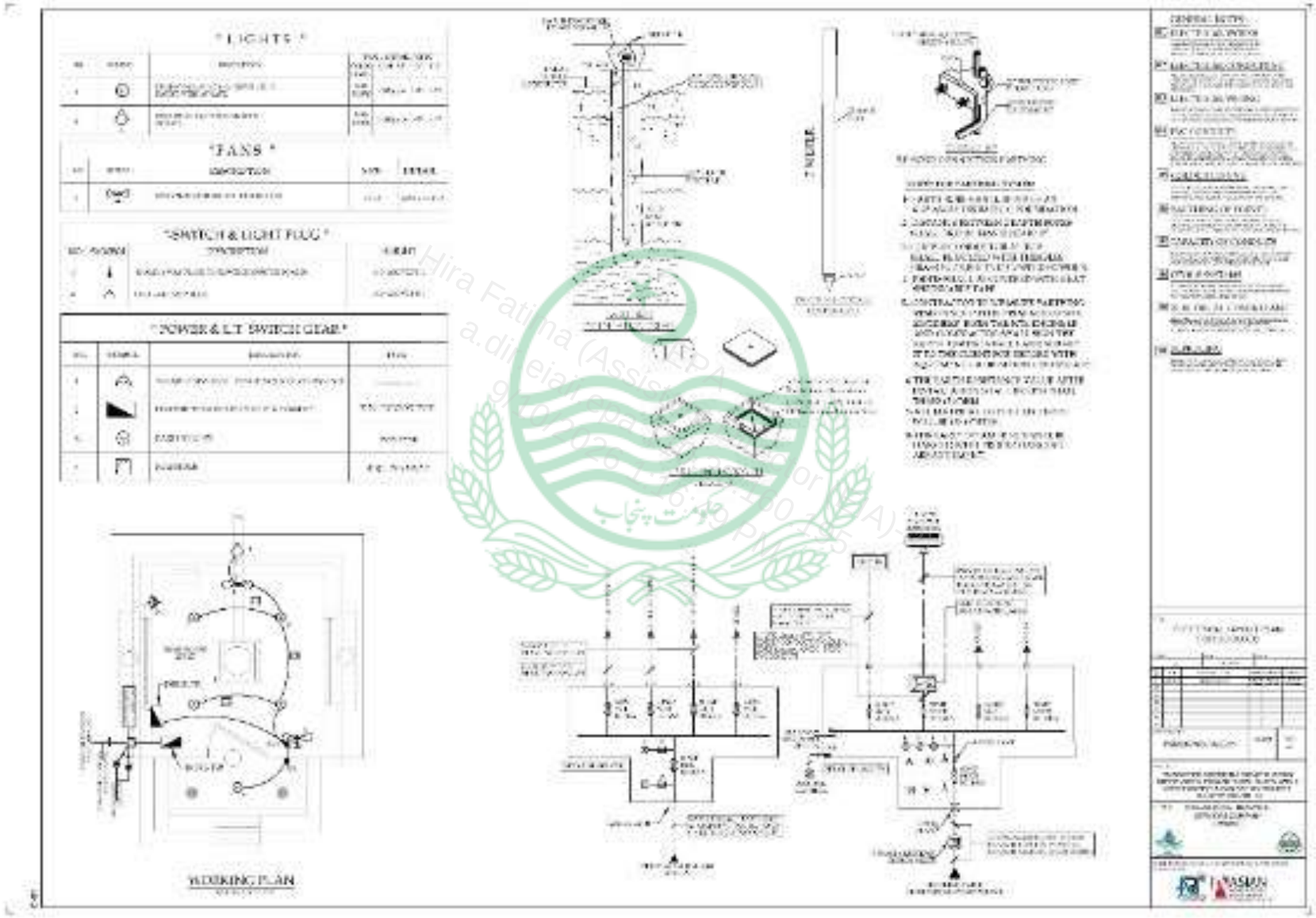

STAND POST WW
SEEPAGE CHAMBER
STAND POST WW
SEEPAGE CHAMBER
SECTION G-G
SECTION G-G

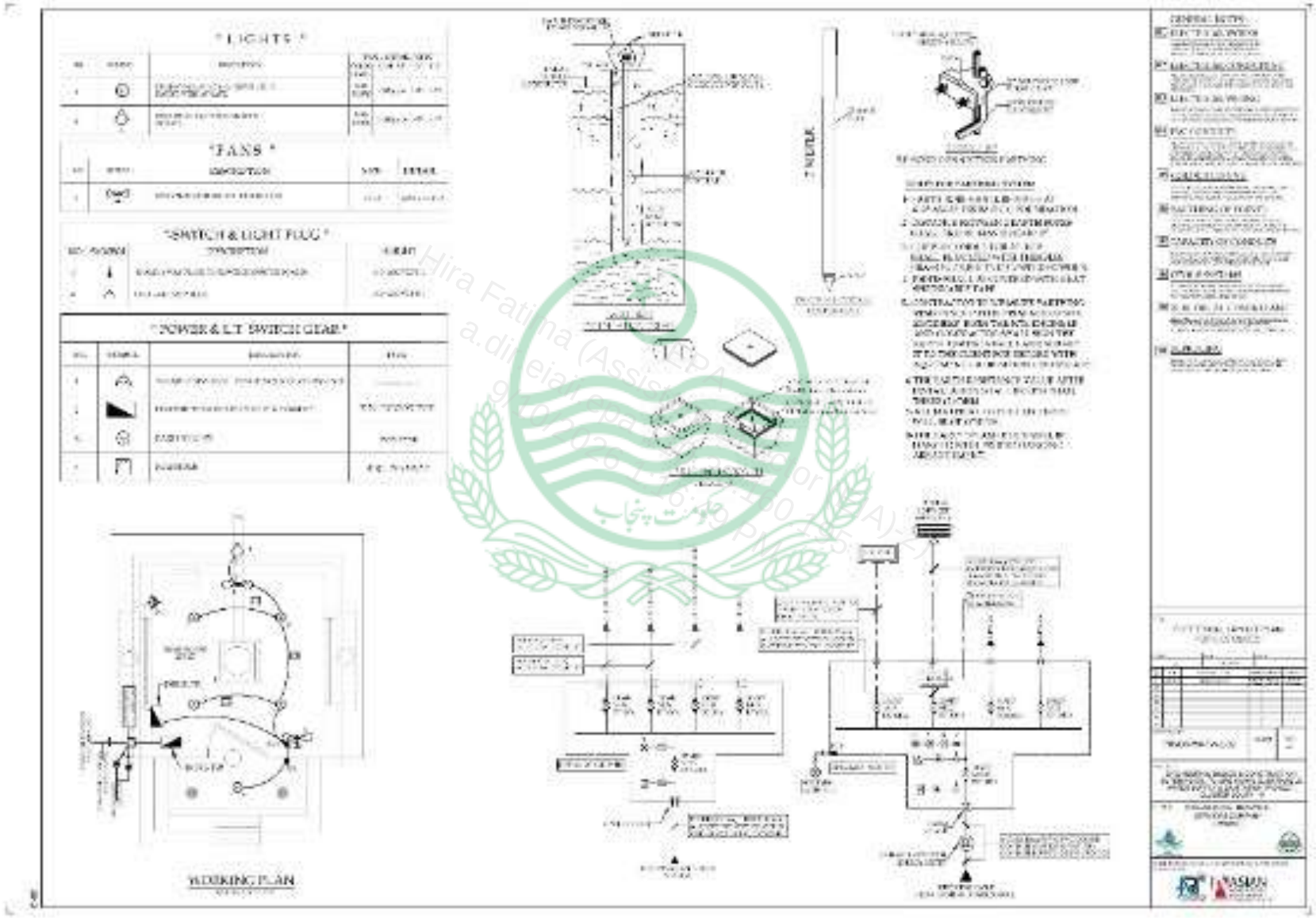

TUBE WELL

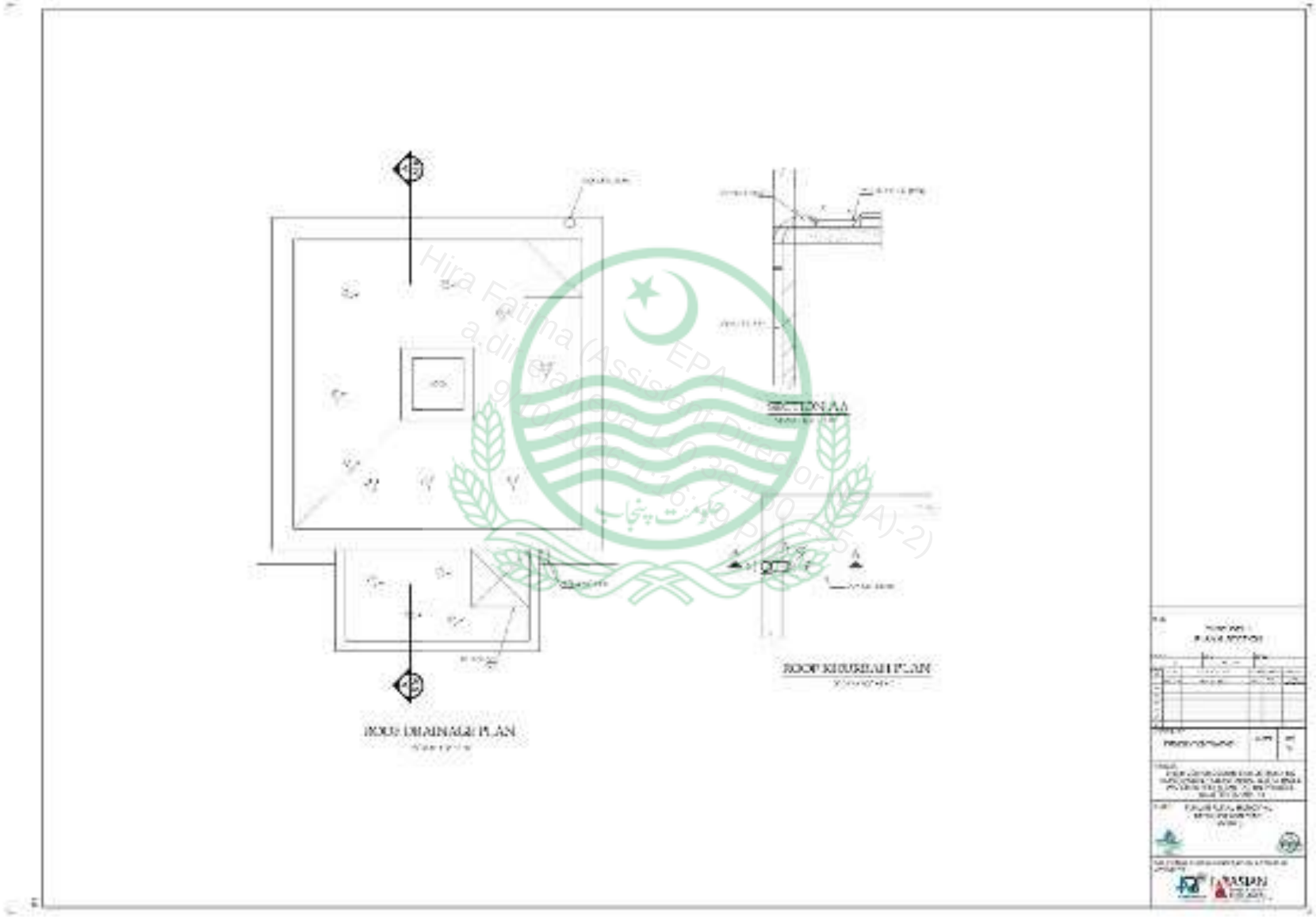

FRONT ELEVATION
RIGHT SIDE ELEVATION
LEFT SIDE ELEVATION
BACK SIDE ELEVATION
CUP BOARD DETAIL
NOTE






"LIGHTS"
"FANS"
"SWITCH & LIGHT PLUG"
"POWER & LT SWITCH GEAR"
WORKING PLAN

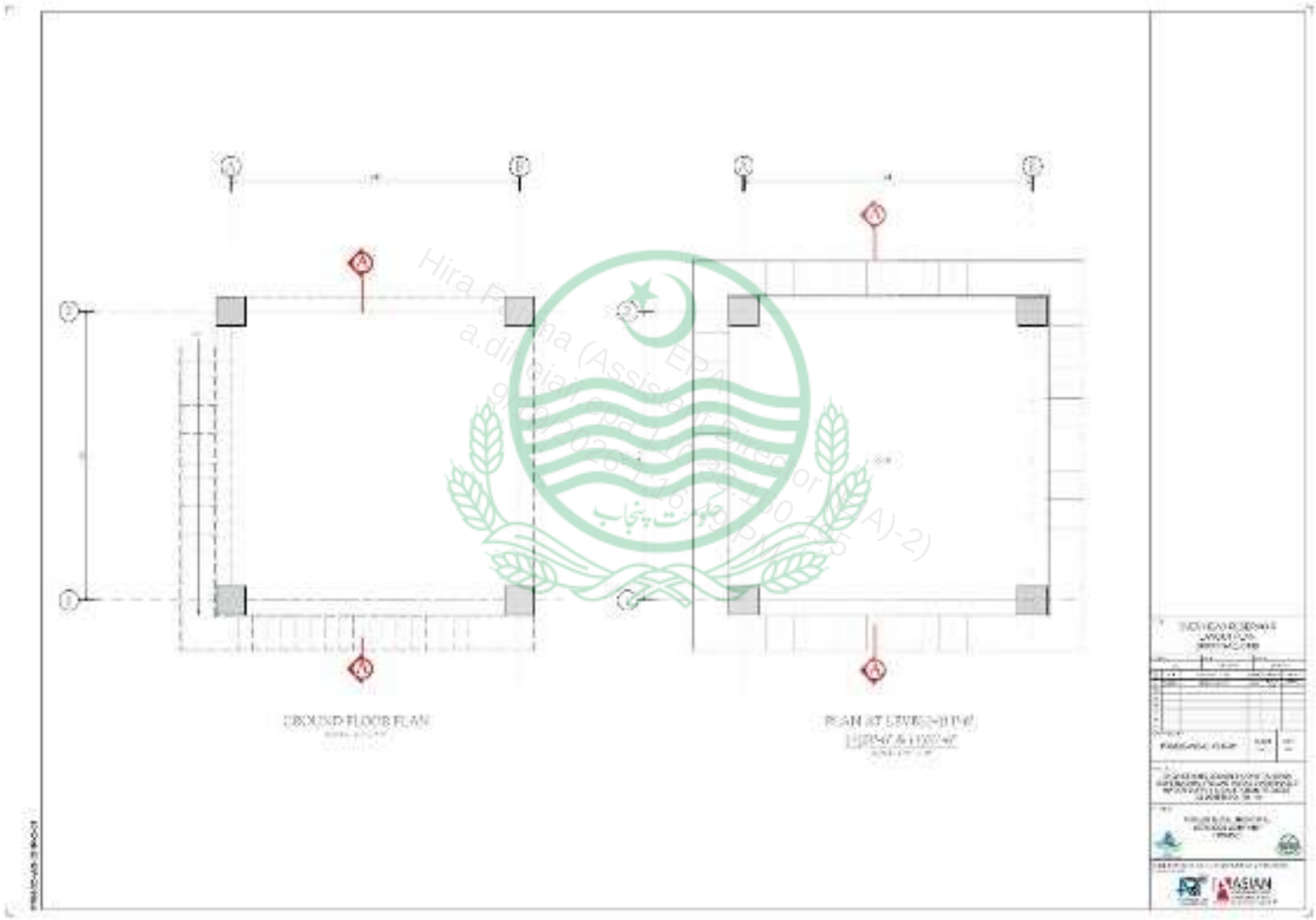

"LIGHTS"
"FANS"
"SWITCH & LIGHT PLUG"
"POWER & LT SWITCH GEAR"
WORKING PLAN

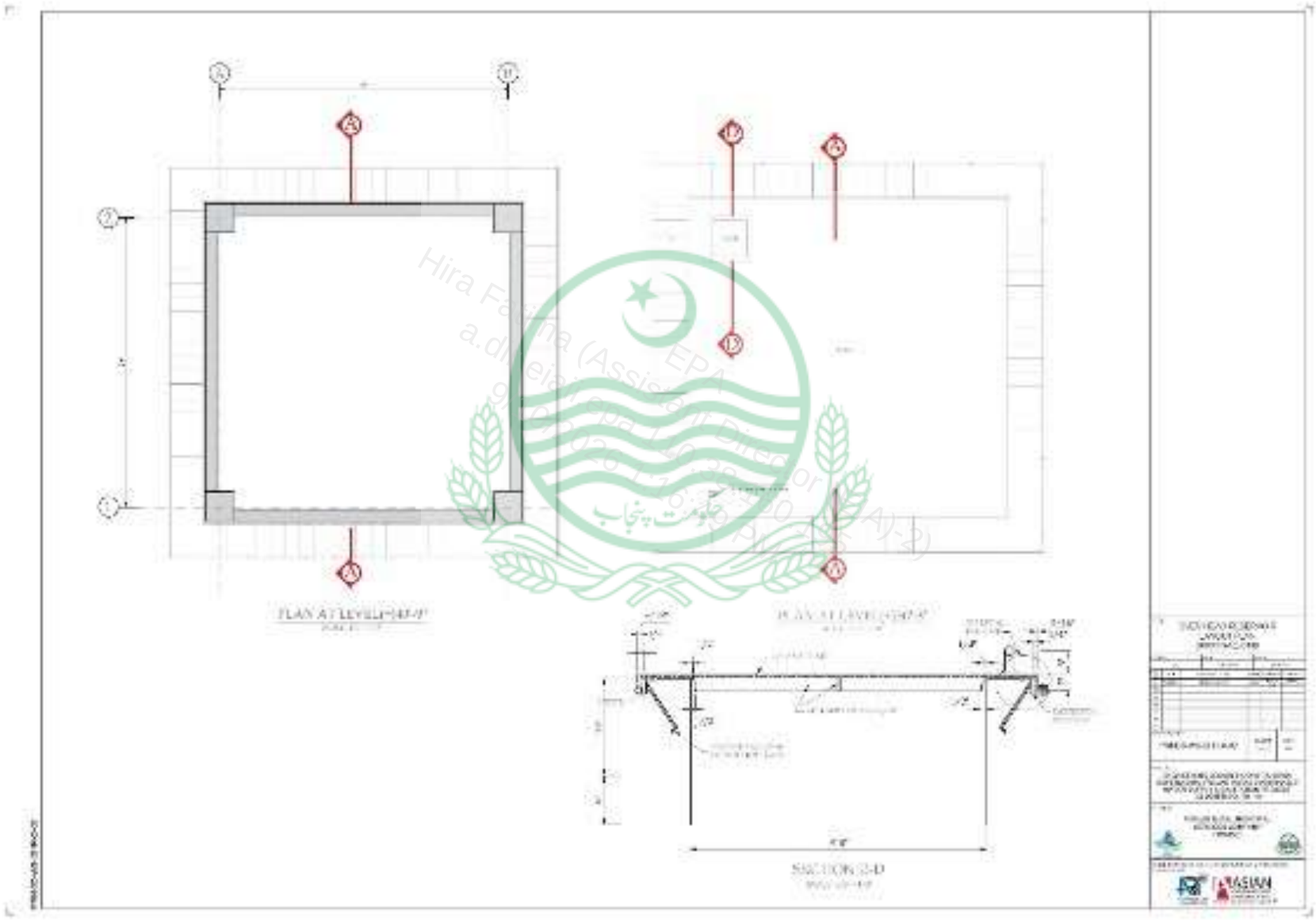

SECTION A-A
ROOF DRAINAGE PLAN

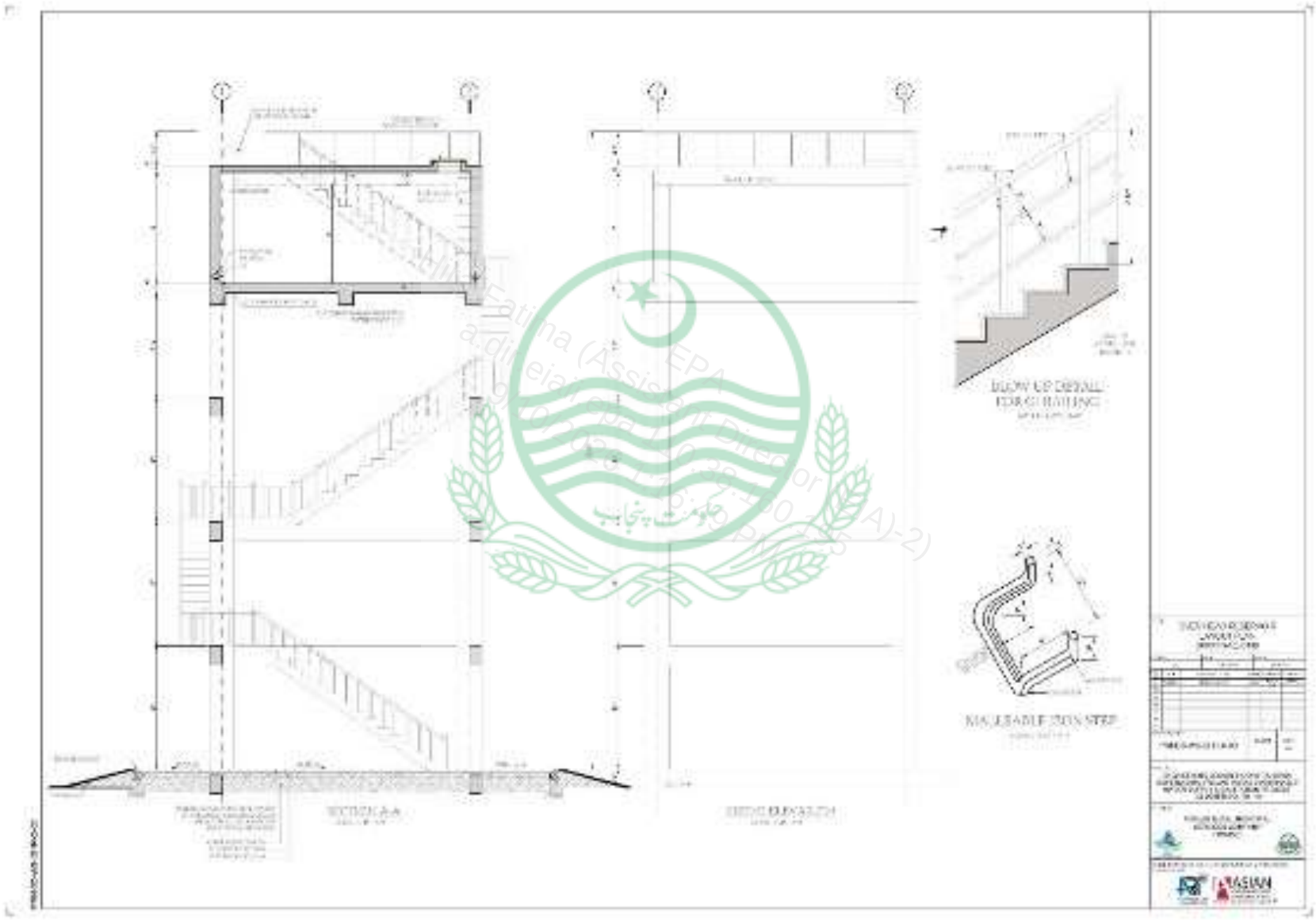
Hira Fatima (Assistant EPA
a.dir.eia...

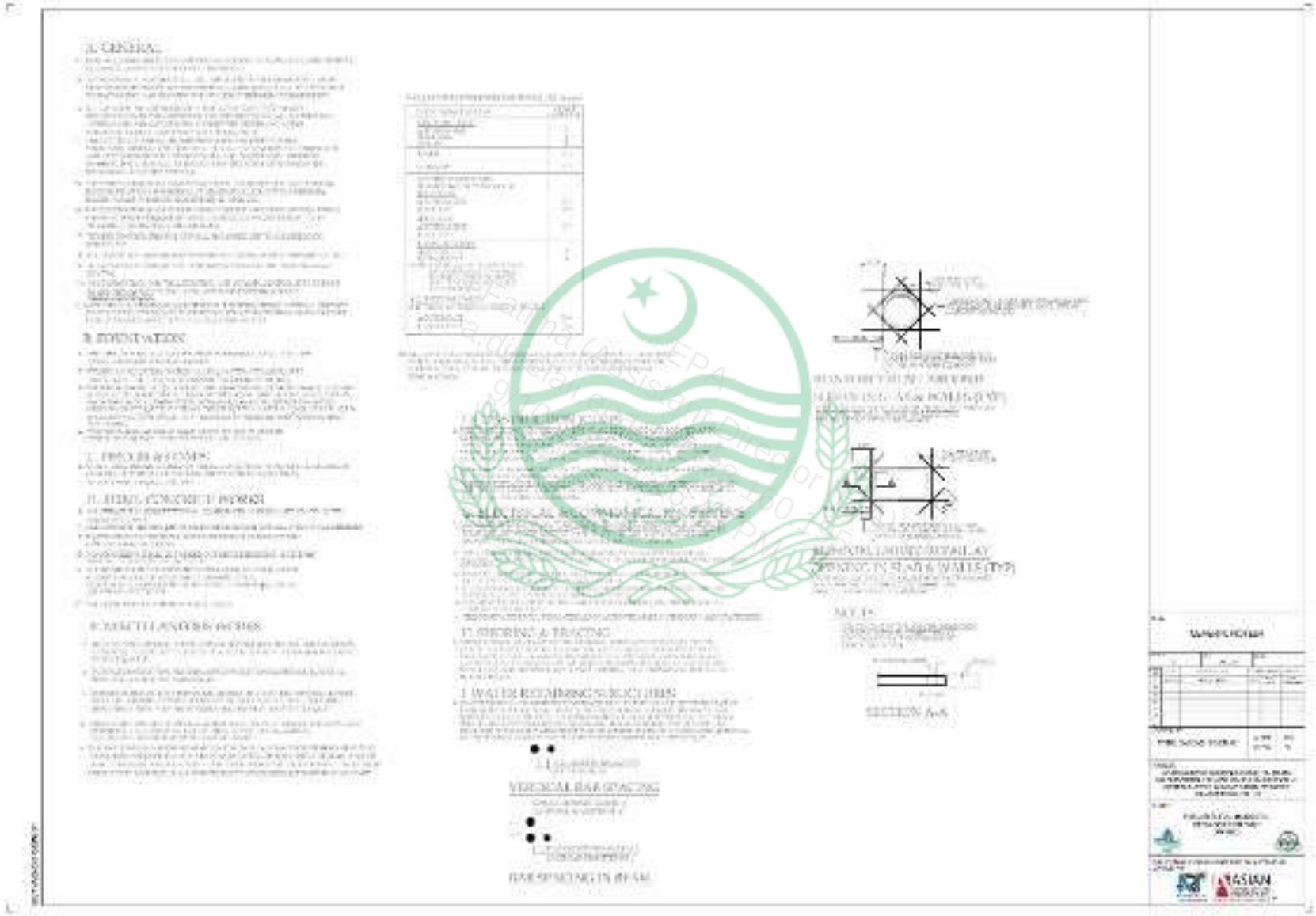
OVERHEAD RESERVIOR

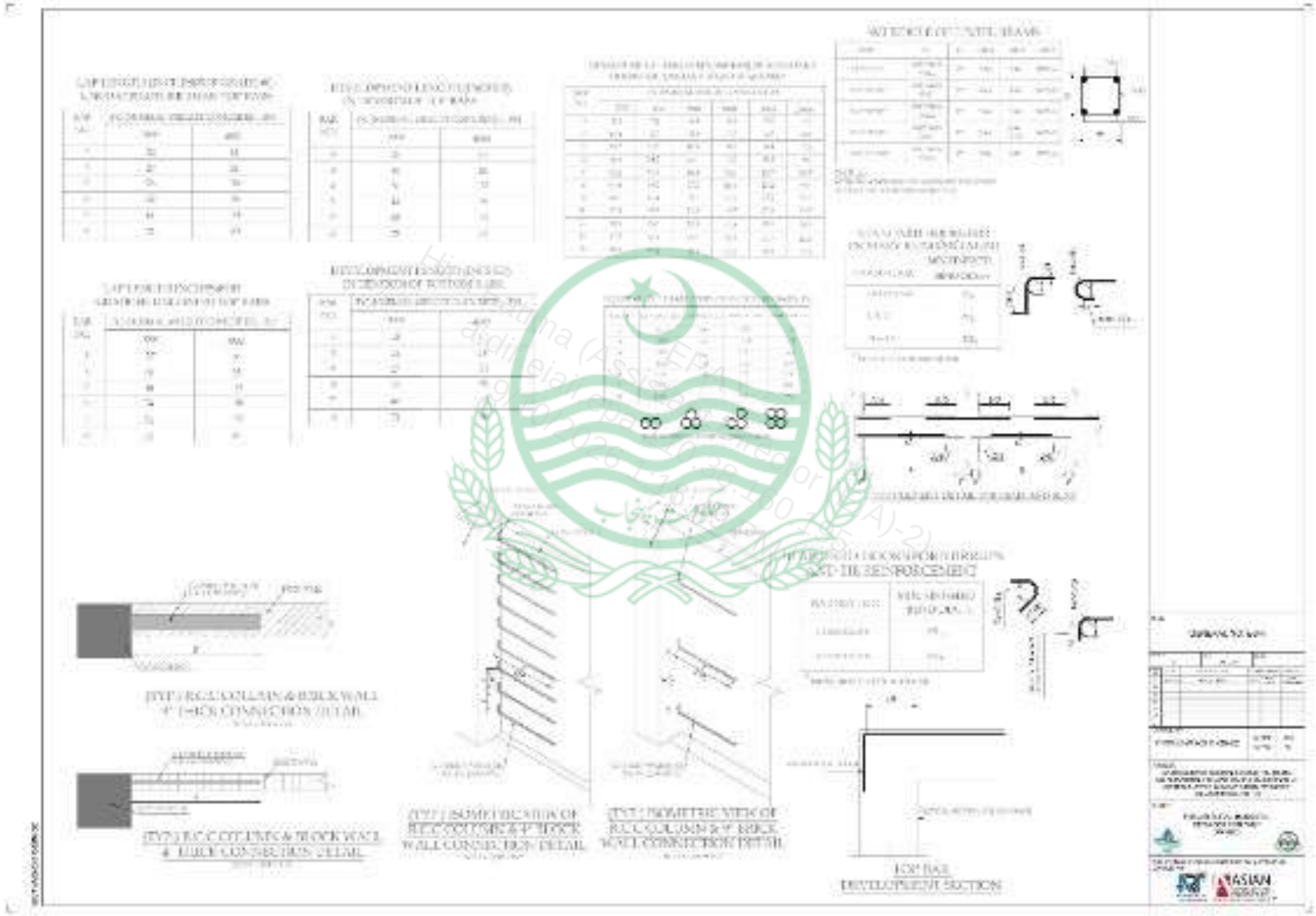


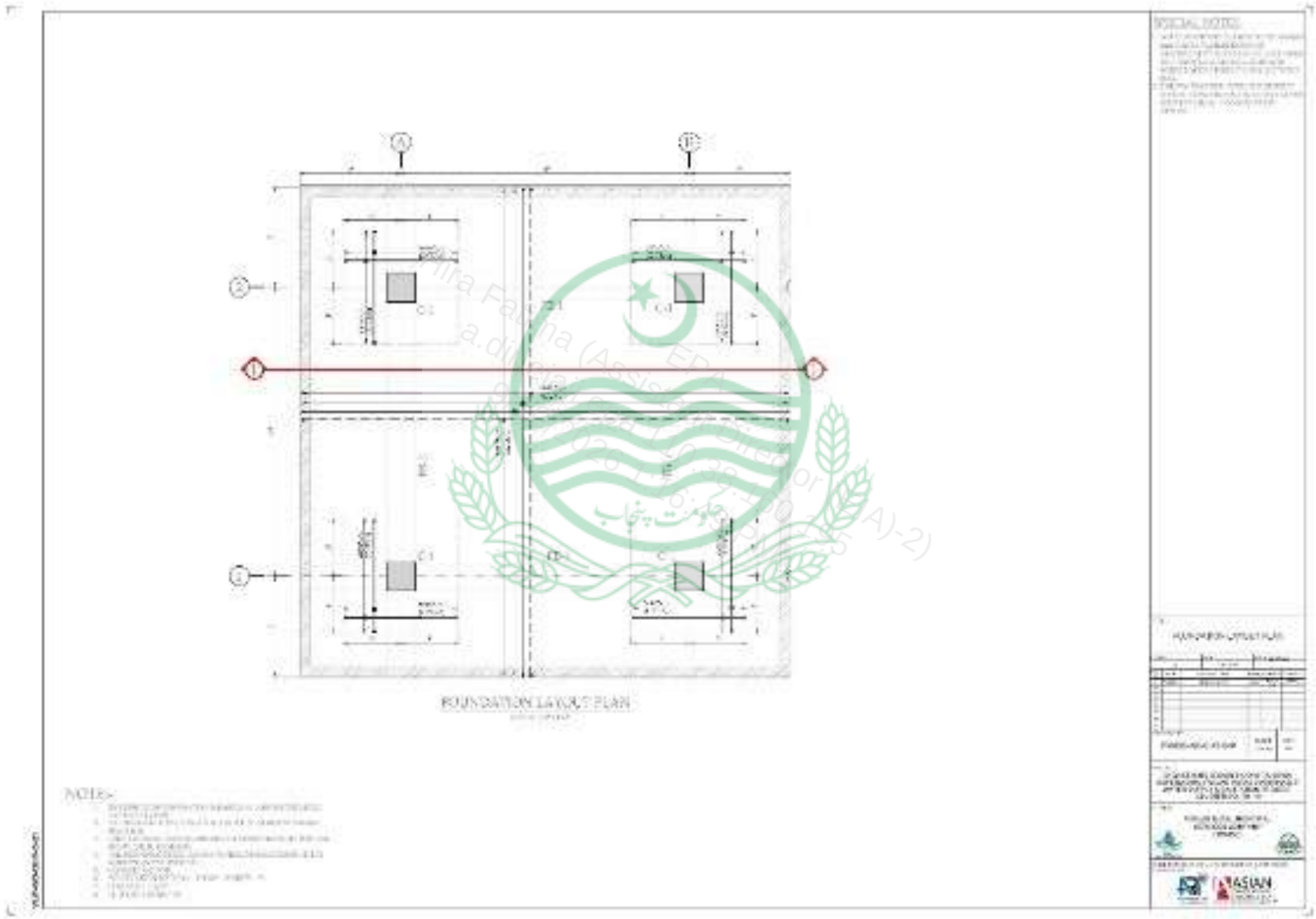


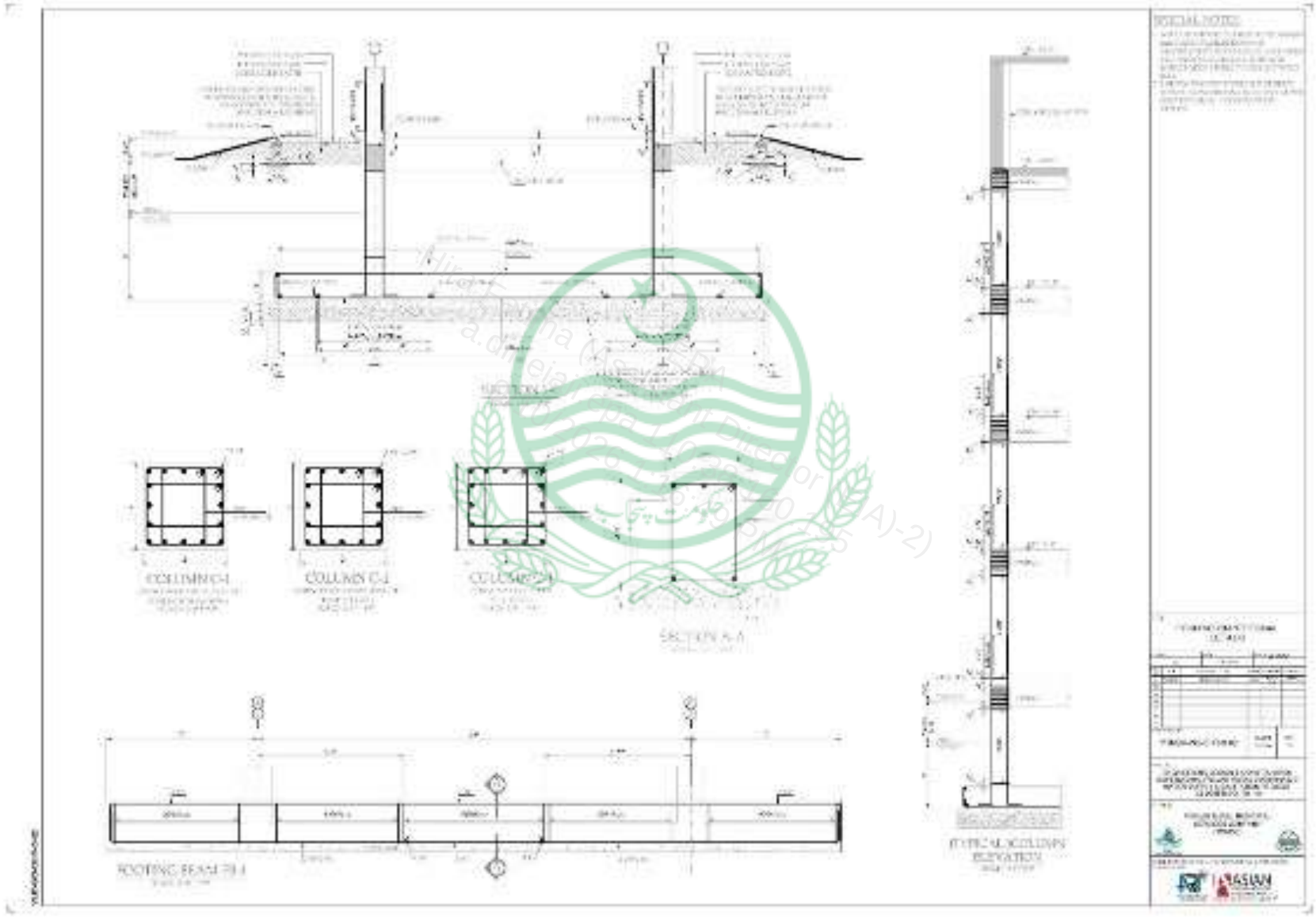


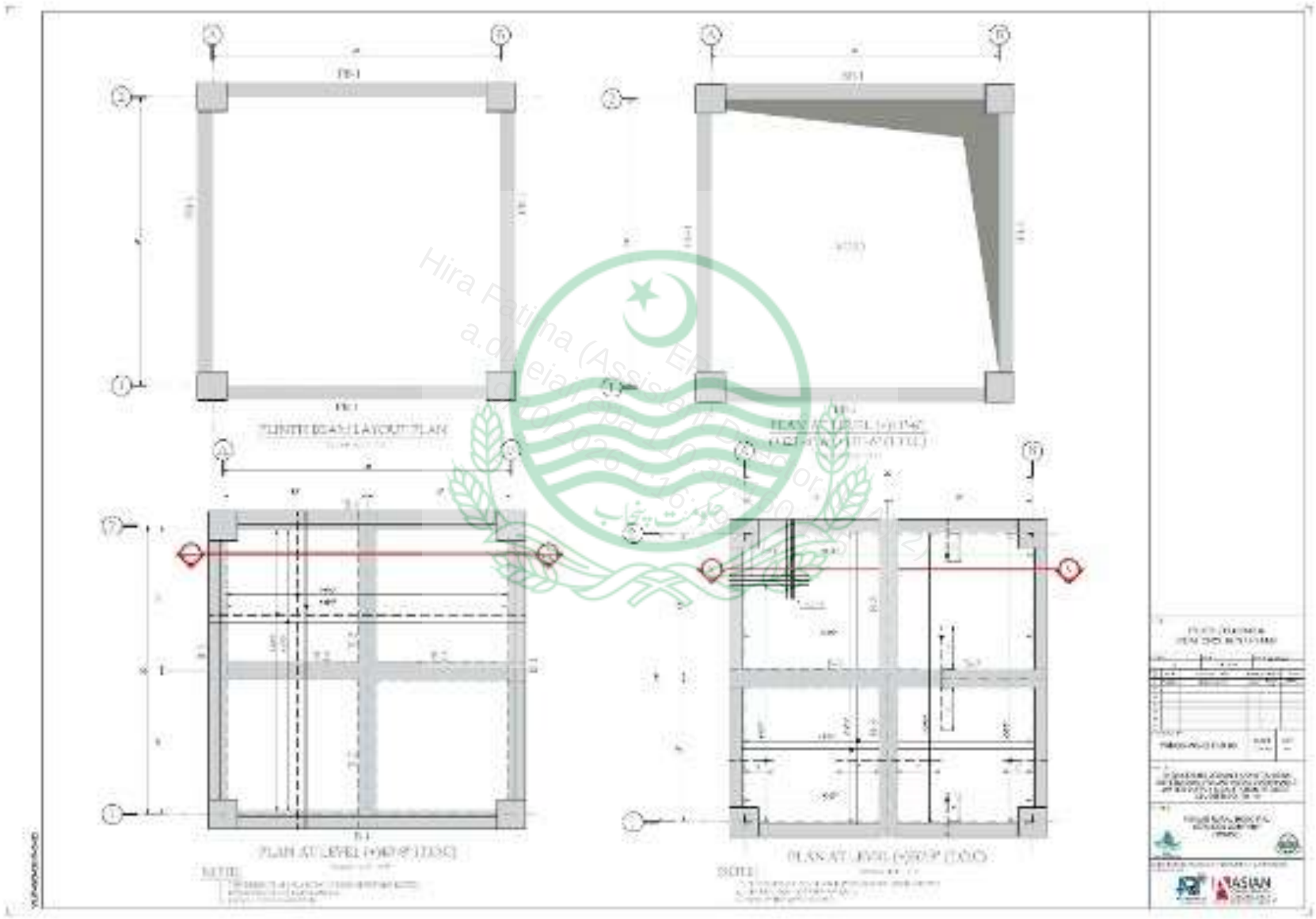


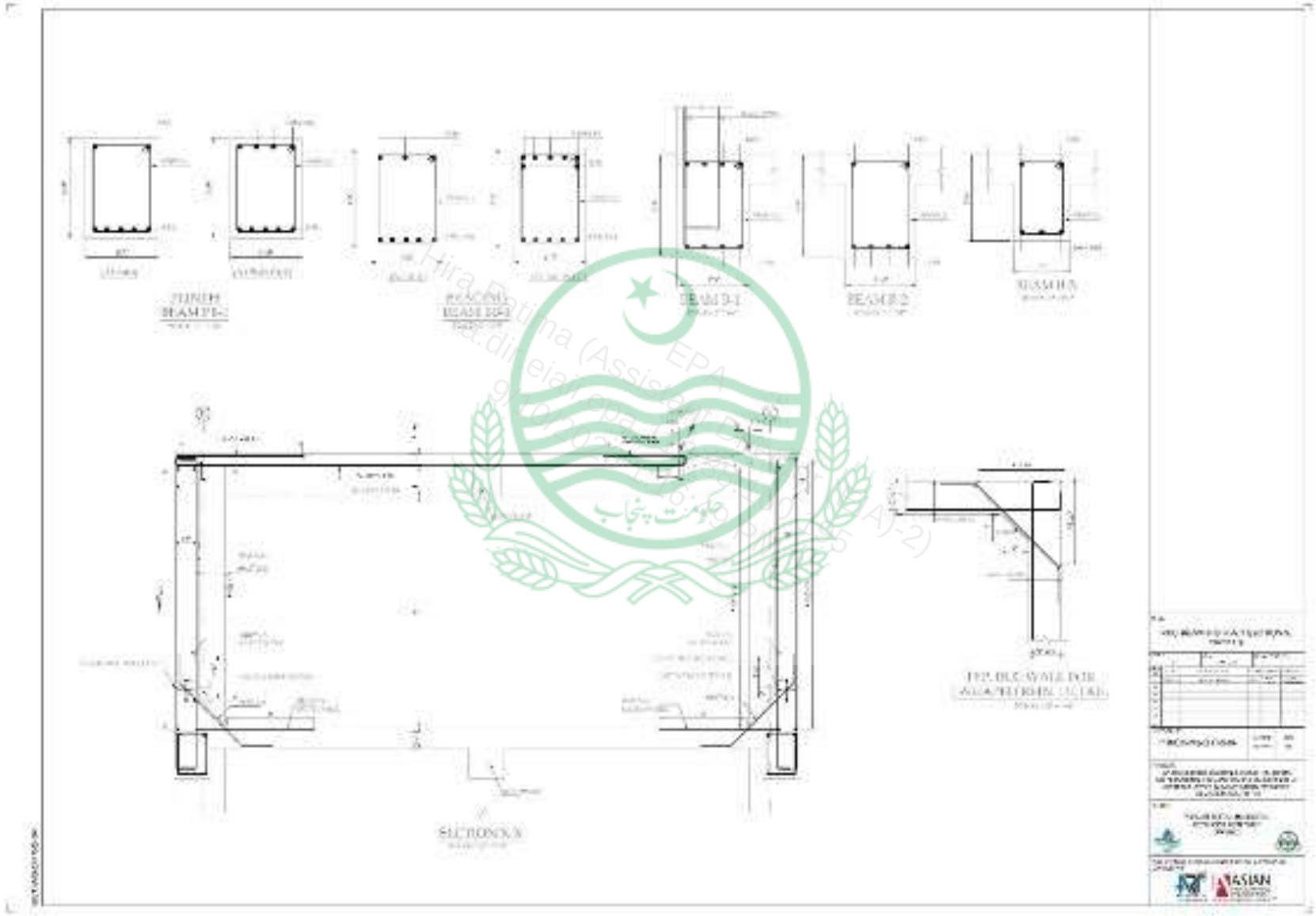


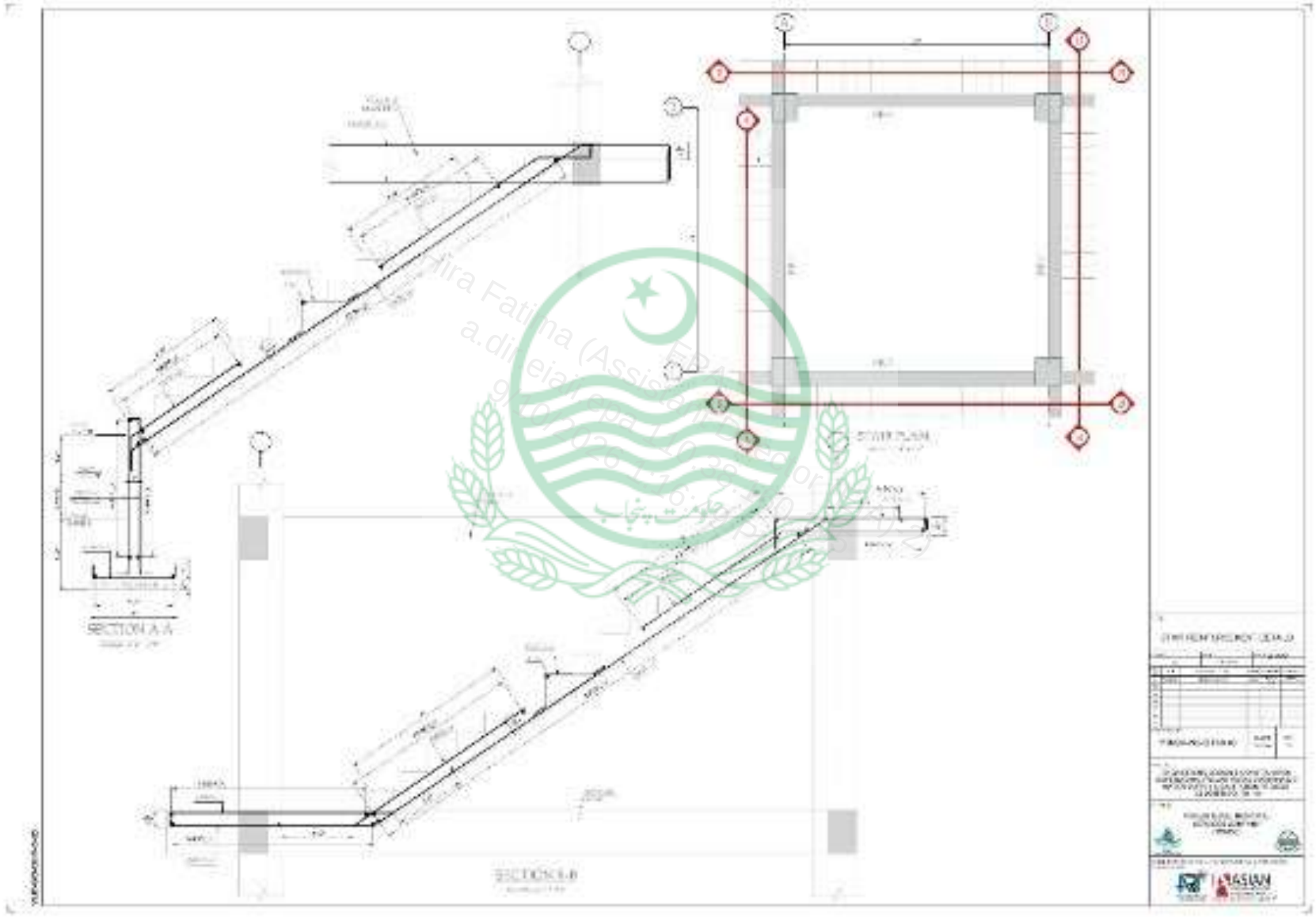


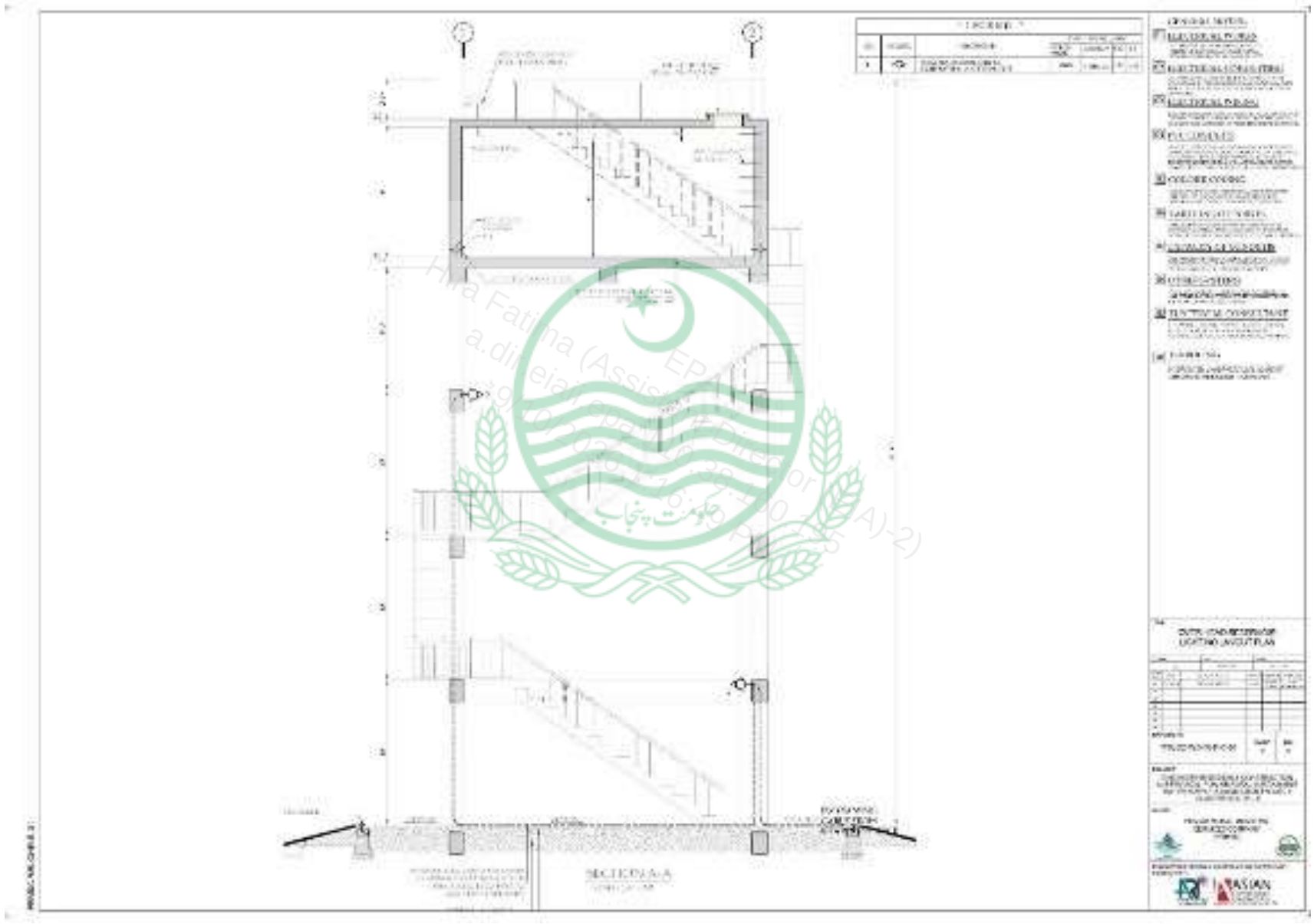


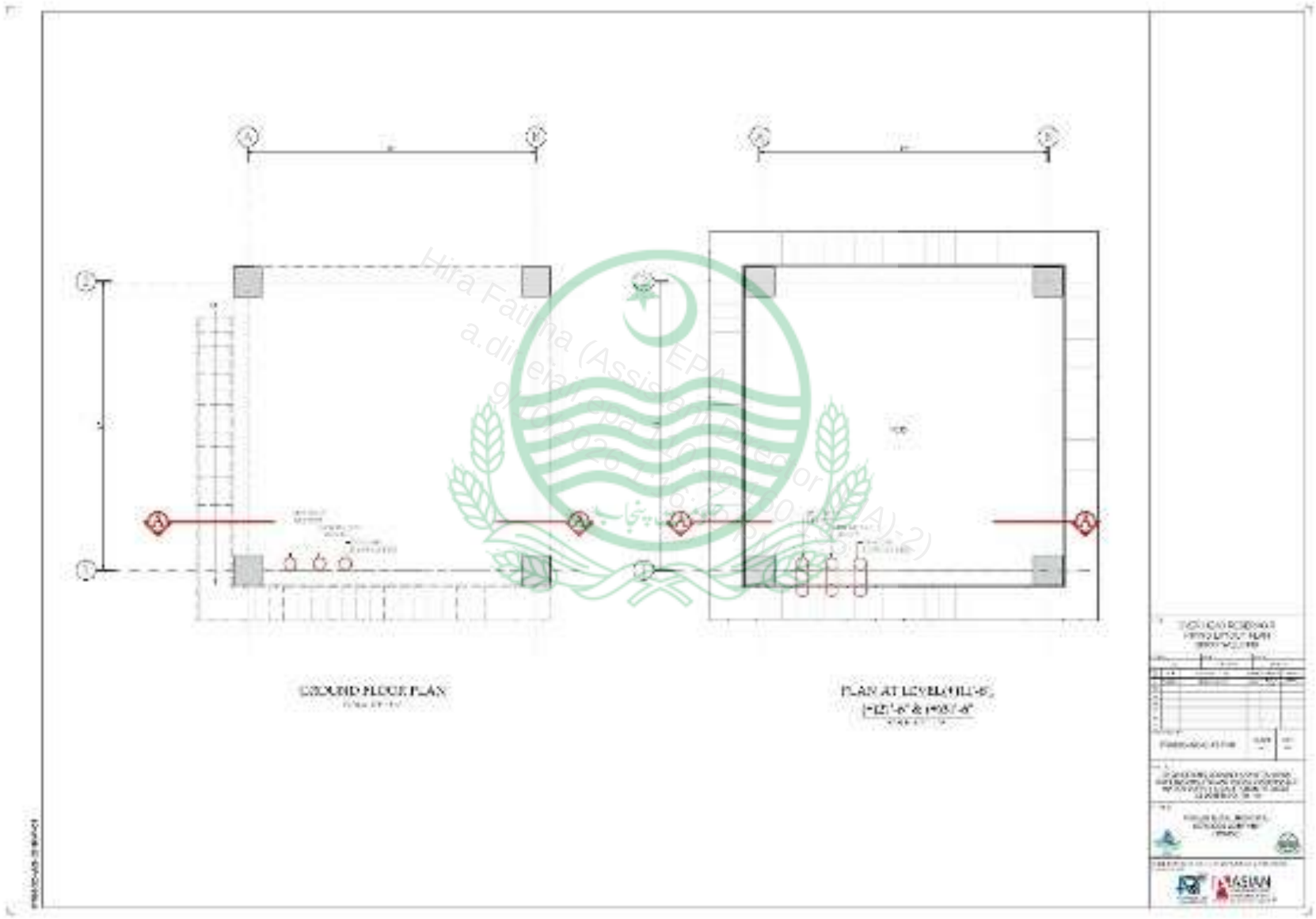


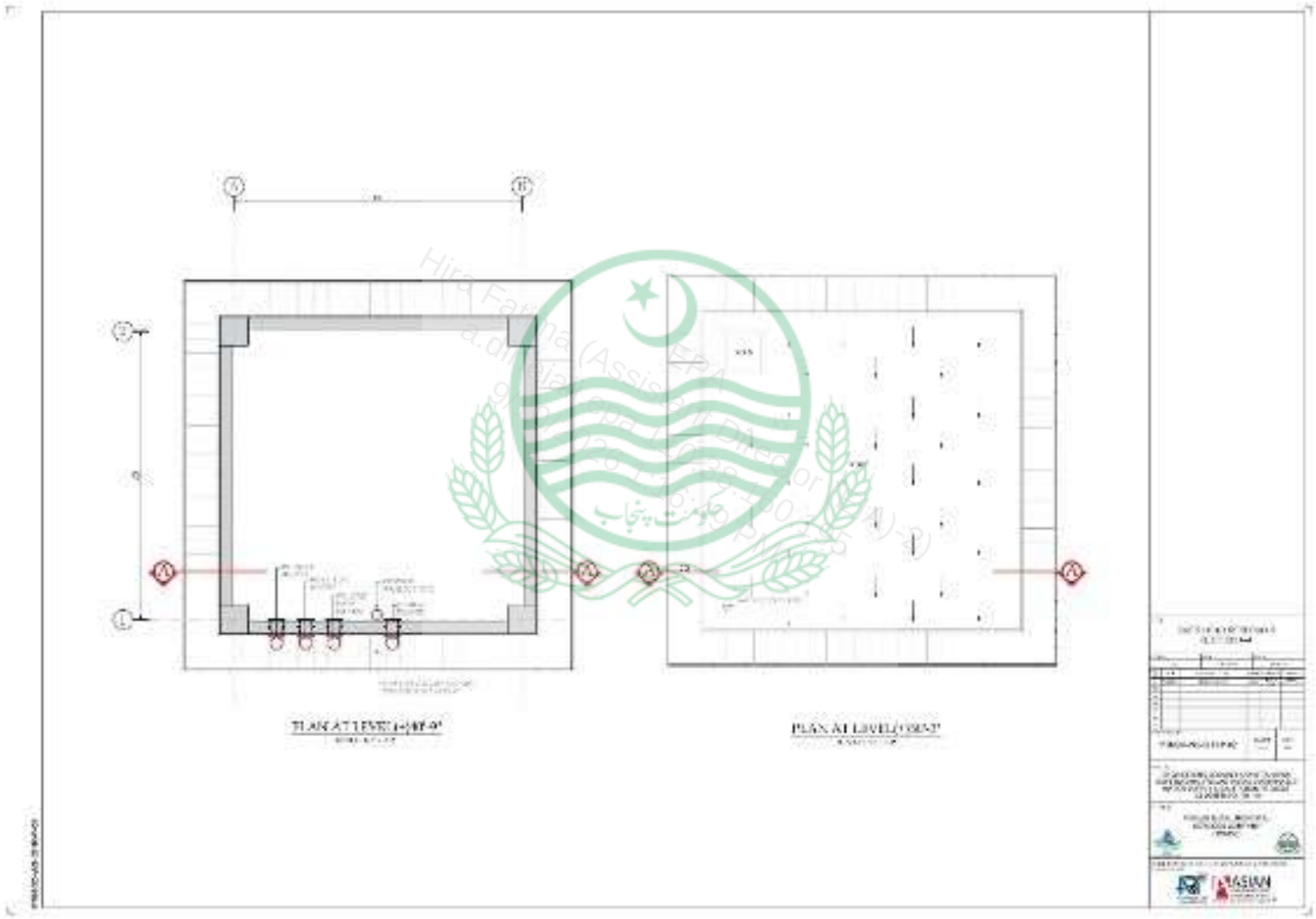


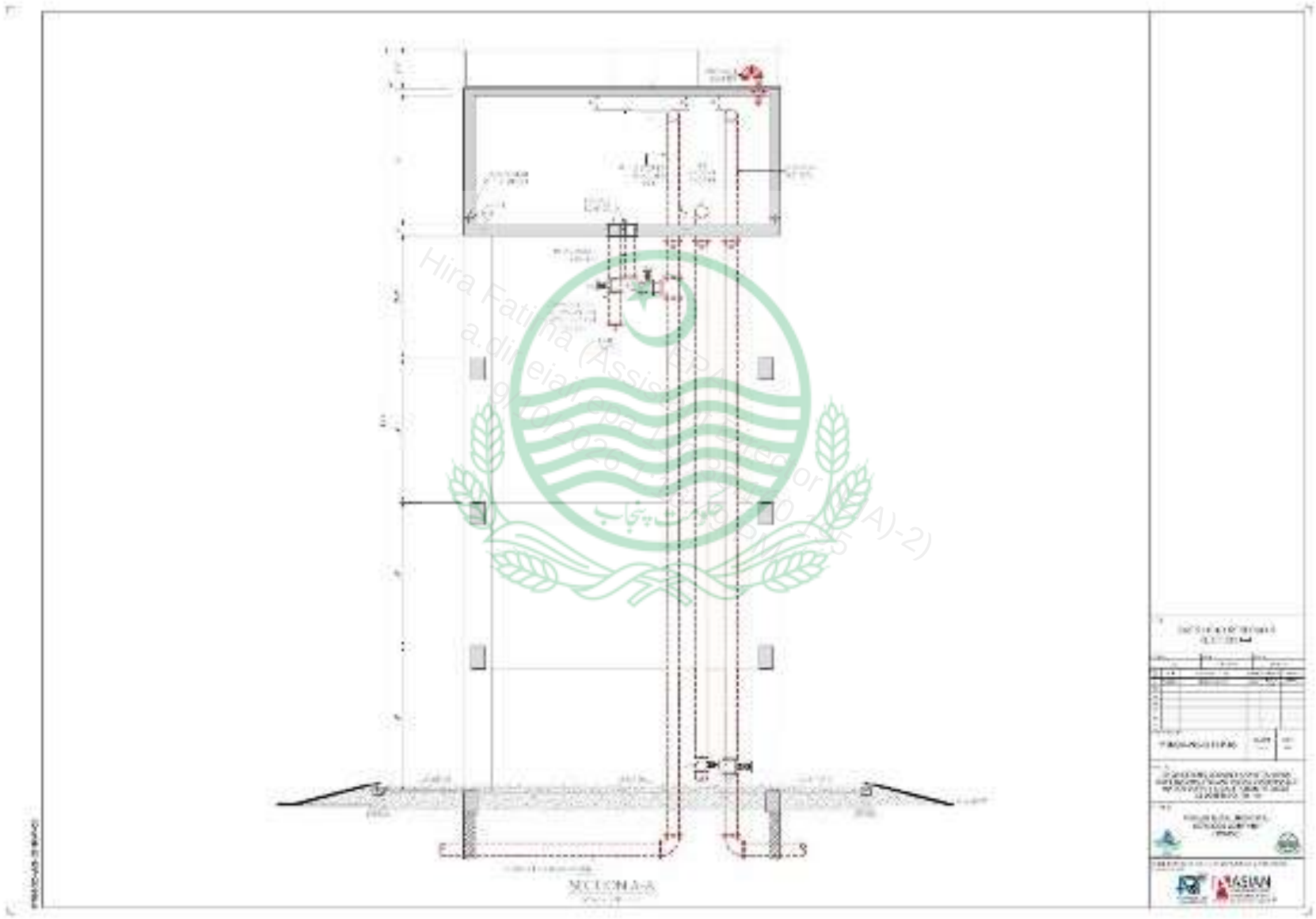



SECTION A-A
SECTION B-B

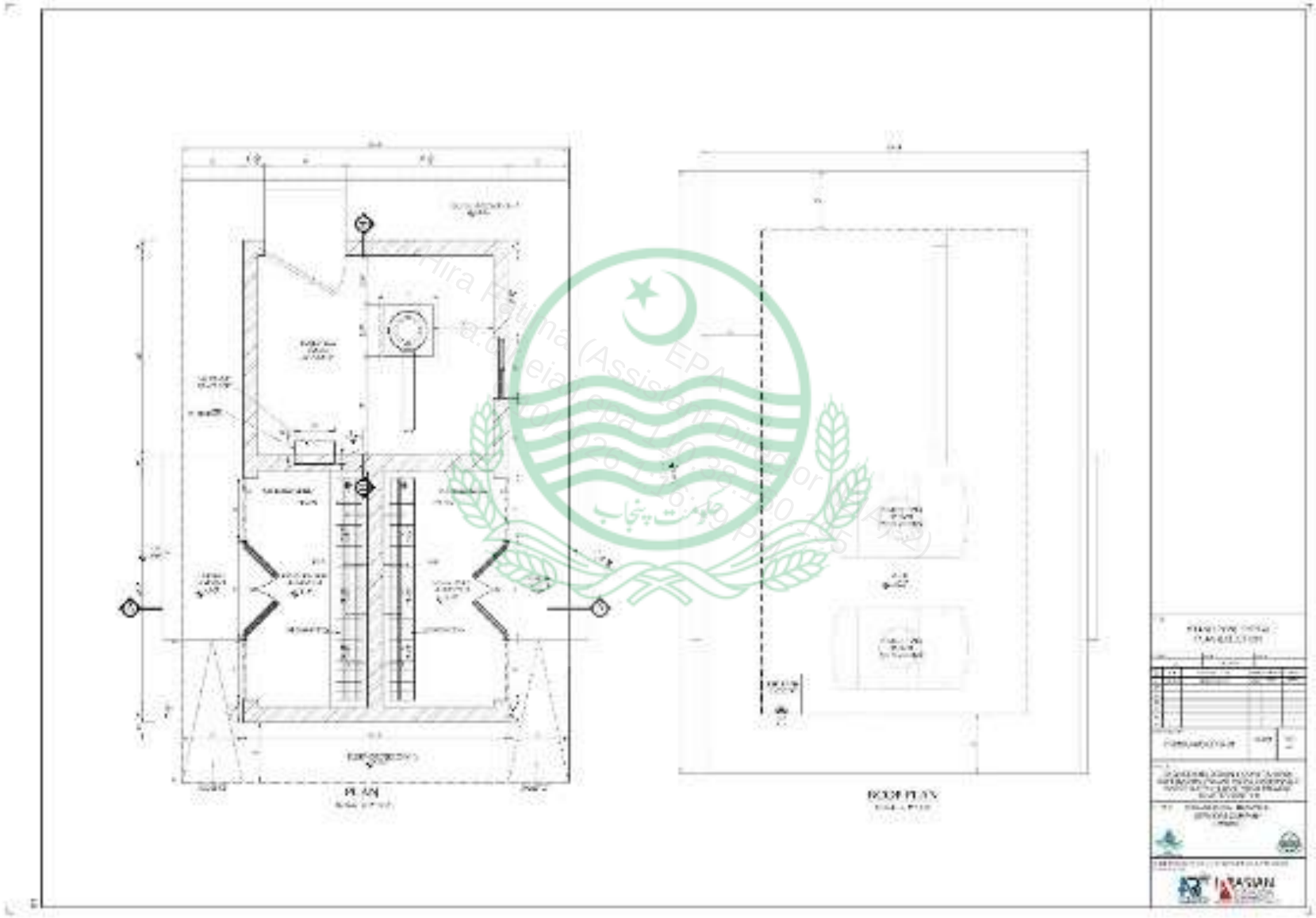


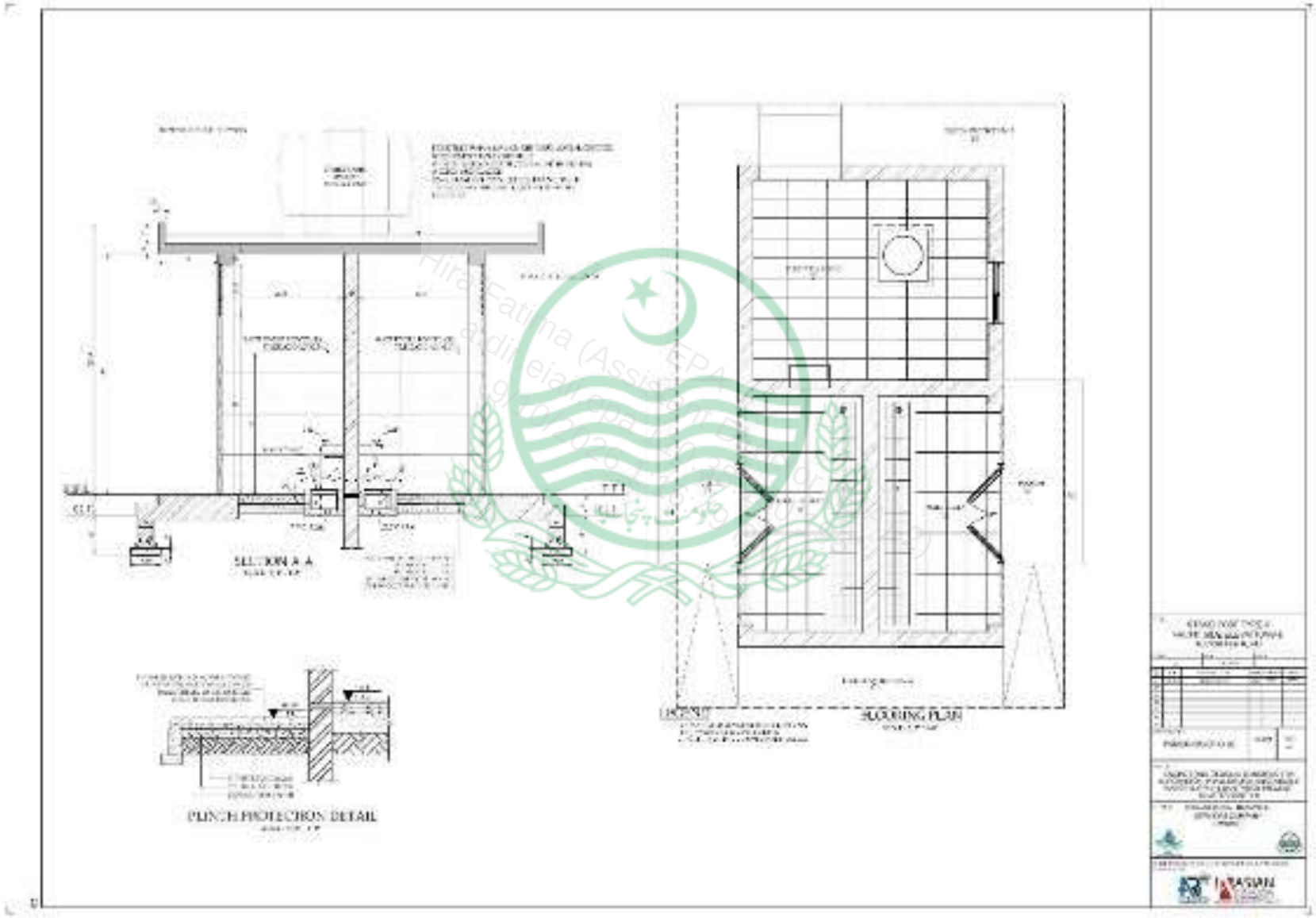

GROUND FLOOR PLAN
PLAN AT LEVEL (+) 12'-6"
1"=12'-0" & 1"=03'-0"

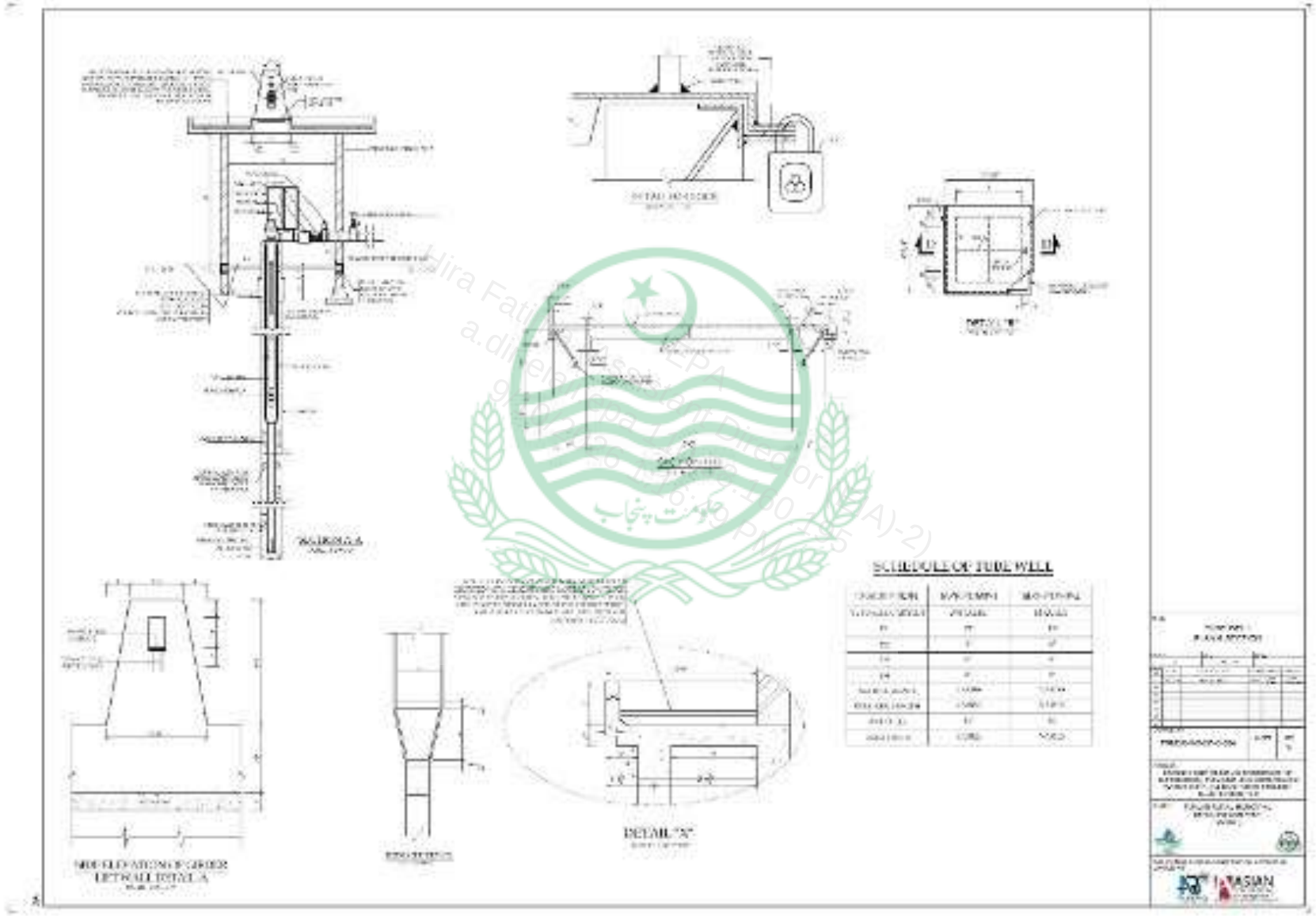


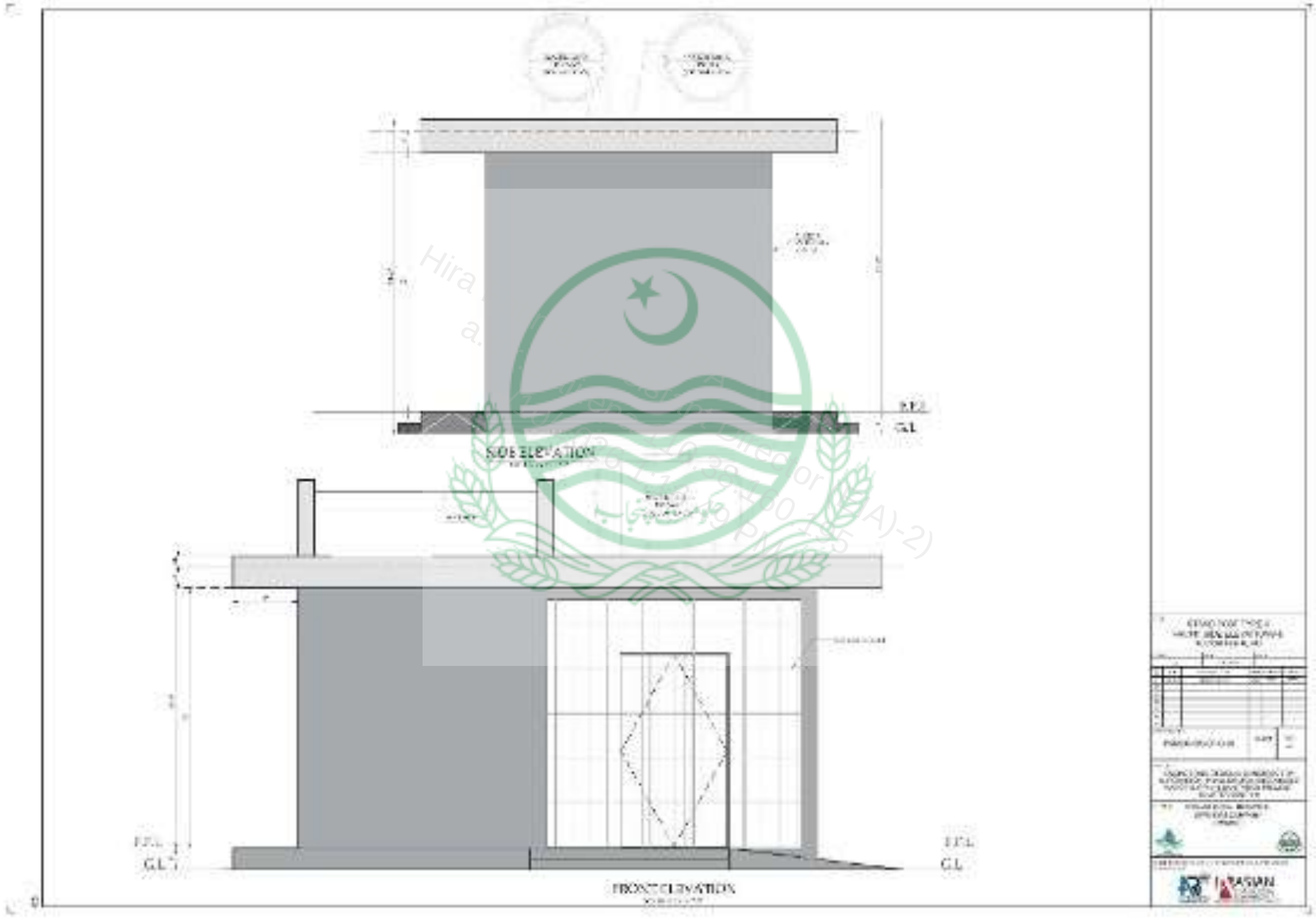


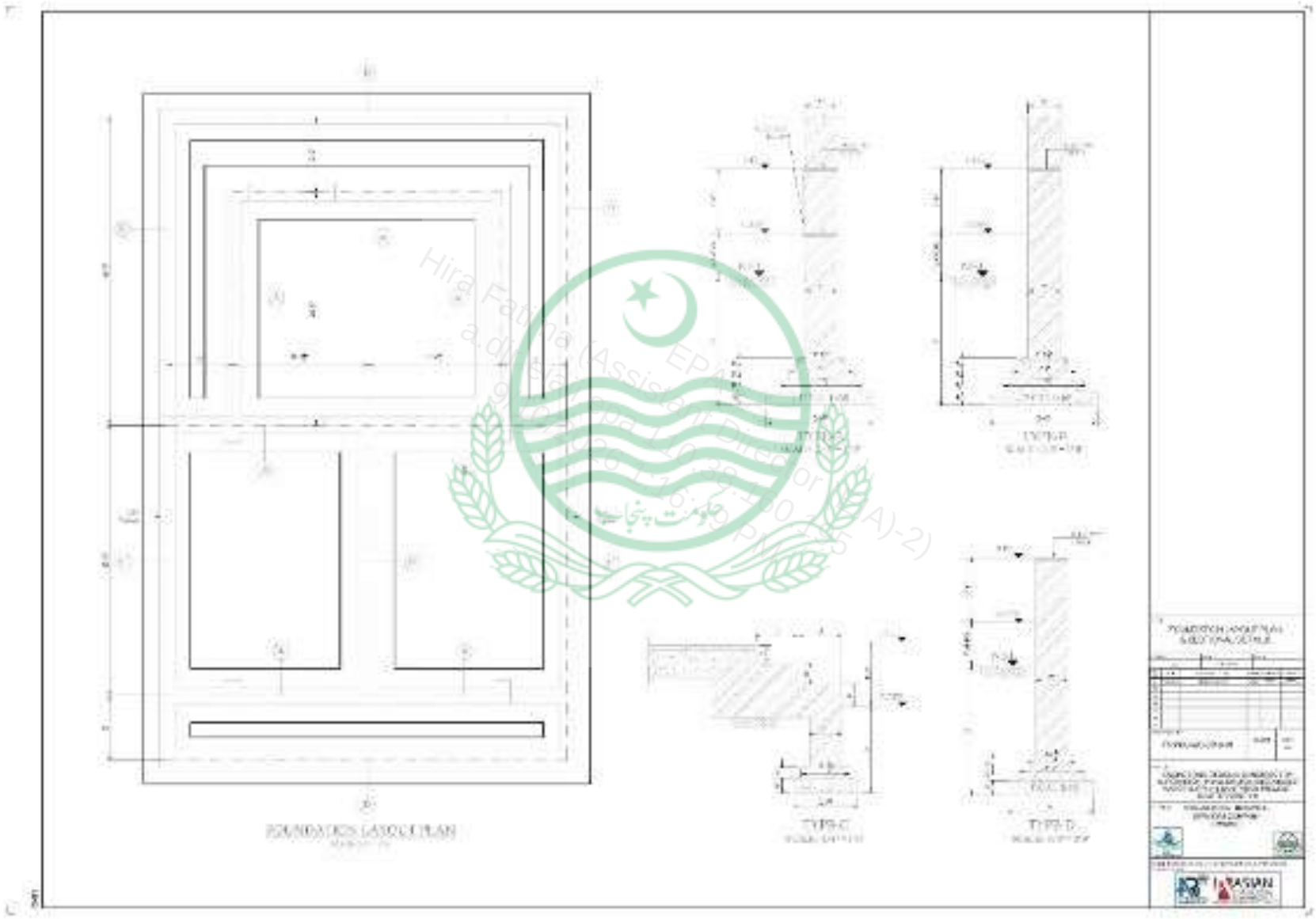

STAND POST

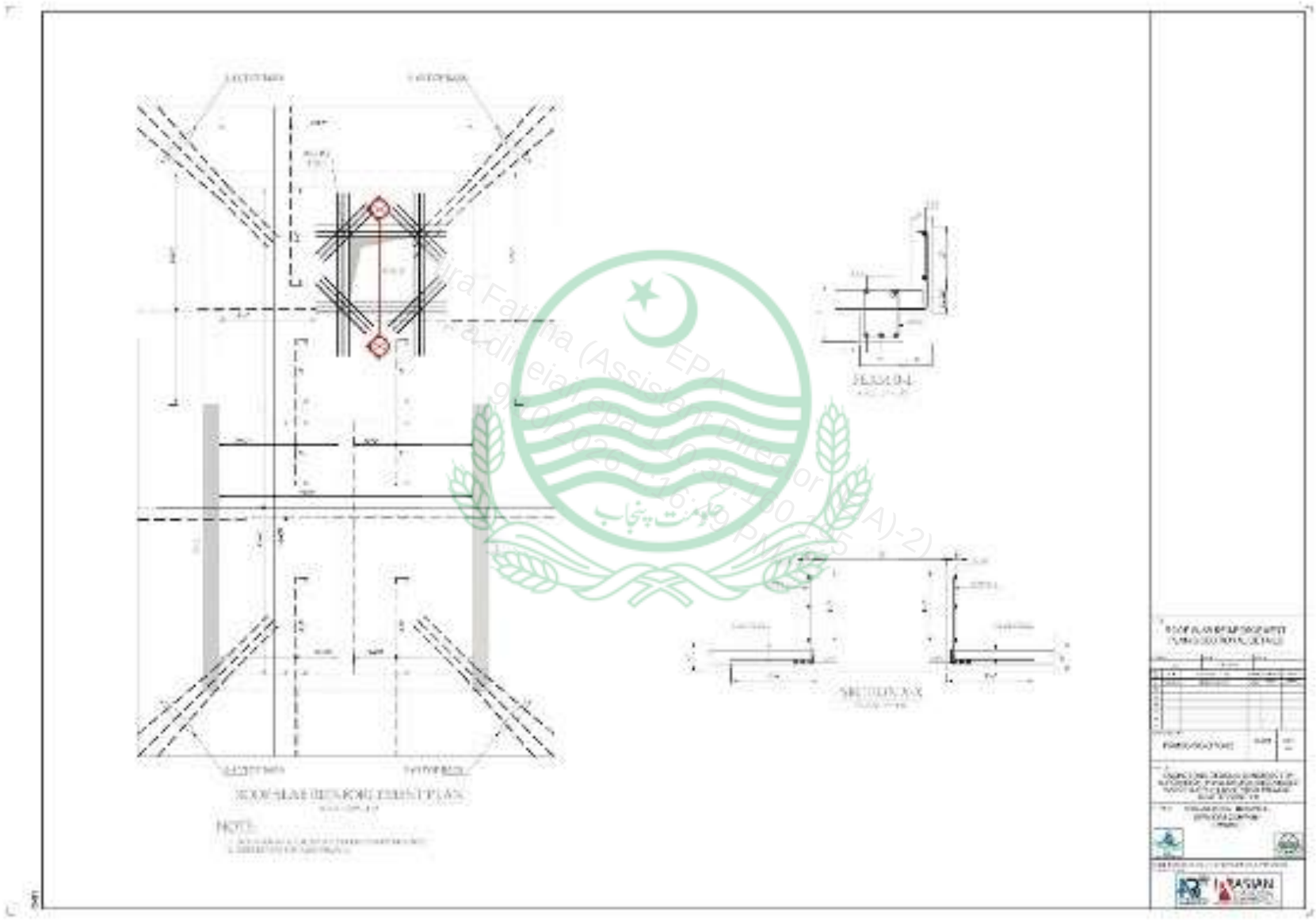


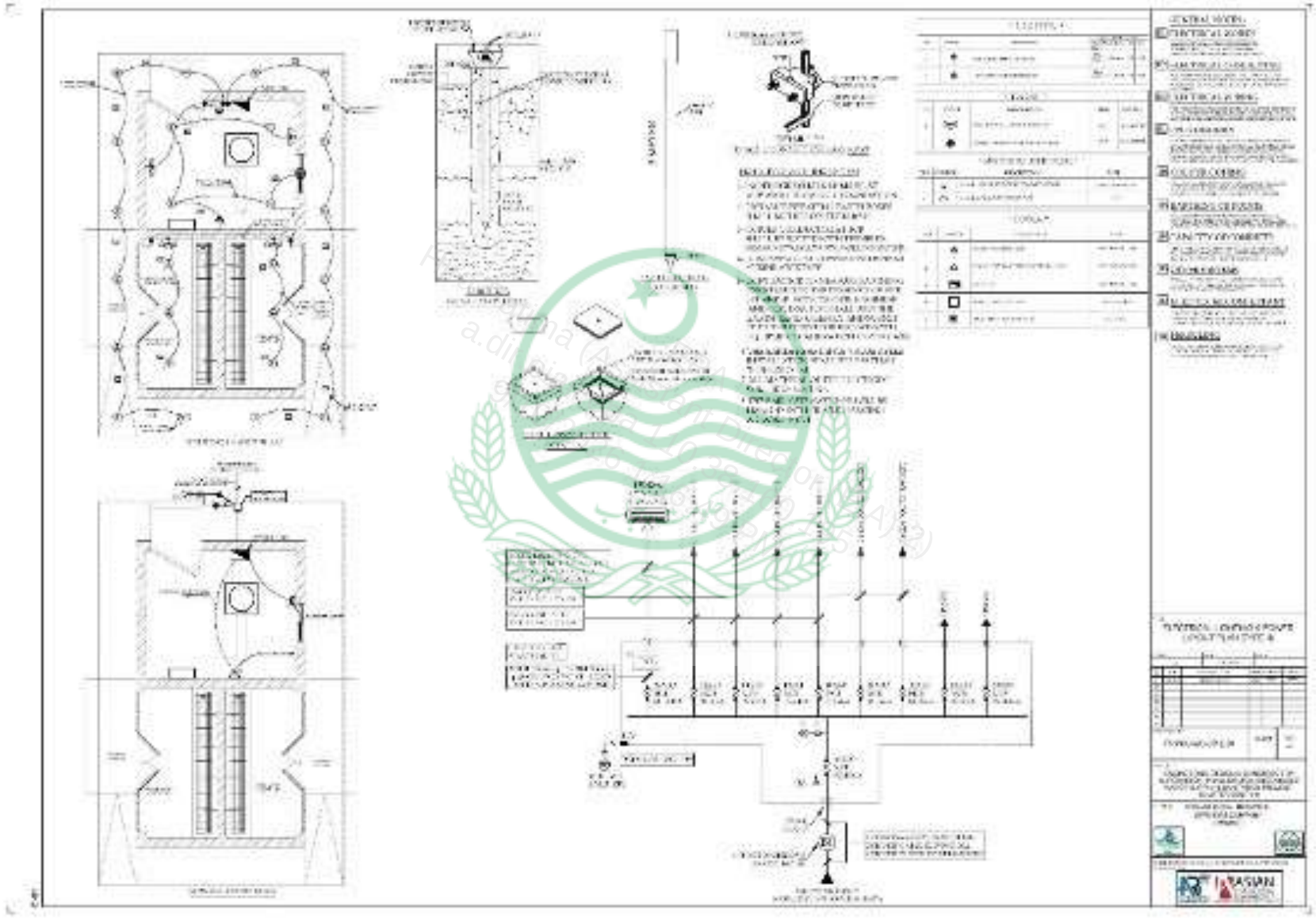

SECTION A-A
BUILDING PLAN
PLINTH PROTECTION DETAIL

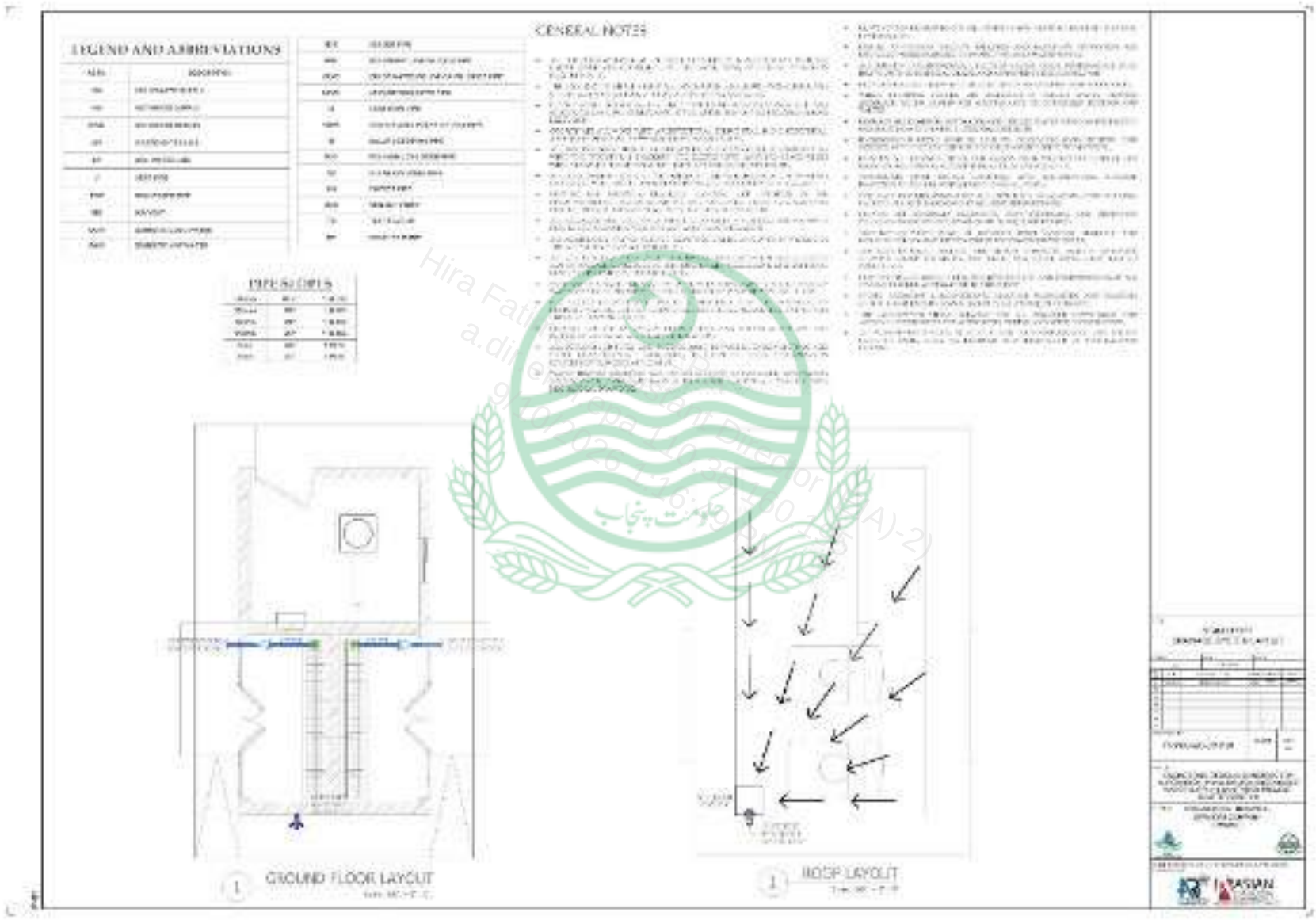

SCHEDULE OF TUBE WELL

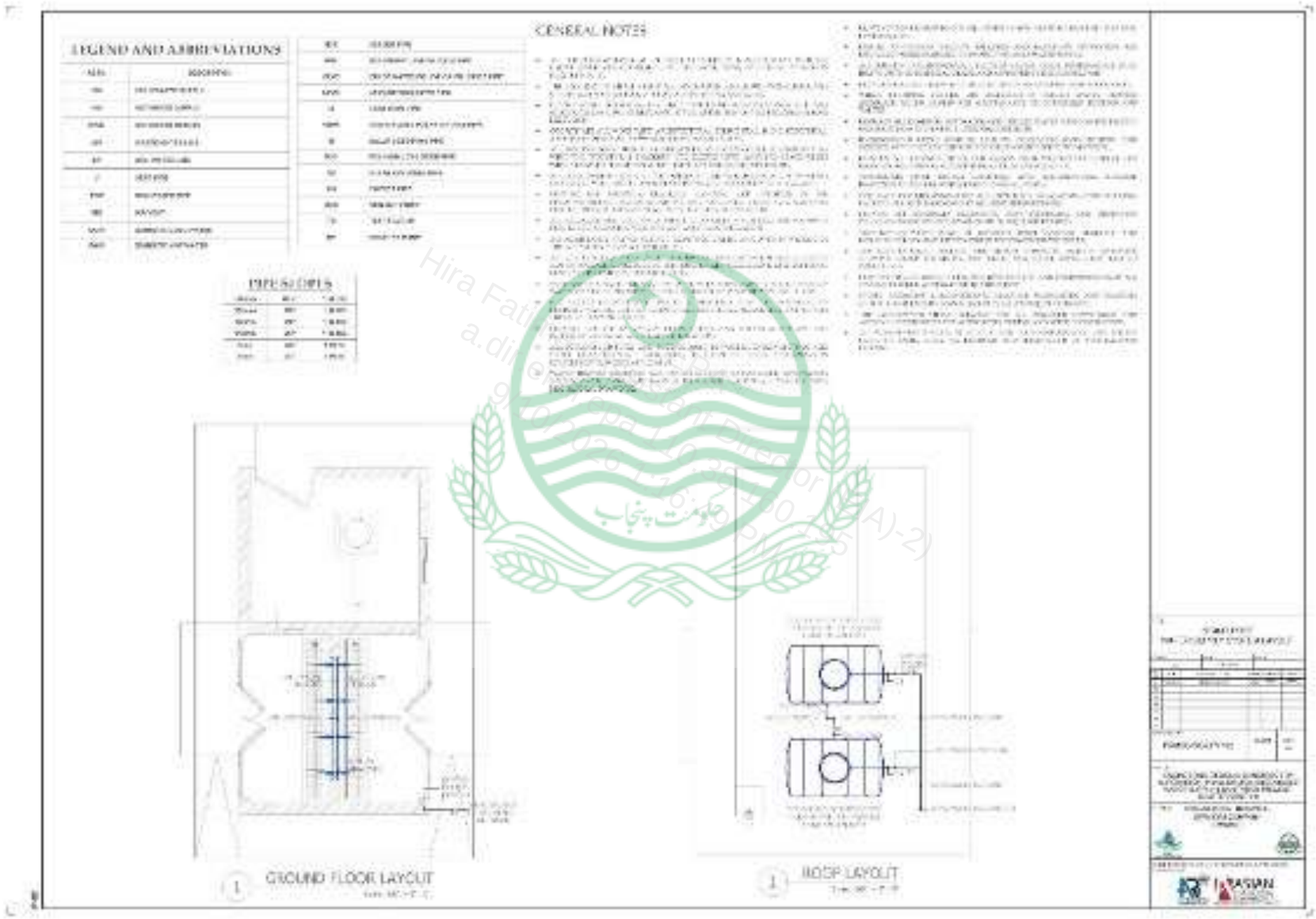

SIDE ELEVATION
FRONT ELEVATION
GL
GL








LEGEND AND ABBREVIATIONS
GENERAL NOTES
PRESETS
GROUND FLOOR LAYOUT
ROOF LAYOUT

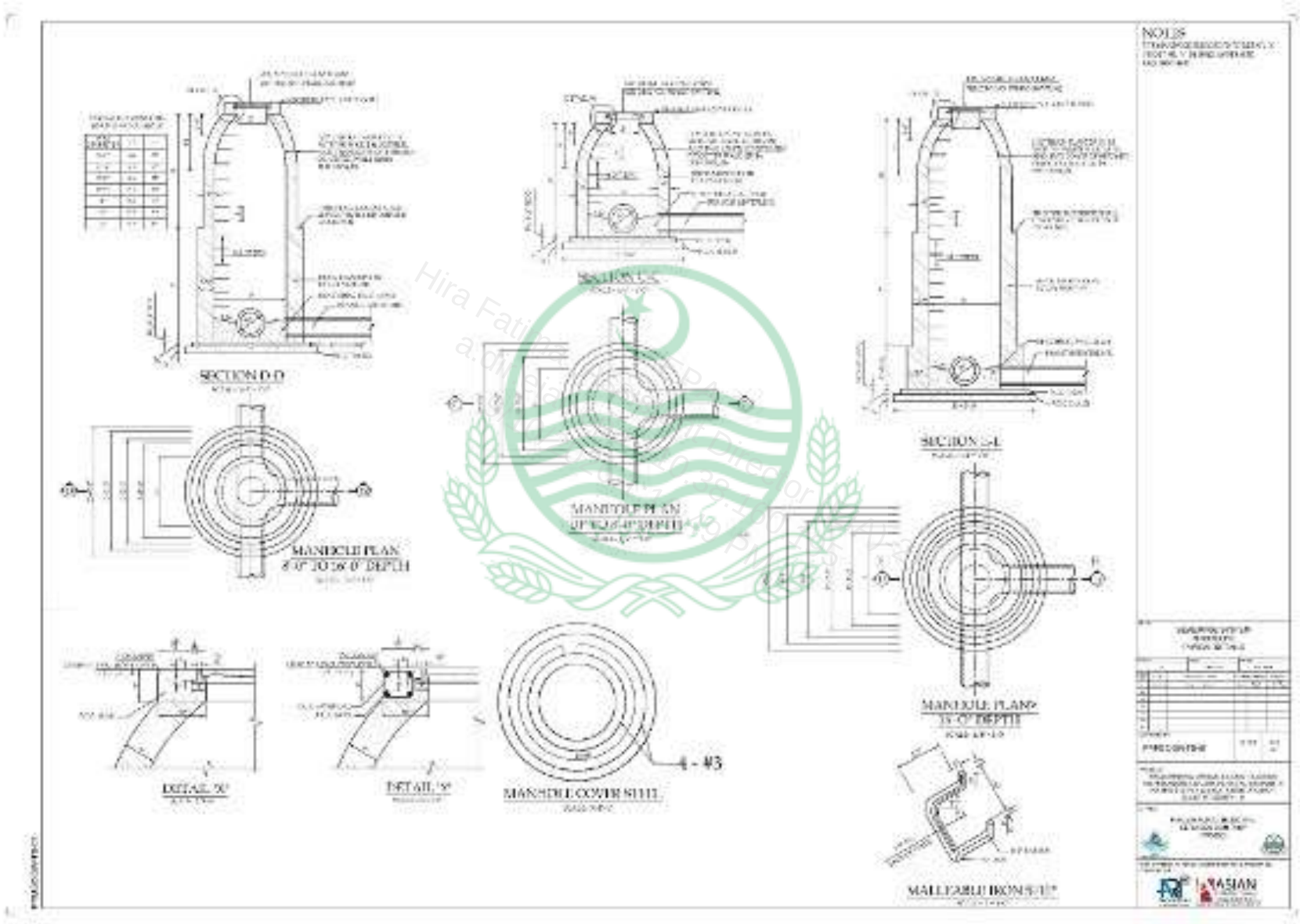

LEGEND AND ABBREVIATIONS
GENERAL NOTES
PRESETS
GROUND FLOOR LAYOUT
ROOF LAYOUT

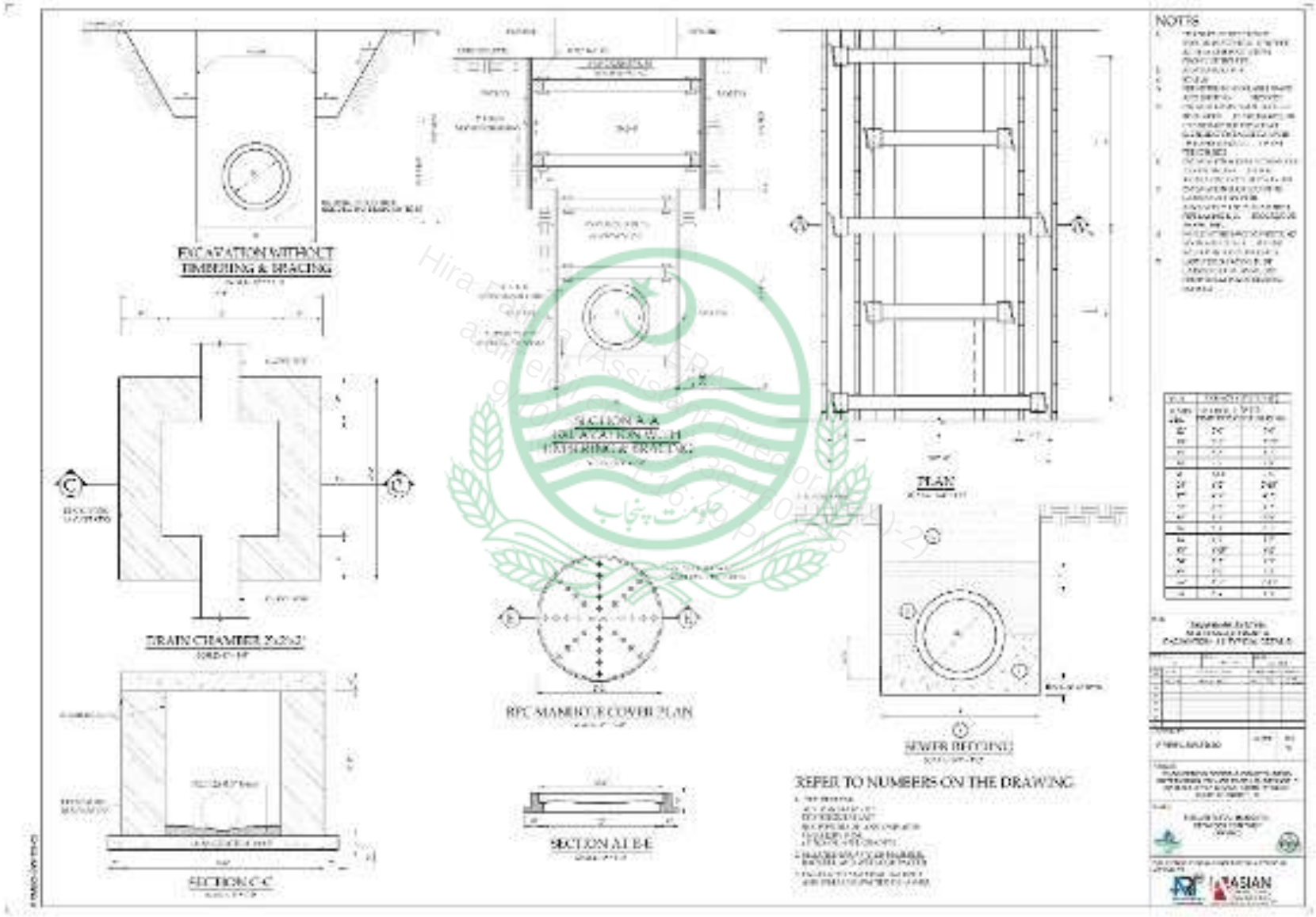
SEWERAGE SYSTEM

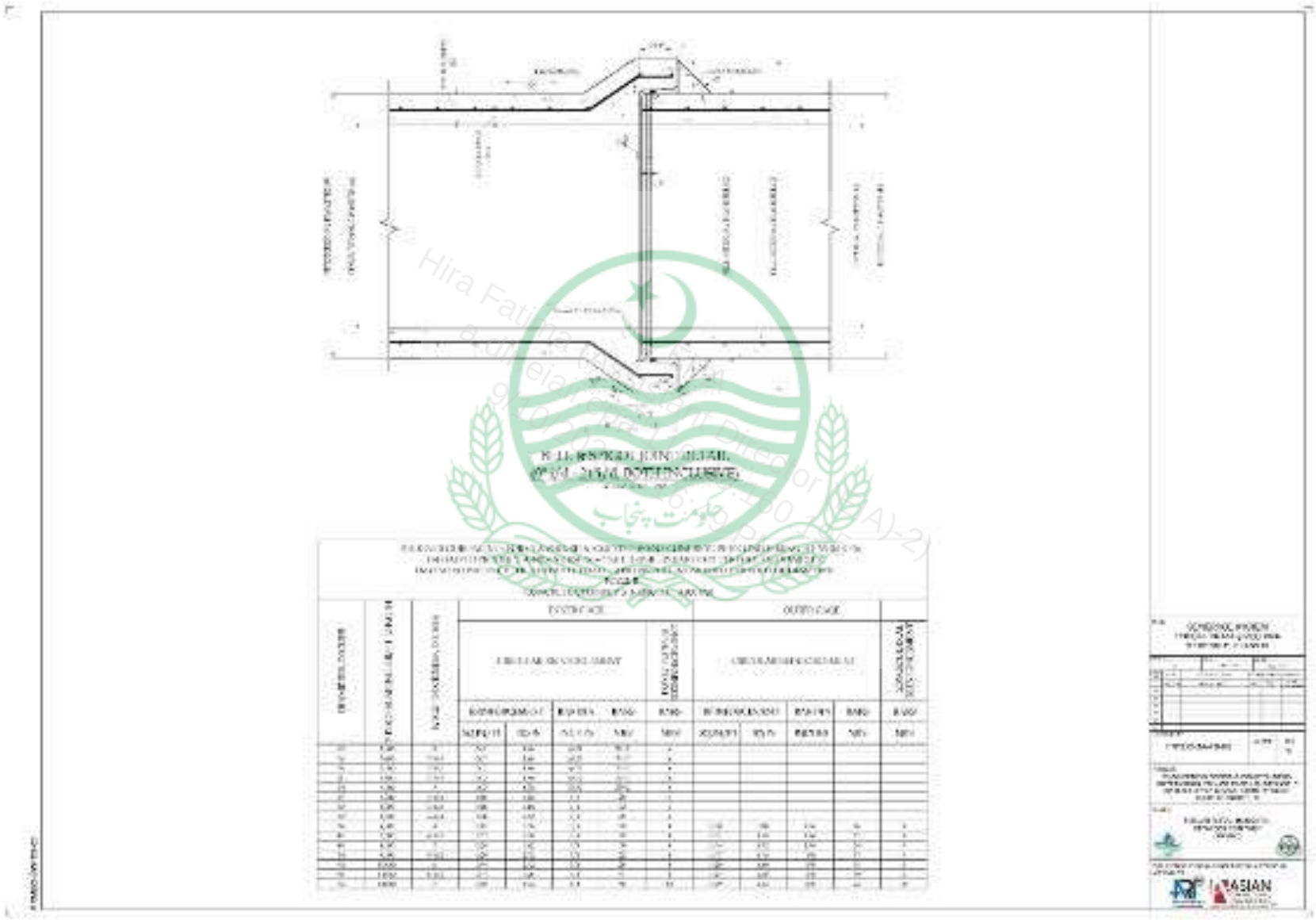
Hira Fatima (Assistant Director (EIA)-2)

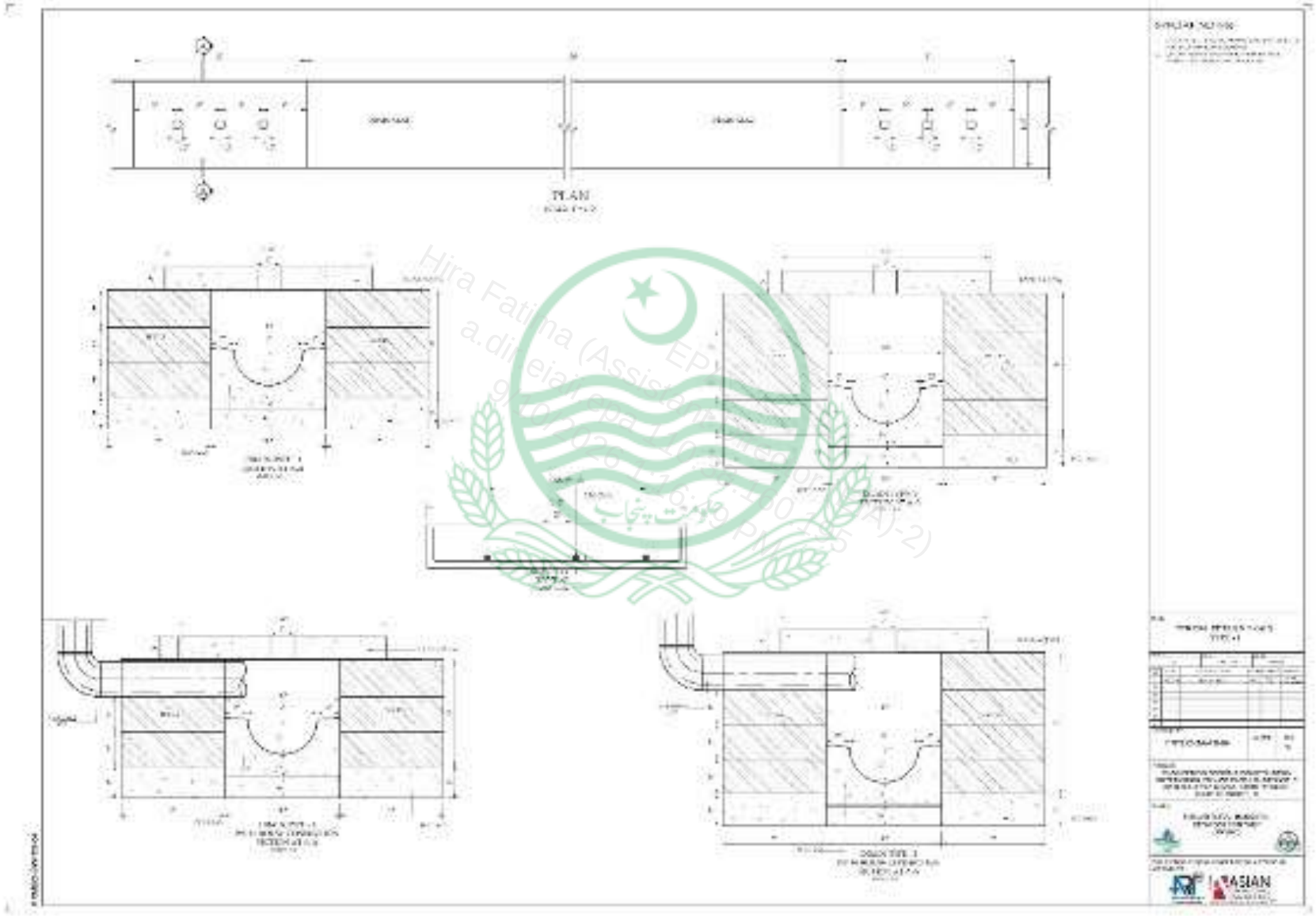
TYPICAL DETAILS

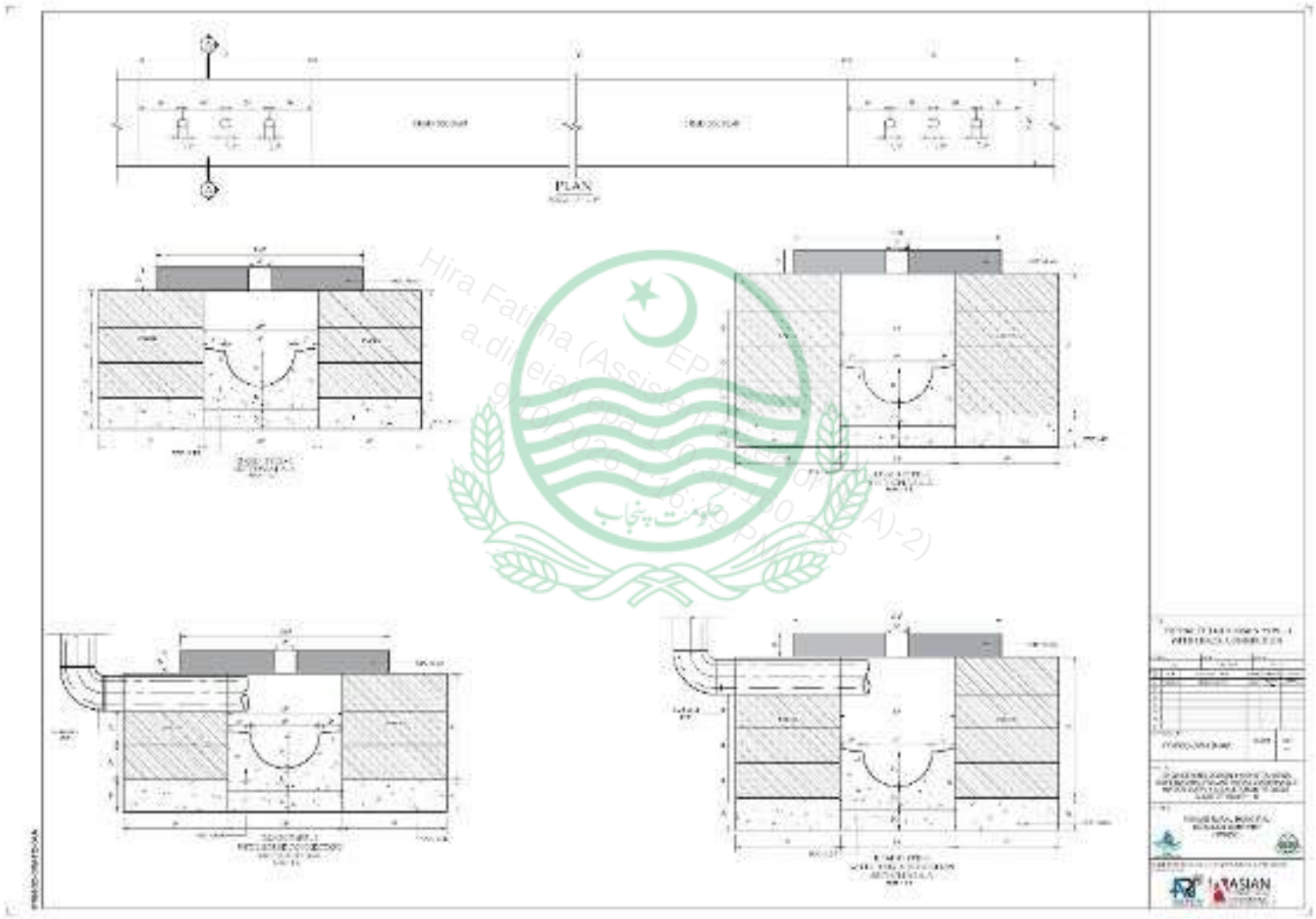
Hira Fatima (Assistant Director (EIA)-2)
EPA Punjab

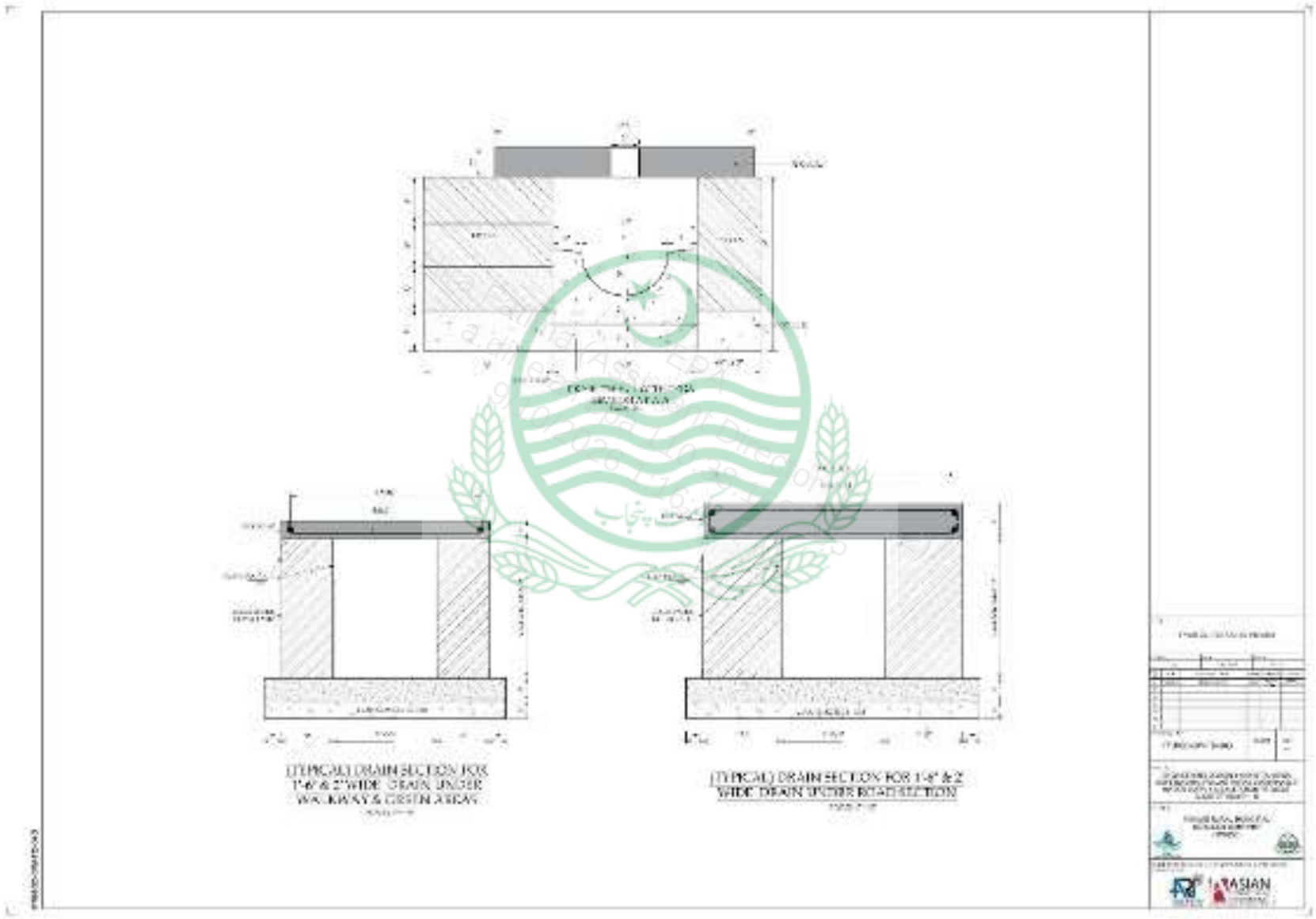

NOTES
SECTION D-D
MANHOLE PLAN
MANHOLE PLAN
MANHOLE COVER SHEET
4 - #3
DETAIL 'B'
DETAIL 'A'

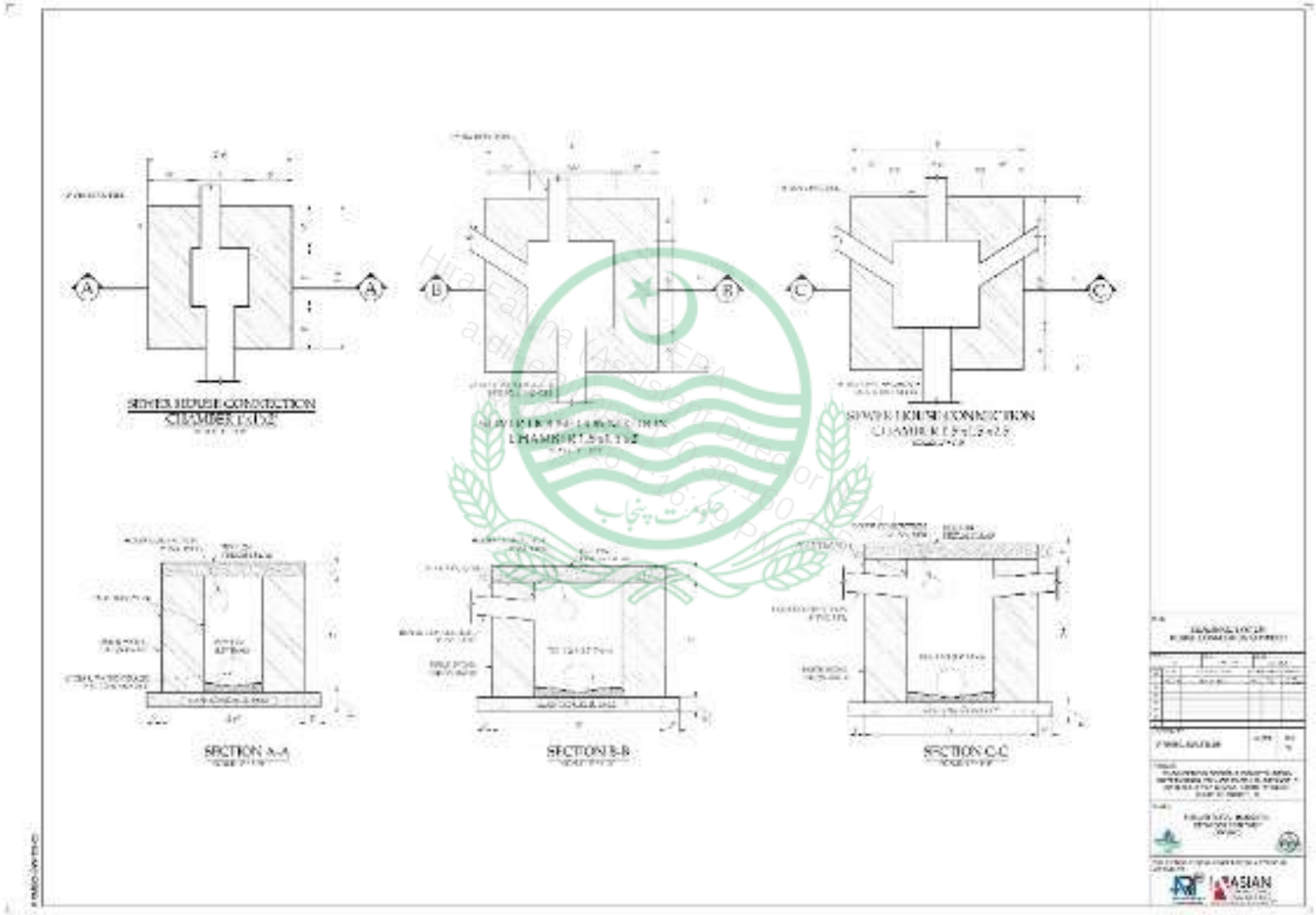

NOTES
EXCAVATION WITHOUT TIMBERING & BRACING
SECTION A-A
PLAN
SECTION C-C
SECTION B-B
REFER TO NUMBERS ON THE DRAWING

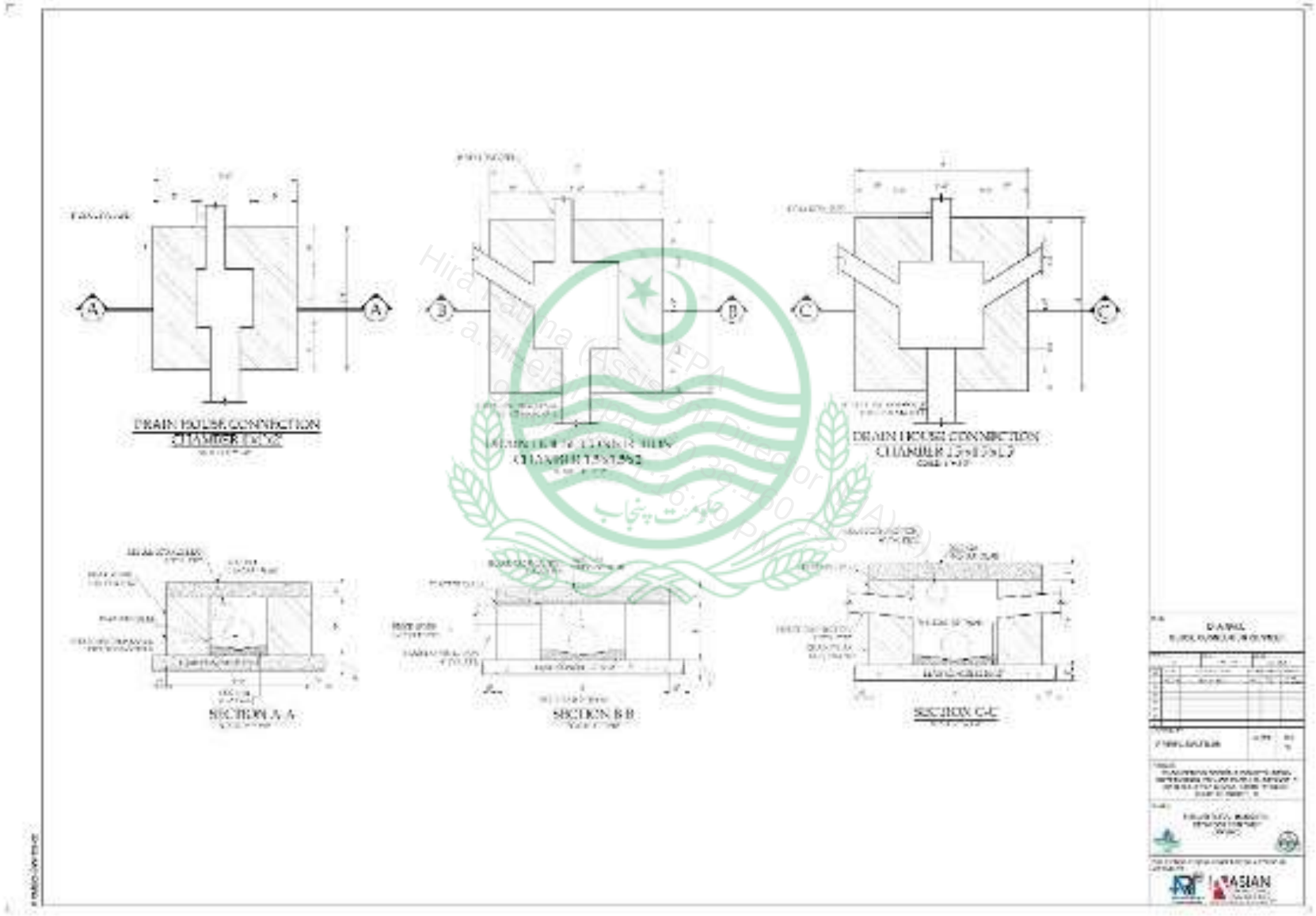


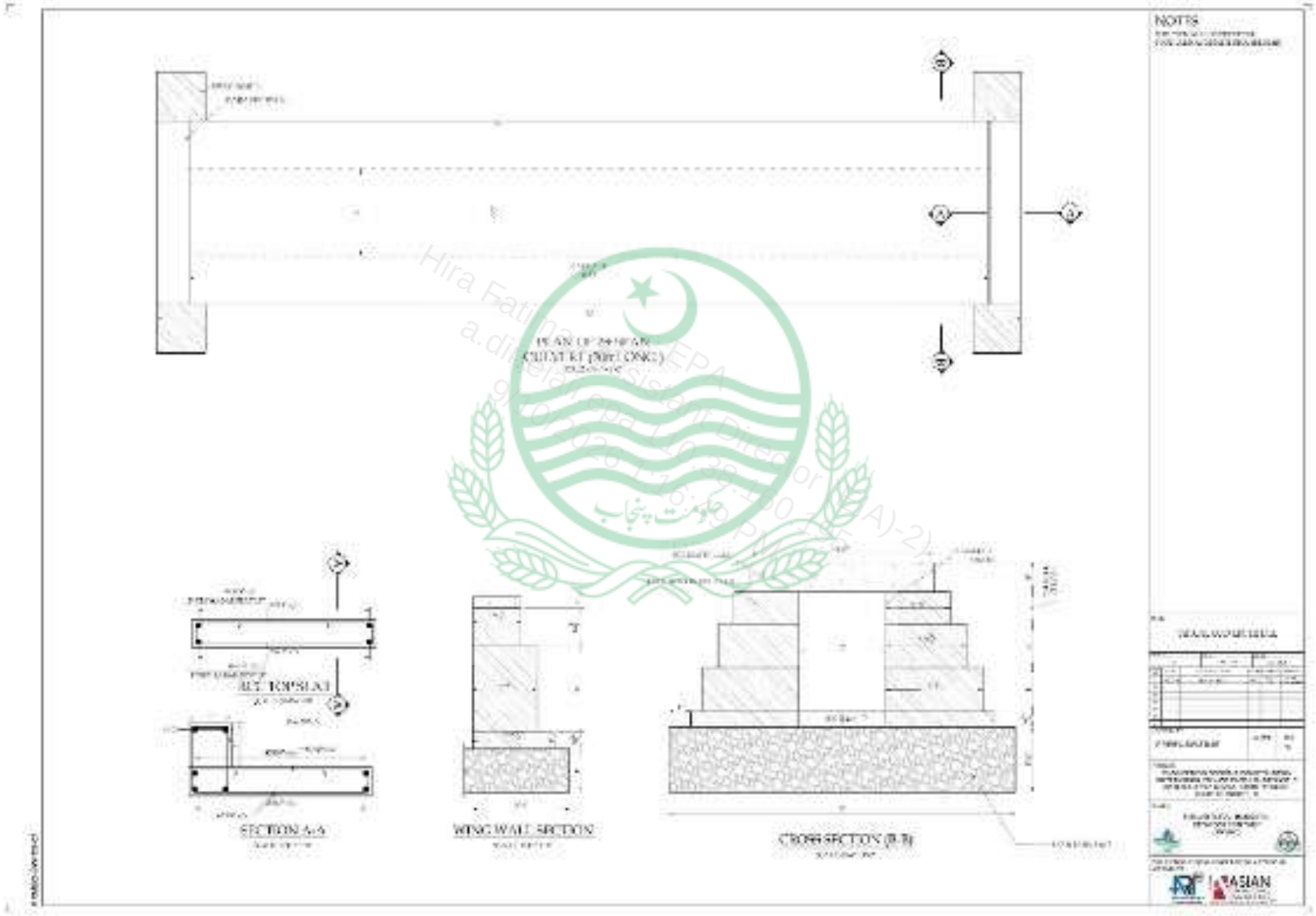

PLAN


PLAN

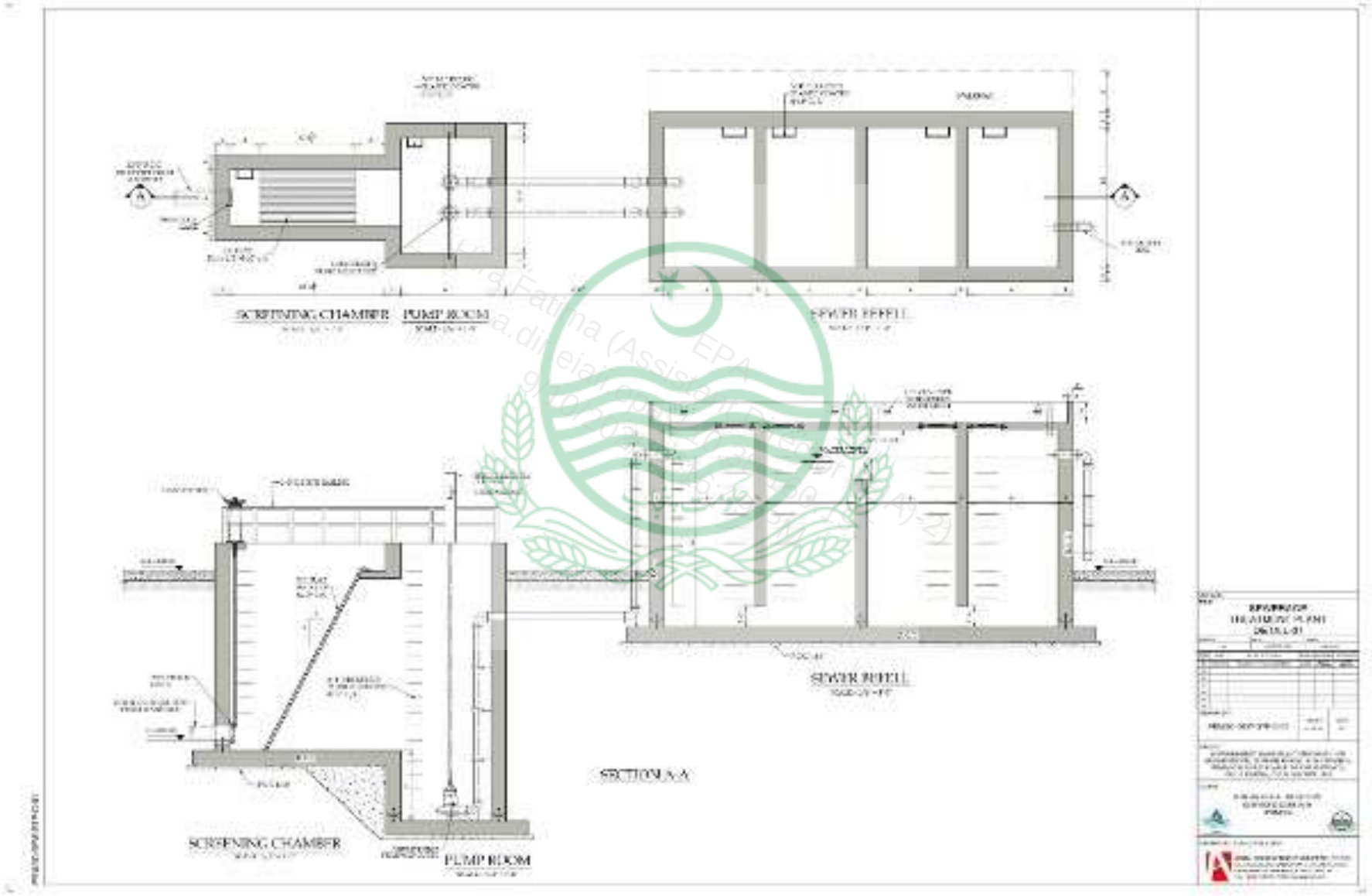

TYPICAL DRAIN SECTION FOR
1'-6" & 2' WIDE DRAIN UNDER
WALKWAY & GREEN AREA
TYPICAL DRAIN SECTION FOR 1'-6" & 2'
WIDE DRAIN UNDER ROAD SECTION

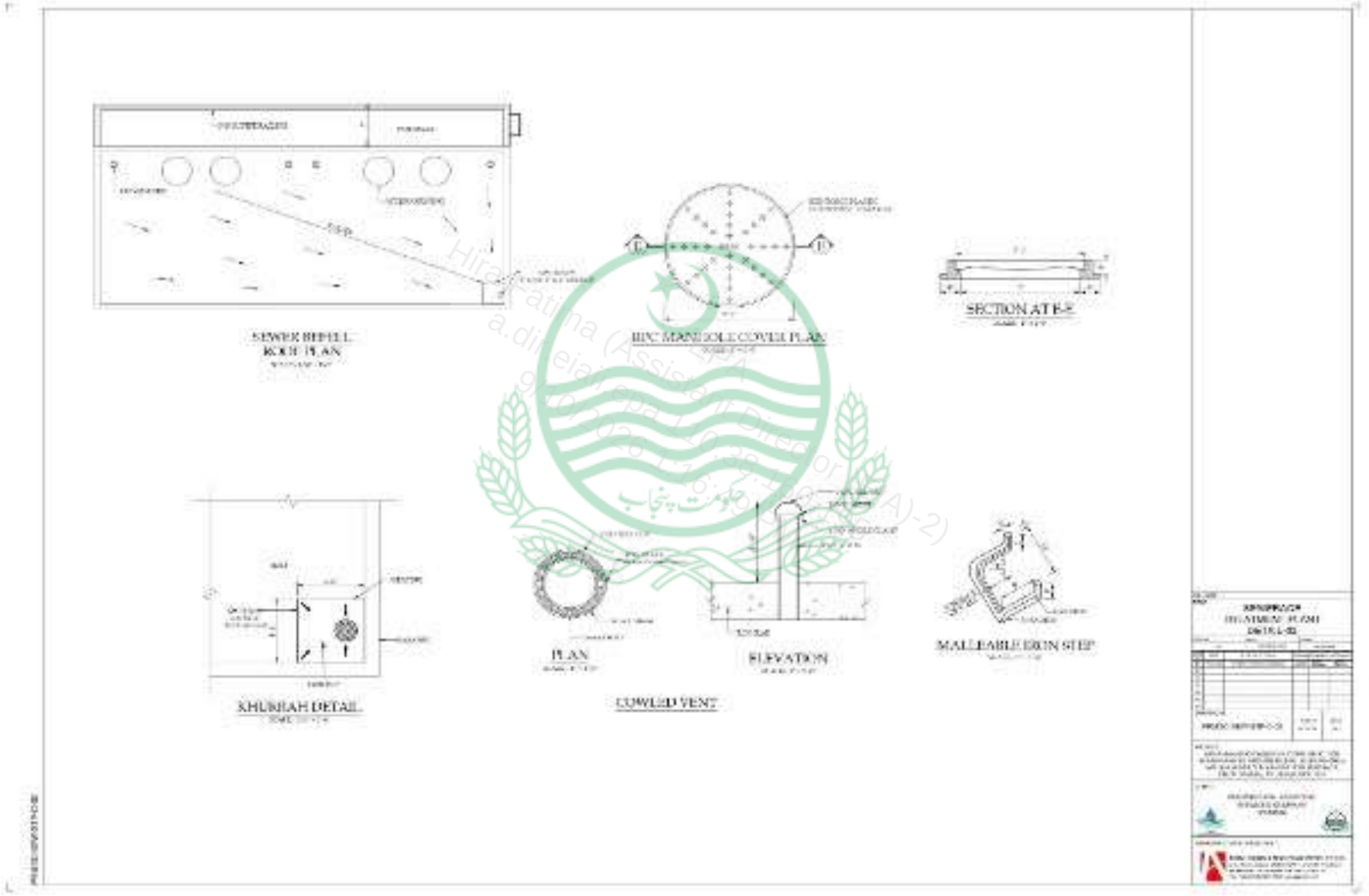

SECTION A-A
SECTION B-B
SECTION C-C

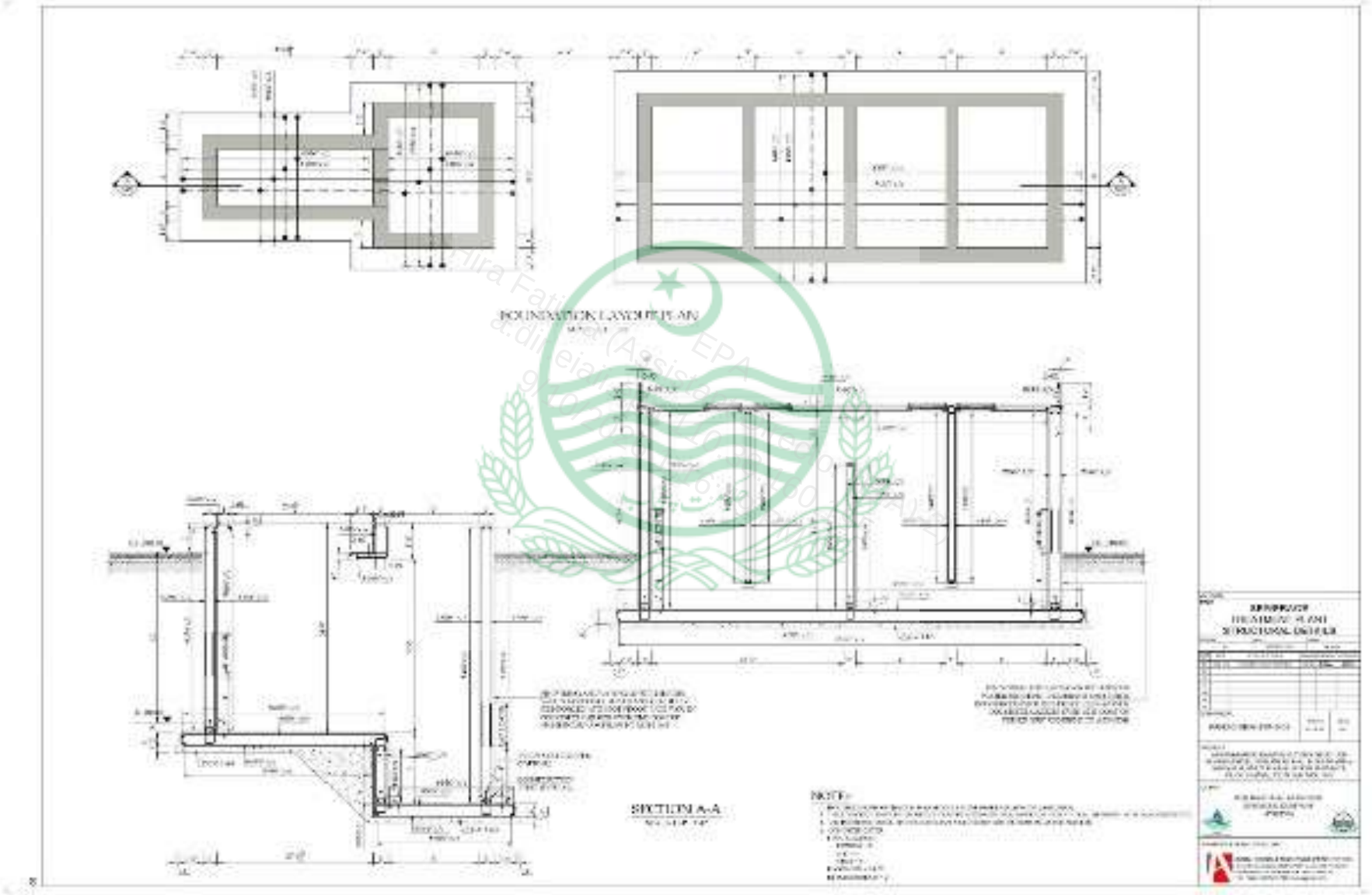

A
A
B
B
C
C
SECTION A-A
SECTION B-B
SECTION C-C


NOTES
SECTION A-A
WING WALL SECTION
CROSS SECTION (B-B)

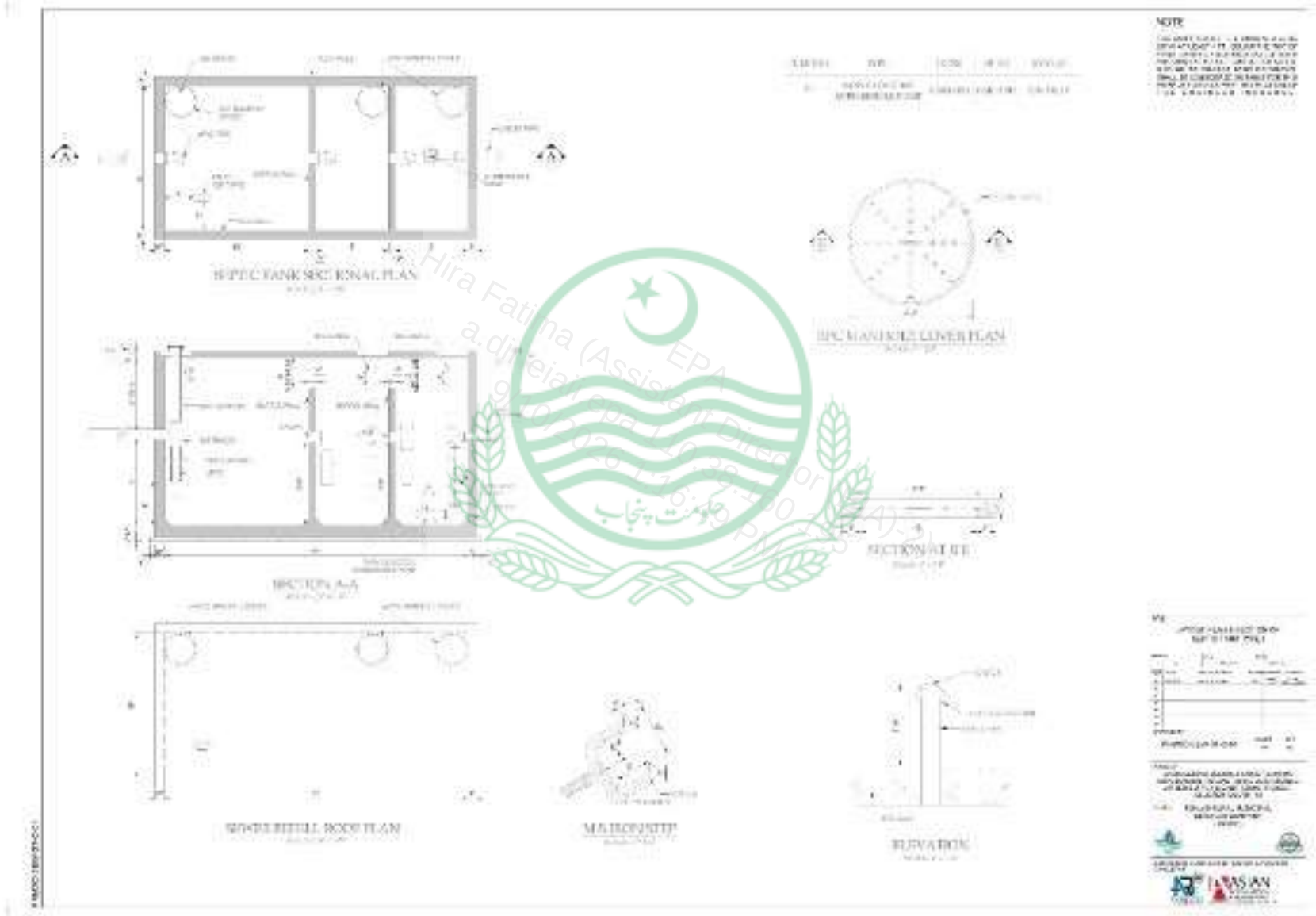

SEWERAGE TREATMENT PLANT

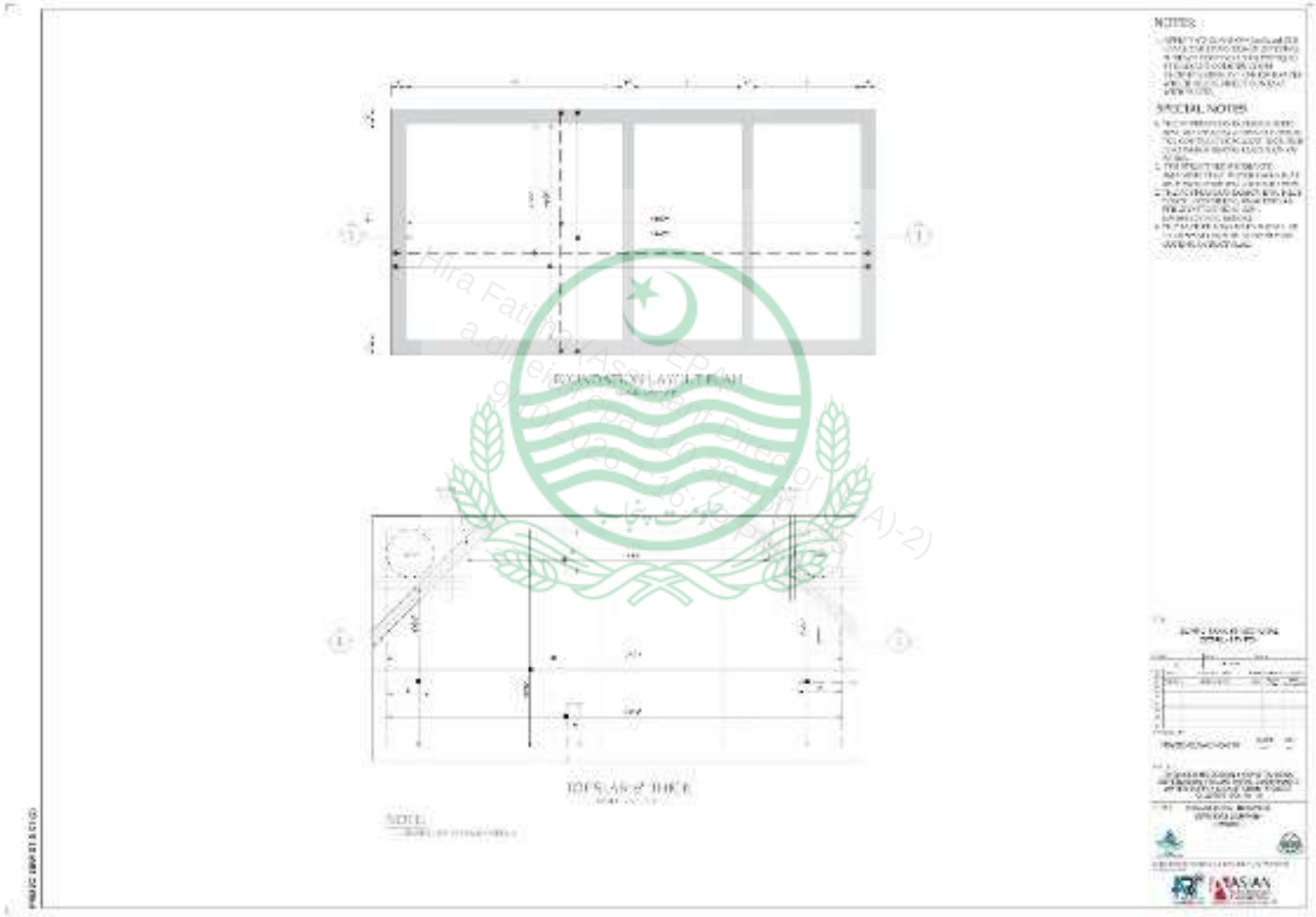

SCREENING CHAMBER
PUMP ROOM
SEWER REFILL
SECTION A-A
SCREENING CHAMBER
PUMP ROOM
SEWER REFILL

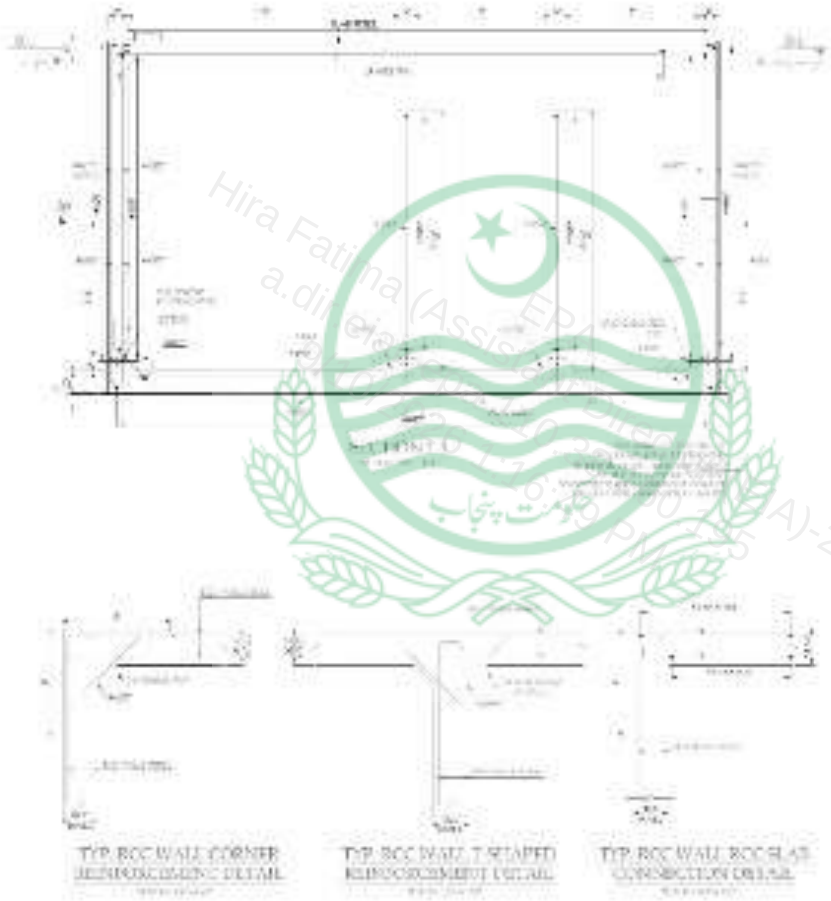

SEWER REPELL
PLAN
SECTION AT E-E
MALLEABLE IRON STEP
KHUSHAH DETAIL
PLAN
ELEVATION
COWLED VENT


FOUNDATION LAYOUT PLAN
SECTION A-A

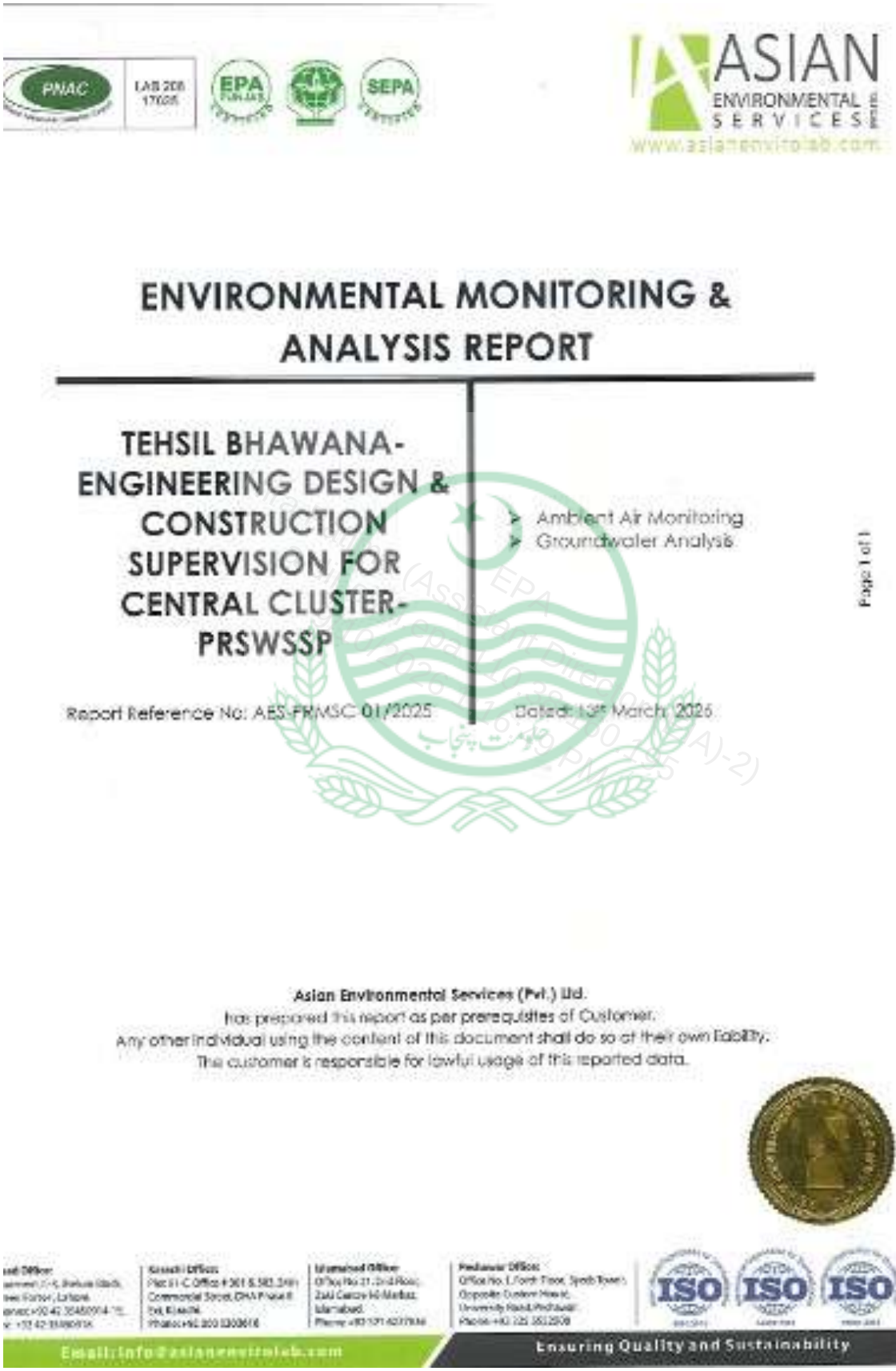
SEPTIC TANK


NOTE
SECTION A-A
SECTION AT EE
ELEVATION





ANNEXURE - G: LAB REPORTS OF ENVIRONMENTAL MONITORING



ENVIRONMENTAL MONITORING & ANALYSIS REPORT

TEHSIL BHAWANA-ENGINEERING DESIGN & CONSTRUCTION SUPERVISION FOR CENTRAL CLUSTER-PRSWSSP

- Ambient Air Monitoring
- Groundwater Analysis

Report Reference No: AES-PRMSC 01/2025 Dated: 13th March 2026

Page 1 of 1

Asian Environmental Services (Pvt.) Ltd.
has prepared this report as per prerequisites of Customer.
Any other individual using the content of this document shall do so at their own liability.
This customer is responsible for lawful usage of this reported data.

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

AMBIENT AIR MONITORING LOCATION-01

NEAR AL-NOOR MASJID

Bhawana



Page 1 of 5

Document No. AES/EMS/TRM-110, Date of Issue 01 April, 2022, Revision No. 01

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES www.asianenvirolab.com

AMBIENT AIR MONITORING REPORT

Monitoring Details			
Report Reference No	AES-PRMSC-01-2026-AA-01	Monitoring Point	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	Monitoring Coordinates	31°33' 54" N 72°38'35" E

Sr. No.	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1	13:00	2.24	14.31	28.09	42.40	62.98
2	14:00	2.11	13.78	27.58	41.36	60.92
3	15:00	2.05	13.15	25.80	38.95	60.39
4	16:00	1.95	12.67	26.04	38.72	60.03
5	17:00	1.90	12.03	24.86	37.89	59.17
6	18:00	1.81	12.71	23.71	36.42	55.46
7	19:00	1.73	11.84	23.55	35.39	57.13
8	20:00	1.68	11.49	23.24	34.73	53.65
9	21:00	1.59	12.23	22.93	35.12	52.56
10	22:00	1.50	11.19	22.76	33.95	51.98
11	23:00	1.54	11.46	21.33	32.79	48.49
12	00:00	1.38	10.97	22.46	33.43	45.01
13	01:00	1.35	10.40	20.17	30.56	42.63
14	02:00	1.19	10.85	19.98	30.83	43.83
15	03:00	1.42	10.73	19.79	30.52	44.72
16	04:00	1.52	9.97	18.31	28.27	45.90
17	05:00	1.67	12.06	19.28	31.34	46.97
18	06:00	1.76	11.28	20.54	31.82	47.33
19	07:00	1.86	12.11	21.37	33.49	48.20
20	08:00	2.02	12.69	21.86	34.56	51.90
21	09:00	2.08	12.80	22.47	35.27	53.08
22	10:00	2.14	13.45	23.11	36.56	56.35
23	11:00	2.25	13.79	23.70	37.47	58.59
24	12:00	2.27	13.42	24.80	38.20	62.41
Average Concentration		1.79	12.18	22.82	36.00	52.90

Page 2 of 5

Monitored By

Reviewed By (TM)

Approved By (QM)

Document No. AES/EMS/TR/14-1.10, Date of issue 01 April, 2022, Revision No. 01

Lahore Office | Karachi Office | Islamabad Office | Peshawar Office

ISO ISO ISO

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES
www.asianenvirolab.com

AMBIENT AIR MONITORING REPORT

Monitoring Details

Report Reference No	AES-PRMSC-01-2026-AA-01	**Monitoring Point**	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	**Monitoring Coordinates**	31°33' 54" N 72°38'35" E

Parameters	Method of Measurement	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	Gas Phase Chemiluminescence	24 Hours	1.00	22.82	80.0 µg/m³	Optimal
Nitrogen Oxide (NO)*	Gas Phase Chemiluminescence	24 Hours	1.00	12.16	40.0 µg/m³	Optimal
NO_x*	Gas Phase Chemiluminescence	24 Hours	1.00	35.00	NCVS µg/m³	-
Sulphur Dioxide (SO_2) *	Ultraviolet Fluorescence method	24 Hours	1.00	52.90	120.0 µg/m³	Optimal
Carbon Monoxide (CO)*	Non-Dispersive Infra-Red (NDIR)	24 Hours	0.01	1.79	05.0 mg/m³	Optimal
Ozone (O_3) *	Non-Dispersive Ultra-Violet Absorption Method	01 Hour	1.00	20.68	130 µg/m³	Optimal
Particulate Matter (PM_{10}) *	β Ray absorption method	24 Hours	1.00	119	150.0 µg/m³	Optimal
Particulate Matter ($PM_{2.5}$) *	β Ray absorption method	24 Hours	1.00	26	35.0 µg/m³	Optimal
Total Particulate Matter (TSP)	Gravimetric Sampling	24 Hours	1.00	144	500.0 µg/m³	Optimal

*Parameters are approved from Punjab Environmental Protection Agency.
Note: The standard for CO monitoring is for 08 hours, however the Average Obtained Concentration is of 24 Hours.

Abbreviations:
LDL= Lower Detection Limit
mg/m³ = Milli Gram per Meter Cube
µg/m³ = Micro Gram per Meter Cube
NCVS = No Curves Value Set

Remarks:
Optimal = Compliance with Permissible Range
Marginal = Close to Extreme Value
High = Exceed from Permissible Range
Low = Less from Permissible Range

Page 3 of 6

Monitored By

Reviewed By
(TM)

Approved By
(QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

Document No. AES/LWE/FRM-110, Date of Issue 01 April, 2022, Revision No. 01

Head Office: [illegible] Karachi Office: Plot 01-C, Office # 301 & 302, 3rd Floor, Commerce Street, DHA Phase II Ext. Karachi. Phone: +92 (0) 21 6533616 Islamabad Office: Office No. 21, 2nd Floor, Zaki Centre I-8 Markaz, Islamabad. Phone: +92 (0) 51 4227834 Peshawar Office: Office No. 1, Ground Floor, Syeda Tower, Opposite Durkhan Hotel, University Road, Peshawar. Phone: +92 (0) 321 5552008

ISO ISO ISO

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 206 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (Pvt) Ltd. www.asianenvirolab.com

AMBIENT AIR MONITORING REPORT

Monitoring Details

Report Reference No	AES-PRMSC-01-2026-AA-01	**Monitoring Point**	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	**Monitoring Coordinates**	31°33' 54" N 72°38'55" E

Sr. No.	Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
1	13:00	22	SE	1	29	761
2	14:00	23	NE	1	29	761
3	15:00	24	N	2	27	760
4	16:00	24	N	1	27	760
5	17:00	23	S	2	36	759
6	18:00	20	NE	2	49	759
7	19:00	17	NW	1	59	760
8	20:00	15	S	1	68	760
9	21:00	14	N	1	72	761
10	22:00	13	N	1	67	760
11	23:00	12	S	2	77	761
12	00:00	11	S	1	82	761
13	01:00	11	NE	1	77	760
14	02:00	10	NW	1	82	760
15	03:00	10	N	2	82	761
16	04:00	9	SE	2	87	761
17	05:00	9	S	1	87	761
18	06:00	8	NE	2	87	761
19	07:00	8	N	2	87	761
20	08:00	9	N	2	82	762
21	09:00	12	W	1	77	763
22	10:00	15	NW	1	59	764
23	11:00	17	SE	2	52	764
24	12:00	21	SW	1	35	763

Page 4 of 5

Monitored By

Reviewed By (TM)

Approved By (QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

Document No. AES/UM/FRM-116, Date of Issue 01 April, 2022, Revision No. 01

ISO ISO ISO

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (PVT) LTD. www.asianenvirolab.com

NOISE MONITORING REPORT

Monitoring Details			
Report Reference No	AES-PRMSC-01-2026-AA-01	Monitoring Point	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	Monitoring Coordinates	31°33' 54" N 72°38'35" E

Sr. No.	Time	Noise dB (A)	
1	13:00	62	
2	14:00	62	
3	15:00	61	
4	16:00	61	
5	17:00	60	
6	18:00	59	Day Time
7	19:00	58	
8	20:00	56	
9	21:00	54	
10	22:00	52	
11	23:00	49	
12	00:00	48	
13	01:00	47	
14	02:00	45	
15	03:00	44	Night Time
16	04:00	43	
17	05:00	41	
18	06:00	42	
19	07:00	44	
20	08:00	47	
21	09:00	49	
22	10:00	52	Day Time
23	11:00	55	
24	12:00	56	

Time	PEQS	Average Values	Remarks
Day Time	65	56	Optimal
Night Time	55	45	Optimal

Page 4 of 5

Abbreviations:
Remarks:
Optimal = Compliance with Permissible Range
Low = Less Than Permissible Range
dB (A) = Decibel (Relative to Human Hearing)
Marginal = Close to Damage Edge
PEQS = Punjab Environmental Quality Standards
High = Exceeds from Permissible Range

Monitored By

Reviewed By (TM)

Approved By (QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

Document No. AES/LMS/Rev-1.0, Date of Issue 01 April, 2022, Revision No. 01

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

AMBIENT AIR MONITORING LOCATION-02

NEAR MISALI MASJID

Bhawan



Page 1 of 6

Document No. ARS/ENV/FRM-110, Date of Issue 01 April, 2022, Revision No. 01

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 200 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES
www.asianenvirolab.com

AMBIENT AIR MONITORING REPORT

Monitoring Details

Report Reference No	AES/PRMSC-01-2026-AA-02	**Monitoring Point**	Near Misal School
Date of Monitoring	02-12-2025 to 03-12-2025	**Monitoring Coordinates**	31°34' 0" N 72°38'59" E

Sr. No.	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1	13:00	2.14	14.42	27.98	42.40	65.02
2	14:00	2.01	14.13	27.45	41.59	61.20
3	15:00	1.89	13.73	26.51	40.24	59.24
4	16:00	1.76	13.20	26.08	39.28	57.18
5	17:00	1.69	12.66	25.42	38.08	54.15
6	18:00	1.57	12.28	24.84	37.12	50.47
7	19:00	1.44	12.11	24.00	36.11	47.83
8	20:00	1.51	11.41	23.43	34.84	45.24
9	21:00	1.38	11.06	22.78	33.83	42.74
10	22:00	1.27	10.29	22.12	32.40	41.53
11	23:00	1.25	10.19	21.29	31.48	38.35
12	00:00	1.22	9.76	20.71	30.47	34.72
13	01:00	1.02	9.59	20.45	30.03	33.29
14	02:00	0.94	9.26	19.41	28.67	35.89
15	03:00	1.11	8.96	18.96	27.33	38.92
16	04:00	1.27	9.67	17.69	27.36	39.91
17	05:00	1.42	10.08	18.85	28.93	42.40
18	06:00	1.54	10.62	19.85	30.46	46.76
19	07:00	1.70	10.96	20.62	31.58	47.96
20	08:00	1.75	11.55	21.10	32.65	51.54
21	09:00	1.93	12.11	22.14	34.25	53.63
22	10:00	1.98	12.64	23.02	35.66	56.53
23	11:00	2.09	13.09	24.57	37.45	59.79
24	12:00	2.25	13.58	25.67	39.25	62.14
Average Concentration		1.69	11.66	22.87	34.25	48.60

Monitored By

Reviewed By (TM)

Approved By (QM)

LAHORE

Page 2 of 5

Head Office: [illegible]
Karachi Office: Plot 51-C Office # 201 & 202, 2nd Floor, Commercial Street, DHA Phase II Ext. Karachi, Phone: +92 [illegible]
Islamabad Office: Office No. 21, 2nd Floor, Zaki Centre F-8 Markaz, Islamabad, Phone: +92 [illegible]
Peshawar Office: Office No. 1, Tenth Road, Saddar, Opposite Qadeer House, University Road, Peshawar, Phone: +92 [illegible]
Email: info@asianenvirolab.com

ISO ISO ISO

Ensuring Quality and Sustainability

AMBIENT AIR MONITORING REPORT

Monitoring Details			
Report Reference No	AES-PRMSC-01-2026-AA-01	Monitoring Point	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	Monitoring Coordinates	31°33' 54" N 72°38'35" E

Parameters	Method of Measurement	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	Gas Phase Chemiluminescence	24 Hours	1.00	22.82	80.0 µg/m³	Optimal
Nitrogen Oxide (NO)*	Gas Phase Chemiluminescence	24 Hours	1.00	12.16	40.0 µg/m³	Optimal
NO_x*	Gas Phase Chemiluminescence	24 Hours	1.00	35.00	NCVS µg/m³	-
Sulphur Dioxide (SO_2) *	Ultraviolet Fluorescence method	24 Hours	1.00	52.90	120.0 µg/m³	Optimal
Carbon Monoxide (CO)*	Non-Dispersive Infra-Red (NDIR)	24 Hours	0.01	1.79	05.0 mg/m³	Optimal
Ozone (O_3) *	Non-Dispersive Ultra-Violet Absorption Method	01 Hour	1.00	20.68	130 µg/m³	Optimal
Particulate Matter (PM_{10}) *	β Ray absorption method	24 Hours	1.00	119	150.0 µg/m³	Optimal
Particulate Matter ($PM_{2.5}$) *	β Ray absorption method	24 Hours	1.00	26	35.0 µg/m³	Optimal
Total Particulate Matter (TSP)	Gravimetric Sampling	24 Hours	1.00	144	500.0 µg/m³	Optimal

*Parameters are approved from Punjab Environmental Protection Agency.
Note: The standard for CO monitoring is for 08 hours, however the Average Obtained Concentration is of 24 Hours.

Abbreviations:
LDL= Lower Detection Limit
mg/m³ = Milli Gram per Meter Cube
µg/m³ = Micro Gram per Meter Cube
NCVS = No Curves Value Set

Remarks:
Optimal = Compliance with Permissible Range
Marginal = Close to Extreme Value
High = Exceed from Permissible Range
Low = Less from Permissible Range

Page 3 of 6

Monitored By

Reviewed By (TM)

Approved By (QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 206 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (Pvt) Ltd. www.asianenvirolab.com

AMBIENT AIR MONITORING REPORT

Monitoring Details

Report Reference No	AES-PRMSC-01-2026-AA-01	**Monitoring Point**	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	**Monitoring Coordinates**	31°33' 54" N 72°38'55" E

Sr. No.	Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
1	13:00	22	SE	1	29	761
2	14:00	23	NE	1	29	761
3	15:00	24	N	2	27	760
4	16:00	24	N	1	27	760
5	17:00	23	S	2	36	759
6	18:00	20	NE	2	49	759
7	19:00	17	NW	1	59	760
8	20:00	15	S	1	68	760
9	21:00	14	N	1	72	761
10	22:00	13	N	1	67	760
11	23:00	12	S	2	77	761
12	00:00	11	S	1	82	761
13	01:00	11	NE	1	77	760
14	02:00	10	NW	1	82	760
15	03:00	10	N	2	82	761
16	04:00	9	SE	2	87	761
17	05:00	9	S	1	87	761
18	06:00	8	NE	2	87	761
19	07:00	8	N	2	87	761
20	08:00	9	N	2	82	762
21	09:00	12	W	1	77	763
22	10:00	15	NW	1	59	764
23	11:00	17	SE	2	52	764
24	12:00	21	SW	1	35	763

Monitored By

Reviewed By (TM)

Approved By (QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

Document No. AES/UM/FRM-116, Date of Issue 01 April, 2022, Revision No. 01

ISO ISO ISO

Email: info@asianenvirolab.com Ensuring Quality and Sustainability

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (PVT) LTD. www.asianenvirolab.com

NOISE MONITORING REPORT

Monitoring Details

Report Reference No	AES-PRMSC-01-2026-AA-01	**Monitoring Point**	Near Al-Noor Masjid
Date of Monitoring	05-12-2025 to 06-12-2025	**Monitoring Coordinates**	31°33' 54" N 72°38'35" E

Sr. No.	Time	Noise dB (A)	
1	13:00	62	
2	14:00	62	
3	15:00	61	
4	16:00	61	
5	17:00	60	
6	18:00	59	Day Time
7	19:00	58	
8	20:00	56	
9	21:00	54	
10	22:00	52	
11	23:00	49	
12	00:00	48	
13	01:00	47	
14	02:00	45	
15	03:00	44	Night Time
16	04:00	43	
17	05:00	41	
18	06:00	42	
19	07:00	44	
20	08:00	47	
21	09:00	49	
22	10:00	52	Day Time
23	11:00	55	
24	12:00	58	

Time	PEQS	Average Values	Remarks
Day Time	65	56	Optimal
Night Time	55	45	Optimal

Page 4 of 5

Abbreviations:
Remarks:
dB (A) = Decibel (Relative to human hearing)
PEQS = Punjab Environmental Quality Standards

Monitored By

Reviewed By (TM)

Approved By (QM)

Document No. AES/LMS/RM-110, Date of Issue 01 April, 2022, Revision No. 01

Karachi Office | Islamabad Office | Peshawar Office

ISO ISO ISO

Email: info@asianenvirolab.com

Ensuring Quality and Sustainability

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (PVT) LTD
www.asianenvirolab.com

GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	ABS-PRMSC-01/2025-GW-29	**Report Issue Date**	13-03-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	ABS/LMS/GSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	ABS
Sample Collection Date	01-12-2025	**Sample Receiving Date**	10-03-2026
Analysis Completion Date	13-03-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %

Ambient Temperature & Humidity at the time of Sample collected 19 °C & 62 %

Sample ID	ABS-BW-GW-29/2025	**Sample Location**	Jand Wala
Project Details	Tehsil Bhowana-Engineering Design & Construction Supervision Consultant Central Cluster-PRSWSSP		



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CI 95%)	Remarks
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	≤ 5 NTU	0	N.A.	Optimal
Total Hardness (as CaCO3) **	SMWW 2340 C	≤ 500 mg/L	336	± 1.40	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	≤ 1000 mg/L	492	± 2.77	Optimal
pH**	SMWW 4500-H+ B	6.5 - 8.5	7.30	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl)**	SMWW 4500-Cl B	≤ 250 mg/L	17	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	BDL	N.A.	Optimal
Cyanide (CN)*	SMWW 4500-CN- E	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F)**	SMWW 4500-F- C	≤ 1.5 mg/L	0.19	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤ 0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3)**	SMWW 4500-NO_3 D	≤ 50 mg/L	1.43	± 0.05	Optimal
Nitrite (NO_2)*	SMWW 4500-NO_2 B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl)*	SMWW 4500-Cl B	0.2-0.5 at consumer end 0.5-1.5 at source/1.0 mg/L	0	N.A.	Optimal

Page 1 of 2

PNAC LAB 208 17025 EPA PUNJAB SEPA

ASIAN ENVIRONMENTAL SERVICES (Pvt) Ltd
www.asianenvirolab.com

GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-PRMSC-01/2025-GW-29	**Report Issue Date**	13-03-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSF-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	01-12-2025	**Sample Receiving Date**	10-03-2026
Analysis Completion Date	13-03-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			19 °C & 62 %
Sample ID	AES-GW-GW-29/2025	**Sample Location**	Jand Wala
Project Details	Tehsil Bhowana-Engineering Design & Construction Supervision Consultant Central Cluster-PRSWSSP		



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.008	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optima
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environmental Protection Agency (EPA).
**Parameters are covered but not within Pakistan National Accreditation Council & approved from EPA.
The reported values are based solely on samples received/collected by the customer. The laboratory is not responsible for sampling procedures, quantity, or representativeness.

Abbreviations:
PEQS = Punjab Environmental Quality Standards
TCU = True Color Unit
NTU = Nephelometric Turbidity Unit
BDL = Below Detection Limit
SMWW 24th Edition = Standard Methods for the Examination of Water and Wastewater
N.A. = Not Available
MU = Measurement Uncertainty
CFU = Colony Forming Unit
WHO GDWQ = WHO Guideline Value for Pakistan

Remarks:
Optimal = Compliance with Permissible Range
Borderline = Close to Permissible Range
Low = Less Than Permissible Range
High = Exceeds the Permissible Range

Report Disclaimer
- If provided in the report, the statement of conformity is based on the binary decision rule of simple acceptance (guard band).
- The duration that will be provided upon request.
- The remaining portion of the sample (if) will be disposed of after 15 days after the issuance of report from the laboratory unless otherwise instructed (Condition Apply).
- This report shall not be reproduced in part or in full.
- This report is not intended to be used legally.
- The provided results relate only to the sample provided/collected.
- Please refer the testing results section for usage of report.

Analyzed By

Reviewed By (TM)

Approved By (QM)

Asian Environmental Services (Pvt) Ltd LAHORE

----------End of Report----------

Page 2 of 2

PNAC LAB 208 17026 | EPA PUNJAB | SEPA

ASIAN ENVIRONMENTAL SERVICES
www.asianenvirolab.com

GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-PRMGC-01/2025-GW-30	Report Issue Date	13-03-2026
Nature of Sample	Ground Water	Sample Collection Reference	AES/UMS/QSF-014
Grab/Composite	Grab	Sample Collected/Sent by	AES
Sample Collection Date	02-12-2025	Sample Receiving Date	10-03-2026
Analysis Completion Date	13-03-2026	Laboratory Temperature & Humidity	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			19 °C & 62 %
Sample ID	AES-BW-GW-30/2025	Sample Location	Aslana
Project Details	Tehsil Bhowana-Engineering Design & Construction Supervision Consultant Central Cluster-PRSWSSP		



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2160 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	≤ 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	≤ 500 mg/L	316	± 10.70	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	≤ 1000 mg/L	648	± 8.28	Optimal
pH**	SMWW 4500 H+ B	6.5-8.5	7.38	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl) **	SMWW 4500-Cl B	≤ 250 mg/L	50	± 1.39	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3113 B	2.0 mg/L	0.155	N.A.	Optimal
Cyanide (CN)*	SMWW 4500-CN E	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F)**	SMWW 4500 F C	≤ 1.5 mg/L	0.42	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤ 0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3) **	SMWW 4500-NO_3 D	≤ 50 mg/L	5.41	± 0.05	Optimal
Nitrite (NO_2) *	SMWW 4500-NO_2 B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl B	0.2-0.5 at consumer end 0.5-1.5 at source/1.0 mg/L	0	N.A.	Optimal

Page 1 of 2

Head Office: [illegible]
General Office: Plot 91-C, Office # 301 & 302, 3rd Floor, Commercial Street, DHA Phase II Ext, Karachi. Phone: +92 (0) 21 35836616
Islamabad Office: Office No 21, 2nd Floor, Zaki Center 18 Markaz, Islamabad. Phone: +92 (0) 51 4612566
Peshawar Office: Office No. 1, Fourth Floor, Syndicate Business Center, Opposite Custom House, University Road, Peshawar. Phone: +92 (0) 91 5610458
Email: info@asianenvirolab.com

ISO ISO ISO

Ensuring Quality and Sustainability

P

PNAC LAB 208 17025 | EPA PUNJAB | SEPA

ASIAN ENVIRONMENTAL SERVICES (PVT) LTD
www.asianenvirolab.com

GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-PRMSC-01/2025-GW-30	**Report Issue Date**	13-03-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/GSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-12-2025	**Sample Receiving Date**	10-03-2026
Analysis Completion Date	13-03-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 10) %
Ambient Temperature & Humidity at the Time of Sample collected			19 °C & 62 %
Sample ID	AES-GW-GW-30/2025	**Sample Location**	Adiana
Project Details	Tehsil Bhowana-Engineering Design & Construction Supervision Consultant Central Cluster-PRSWSSP		



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenol) *	SMWW 5530 D	NGVS mg/L	0	N.A.	–
Zinc (Zn)	SMWW 3113 B	5.0 max.	0.042	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

**Parameters are approved from Punjab Environmental Protection Agency (EPA).
*Parameters are included in Pakistan National Accreditation Council & approved from EPA.
The reported measurement uncertainty is based on combined standard uncertainty multiplied by a coverage factor (k), delivering a coverage probability of approximately 95%.

Abbreviations:
PEQS = Punjab Environmental Quality Standards; SMWW 24th Edition = standard methods for the examination of water and wastewater; N.A. = Not Available; CFU = Colony Forming Unit; ME = Measurement Uncertainty; NGVS = National Guideline Value Set; TCU = True Color Unit; NTU = Nephelometric Turbidity Unit; BDL= Below Detection Limit

Remarks:
Optimal = Compliance with Permissible Range; Marginal = Close to Reference Range; High = Beyond Permissible Range; Low = Less Than Permissible Range

Report Disclaimer
- If provided in the report, the statement of conformity is based on shall any decision rule agreed upon with the customer (Shared risk)
- The decision rule will be provided upon request.
- The remaining portion of the sample (s) will be disposed off after 14 days after the issuance of report from the laboratory unless otherwise instructed (Condition Apply)
- This report shall not be reproduced in part/parties.
- This report is not intended to be used legally.
- The provided results relate only to the samples provided/collected.
- Values reflect the testing results decision for usage of report totally or partially is customer.

Analyzed By | Reviewed By (TM) | Approved By (QM)

Asian Environmental Services (Pvt) Ltd. LAHORE

----------End of Report----------

Page 2 of 2

Head Office: Basement, C-6, Behind Block, Green Forest, Lahore. Phone: +92 42 35458014-15, Fax: +92 42 35458016
Karachi Office: Plot 91-C, Office 1001 & 1005, 10th Commercial Street, DHA Phase II Ext, Karachi. Phone: +92 300 8805818
Islamabad Office: Office No. 21, 2nd Floor, Zaib Centre, I-10 Markaz, Islamabad. Phone: +92 321 8203354
Peshawar Office: Office No. 1, Ground Floor, Sports Tower, Opposite Custom House, University Road, Peshawar. Phone: +92 329 5152385
Email: info@asianenvirolab.com

ISO ISO ISO

Ensuring Quality and Sustainability

ANNEXURE - H: TORS

These terms of references are being submitted for the subject EIA study under Clause 5 (f) of policy and procedure for the filing, review and approval of environmental assessment. These TORs of EIA have been prepared by the environmental consultants, in consultation with the project proponent.

Introduction of Project

The project aims at improvement of infrastructure of municipal services such as laying of water supply system and sewerage system in selected revenue villages within tehsil Bhowana, district Chiniot.

The project comprises of piped network along with Tube-wells, OHRs, Standposts, WWTPs, Septic tanks, pumping machinery, electrification & other allied works.

Cost of Project:

The capital cost of the project will be about 553 million USD (WB: 442.40, GoPb: 110.60 (Million)).

Name of Proponent

Chief Executive Officer of PRMSC is the project Proponent.

Environmental Consultant & Client

PRMSC has appointed the Asian Consulting Engineers Private Limited, as the Consultant for the subject project to conduct the EIA. Asian Consulting Engineers Private Limited will be called as "Consultant" and PRMSC as the "Client".

Objective of the EIA study

The Objective of study includes Compliance of section 12 of PEPA 1997 (Amended 2012), PEQS and fulfilment of HSE conditions.

Purpose of the EIA

The key objectives of the EIA are to:

- Document the ecological and socio-economic baseline conditions of the study area and the affected communities
- Inform and obtain input from stakeholders, (e.g., governmental authorities, the public, and indigenous communities) and capture their relevant issues and concerns
- Assess in detail the environmental, social, and health impacts that would result from the project
- Suggestion of environmental and social mitigation measures to identified environmental Impacts
- Develop the EMPs as discussed above, based on the mitigation measures developed in the EIA.

- Meet the requirements or recommendations of the applicable National Environmental Laws and Guidelines

Scope of Services

EIA for the subject project is in accordance with:

1. The Punjab Environmental Protection Act, 1997 (amended 2012) and the
   - Various guidelines developed by the Punjab Environmental Protection Agency
   - Pakistan Environment Protection Agency Guidelines
   - Guidelines of Labor & Human Resource Department
   - Punjab Local Government Guidelines
   - Punjab Food Authority Guidelines
2. Methodology for carrying out this study
   - Project Description
   - Site Selection
   - Project Alternatives
3. Process Description
   - Detailed review of the processes
   - Design Parameters
   - Process flow chart
   - Details related top Plant and Equipment
4. Environmental profile of the environmental study area
   - Climatology
   - Geographical features
   - Geological and Hydrological features
   - Historical review
   - Land Use
   - Ecology, i.e., Flora and Fauna etc.
5. Analysis of EPA required environmental parameters
   - Sampling for Air, Water, and Noise Level
   - Ambient Air Quality will be monitored at the existing sub-project site by using certified instruments/methods to check the concentration of pollutants in ambient air before construction.
   - Groundwater quality of the area will be checked through analysing EPA Smart Parameters. 2-3 representative samples will be collected to check the groundwater quality by using certified sampling techniques and analysis procedures.
   - Noise Level will be monitored at different localities at existing project site

- Investigate Socio-Economic and Socio-Environmental aspects and cultural values within and around the operating facility
- Administrative Set up
- Cultural and Social Values
- Social Cohesion
- Interviews from different groups

7. Development activities and Waste Management
8. Identify and evaluate major environmental impacts
9. Identify mitigation measures and develop Environmental Management and Monitoring plan
10. Conclusions based on the study conducted for this EIA.

EIA Proceedings

1. All other requirements, as set forth by
   - The Punjab Environmental Protection Act, 1997 (Amended 2012) and the
   - Various guidelines developed by PEPA
   - Any other legal requirements existing within Pakistan
2. 1-2 Site Visits for data acquisition
3. Environmental Monitoring
4. Preparation of Lab Analysis Report
5. Preparation of Environmental Impact Assessment (EIA)
6. Submission of all EIA report in office of DG EPA Punjab
7. Conduction of Public Hearing of EIA
8. Briefing & Presentation at the site to District Officer/Inspector for Environmental Management.
9. Reply to technical Environmental Objections/Review
10. Presentation in the office of DG EPA, Punjab
11. Issuance of NOC

Client's Responsibility

We expect the following inputs from the clients:

- As soon as the Proposal is accepted, the Consultants will request for the nomination of Environmental Specialist to be nominated as Coordinator who will be responsible for all coordination activities as required by the Consultants and to whom the Consultants will refer for information and assistance. All correspondence between the Consultants and the CLIENT will be routed through the coordinator.
- AsCE will require free access to all relevant information available with the Client.
- Assess and identify major potential issues and impacts particularly those which may have influence on design, construction and operation at any stage.
- The report developed for the CLIENT shall be the property of the CLIENT and the Consultants shall adhere to confidentiality morally as well as legally.
- Client will provide relevant documents as:

1. Signed application on company letter head (pattern will be provided)
2. Undertaking on Rs. 100/- Stamp Paper (pattern will be provided)
3. Affidavit on Rs. 100/- Stamp Paper (pattern will be provided)
4. Copy of CNIC of proponent
5. Signature on Schedule IV (pattern will be provided)
6. Layout Map of the project
7. Other NOCs / Certificate's form other concerned departments (if any)

- Project proponent will provide the Bank Draft of amount of Rs. 30,000/- in favor of D.G. EPA Punjab which is review fee for EIA.
- If any legal litigation arises from stockholders during the preceding of EIA, the consultant will not be responsible for the delay in the approval process due to legal litigation.

Signature:	Signature:
_____	_____
Muhammad Abbas	
Environmentalist	Proponent
Date:	Date:

ANNEXURE - I: IFC EHS GUIDELINES FOR CONSTRUCTION AND DECOMMISSIONING

General EHS Guidelines [Complete version] at: **www.ifc.org/ehsguidelines**

IFC International Finance Corporation

Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING

4.0 Construction and Decommissioning

4.1 Environment 89
Noise and Vibration 89
Soil Erosion 89
Air Quality 90
Solid Waste 90
Hazardous Materials 91
Wastewater Discharges 91
Contaminated Land 91
4.2 Occupational Health and Safety 92
4.3 Community Health and Safety 94
General Site Hazards 94
Disease Prevention 94
Traffic Safety 95

Applicability and Approach

This section provides additional specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life cycle, or due to expansion or modification of existing project facilities. Cross referencing is made to various other sections of the General EHS Guidelines.

4.1 Environment{ TC "4.1 Environment" \f C \l "2" }

Noise and Vibration

During construction and decommissioning activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, dozers and the transportation of equipment, materials and people. Some recommended noise reduction and control strategies to consider in areas close to community areas include:

- Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance
- Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines
- Avoiding or minimizing project transportation through community areas

Soil Erosion

Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may in turn result in sedimentation of surface drainage networks which may result in impacts to the quality of natural water systems and ultimately, the biological systems that use these waters. Recommended soil erosion and water system management approaches include:

Sediment mobilization and transport

- Reducing or preventing erosion by:
  - Scheduling to avoid heavy rainfall periods (i.e. during the dry season) to the extent practical
  - Contouring and minimizing length and steepness of slopes
  - Mulching to stabilize exposed areas
  - Re-vegetating areas promptly
  - Designing channels and ditches for post-construction flows
  - Lining steep channel and slopes (e.g. use jute matting)
- Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment, and modifying or suspending activities during extreme rainfall and high winds to the extent practical

Clean runoff management

- Segregating or diverting clean water runoff to prevent it mixing with water containing a high solids content, to minimize the volume of water to be treated prior to release

Road design

- Limiting access road gradients to reduce runoff-induced erosion
- Providing adequate road drainage based on road width, surface material, compaction, and maintenance

Disturbance to water bodies

- Depending on the potential for adverse impacts, installing free-spanning structures (e.g., single span bridges) for road watercourse crossings
- Restricting the duration and timing of in-stream activities to lower flow periods, and avoiding periods of critical biological cycles of valued flora and fauna (e.g., migration, spawning, etc.)
- For in-stream works, using isolation techniques such as berming or diversion during construction to limit the exposure of disturbed sediments to moving water
- Consider using trenchless technology for pipeline crossings (e.g., suspended crossings) or installation by directional drilling

Structural (slope) stability

- Providing effective short term measures for slope stabilization, sediment control and subsidence control until long term measures for the operational phase can be implemented
- Providing adequate drainage systems to minimize and control infiltration

Air Quality

Construction and decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. Techniques to consider for the reduction and control of air emissions from construction and decommissioning sites include:

- Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone)
- Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content
- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- Selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition
- Managing emissions from mobile sources according to Section 1.1
- Avoiding open burning of solid (refer to solid waste management guidance in Section 1.6)

Solid Waste

Non-hazardous solid waste generated at construction and decommissioning sites includes excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid wastes include office, kitchen, and dormitory wastes when these types of operations are part of construction project activities. Hazardous solid waste includes contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small

amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill cleanup materials from oil and fuel spills. Techniques for preventing and controlling non-hazardous and hazardous construction site solid waste include those already discussed in Section 1.6.

Hazardous Materials

Construction and decommissioning activities may pose the potential for release of petroleum based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. These materials may also be encountered during decommissioning activities in building components or industrial process equipment. Techniques for prevention, minimization, and control of these impacts include:

- Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids;
- Using impervious surfaces for refueling areas and other fluid transfer areas;
- Training workers on the correct transfer and handling of fuels and chemicals and the response to spills;
- Providing portable spill containment or cleanup equipment on site and training in the equipment deployment;
- Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g. PCB containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities, and managing their treatment and disposal according to Sections 1.5 and 1.6 on Hazardous Materials and Hazardous Waste Management, respectively;
- Assessing the presence of hazardous substances in or on building materials (e.g., polychlorinated biphenyls, asbestos-containing flooring or insulation) and decontaminating or properly managing contaminated building materials.

Wastewater Discharges

Construction and decommissioning activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. Adequate portable or permanent sanitation facilities serving all workers should be provided at all construction sites. Sanitary wastewater in construction and other sites should be managed as described in Section 1.3.

Contaminated Land

Land contamination may be encountered in sites under construction or decommissioning due to known or unknown historical releases of hazardous materials or oil, or due to the presence of abandoned infrastructure formerly used to store or handle these materials, including underground storage tanks. Actions necessary to manage the risk from contaminated land will depend on factors such as the level and location of contamination, the type and risks of the contaminated media, and the intended land use. However, a basic management strategy should include:

- Managing contaminated media with the objective of protecting the safety and health of occupants of the site, the surrounding community, and the environment post construction or post decommissioning;
- Understanding the historical use of the land with regard to the potential presence of hazardous materials or oil prior to initiation of construction or decommissioning activities;
- Preparing plans and procedures to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment consistent with the approach for Contaminated Land in Section 1.6;
- Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management described in Section 1.6.

Successful implementation of any management strategy may require identification and cooperation with whoever is responsible and liable for the contamination.

4.2 Occupational Health and Safety{ TC "4.2 Occupational Health and Safety" \f C \l "2" }

Over-exertion

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries in construction and decommissioning sites. Recommendations for their prevention and control include:

- Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-persons lifts are necessary
- Planning work site layout to minimize the need for manual transfer of heavy loads
- Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
- Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks

Slips and Falls

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites. Recommended methods for the prevention of slips and falls from or on the same elevation include:

- Implementing good house keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
- Cleaning up excessive waste debris and liquid spills regularly
- Locating electrical cords and ropes in common areas and marked corridors
- Use of slip retardant footwear

Work in Heights

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard[8]:

- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 5000 pounds (also described in this section in "Working at Heights above"), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie-in point of the fall arresting system should also be able to support 5000 pounds
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as

[8] Additional information on identification of fall hazards and design of protection systems can be found in the United States Occupational Health and Safety Administration's (US OSHA) web site: http://www.osha.gov/SLTC/fallprotection/index.html

securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces.

Struck By Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities. Techniques for the prevention and control of these hazards include:

- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap
- Use of temporary fall protection measures on scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes

Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving. Techniques for the prevention and control of these impacts include:

- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag people wearing high-visibility vests or color clothing covering to direct traffic
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- Ensuring moving equipment is outfitted with audible back-up alarms
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations

Dust

- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- PPE, such as dust masks, should be used where dust levels are excessive

Confined Spaces and Excavations

Examples of confined spaces that may be present in construction or demolition sites include: silos, vats, hoppers, utility vaults, tanks, sewers, pipes, and access shafts. Ditches and trenches may also be considered a confined space when access or egress is limited. In addition to the guidance provided in Section 2.8 the occupational hazards associated with confined spaces and excavations in construction and decommissioning sites should be prevented according to the following recommendations:

- Controlling site specific factors which may contribute to excavation slope instability including, for example, the use of excavation dewatering, side-walls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning
- Providing safe means of access and egress from excavations, such as graded slopes, graded access roads or stairs and ladders
- Avoiding the operation of combustion equipment for prolonged periods inside excavations or areas where other workers are required to enter, unless the area is actively ventilated

Other Site Hazards

Construction and decommissioning sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials and wastes in a combination of liquid, solid, or gaseous forms, which should be prevented through the implementation of project-specific plans and other applicable management practices, including:

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment, or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements prior to dismantling or demolition, including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury[8]
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection

4.3 Community Health and Safety{ TC "4.3 Community Health and Safety" \f C \l "2" }

General Site Hazards

Projects should implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning. Risks may arise from inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and other environmental media, buildings that are vacant or under construction, or excavations and structures which may pose falling and entrapment hazards. Risk management strategies may include:

- Restricting access to the site through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community
- Removing hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials

Disease Prevention

Increased incidence of communicable and vector-borne diseases attributable to construction activities represents a potentially serious health threat to project personnel and residents of local communities. Recommendations for the prevention and control of communicable and vector-borne diseases also applicable to

[8] Additional information on the management and removal of asbestos containing building materials can be found in ASTM Standard E2356 and E1368

construction phase activities are provided in Section 3.6 (Disease Prevention).

Traffic Safety

Construction activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers and local communities. The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures described in Section 3.4 (Traffic Safety).

Hira Fatima (Assistant Director (EIA)-2)
EPA
a.dirieia.epapb@gmail.com
9101 05 14 9:46 PM 27-Jan-20
حکومت پنجاب

ANNEXURE - J: ILO GUIDELINES ON OHS

Hira Fatima (Assistant Director (EIA)-2)
EPA



Hira Fatima (Assistant Director (EIA)-2)
EPA

Guidelines on occupational safety and health management systems

ILO-OSH 2001

(Second Edition*)

Hira Fatima (Assistant Director (EIA)-2)
EPA

*This second edition includes additions made by the Office to the bibliography which are indicated with an asterisk (*).

Guidelines on occupational safety and health management systems

ILO-OSH 2001

Hira Fatima (Assistant Director (EIA)-2)

INTERNATIONAL LABOUR OFFICE GENEVA

Copyright © International Labour Organization 2001
First published 2001
Second edition 2009

Publications of the International Labour Office enjoy copyright under Protocol 2 of the Universal Copyright Convention. Nevertheless, short excerpts from them may be reproduced without authorization, on condition that the source is indicated. For rights of reproduction or translation, application should be made to the Publications Bureau (Rights and Permissions), International Labour Office, CH-1211 Geneva 22, Switzerland. The International Labour Office welcomes such applications.

Libraries, institutions and other users registered in the United Kingdom with the Copyright Licensing Agency, 90 Tottenham Court Road, London W1T 4LP [Fax: (+44) (0)20 7631 5500; email: cla@cla.co.uk], in the United States with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923 [Fax: (+1) (978) 750-4470; email: info@copyright.com] or in other countries with associated Reproduction Rights Organizations, may make photocopies in accordance with the licences issued to them for this purpose.



The designations employed in ILO publications, which are in conformity with United Nations practice, and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the International Labour Office concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its frontiers.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by the International Labour Office of the opinions expressed in them.

Reference to names of firms and commercial products and processes does not imply their endorsement by the International Labour Office, and any failure to mention a particular firm, commercial product or process is not a sign of disapproval.

ILO publications can be obtained through major booksellers or ILO local offices in many countries, or direct from ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland. Catalogues or lists of new publications are available free of charge from the above address, or by email: pubvente@ilo.org.

Foreword

The protection of workers against work-related sickness, disease and injury forms part of the historical mandate of the ILO. Disease and injury do not go with the job nor can poverty justify disregard for workers' safety and health. The ILO's primary goal is to promote opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity. We have summarized this as "decent work". Decent work is safe work. And safe work is also a positive factor for productivity and economic growth.

Today, technological progress and intense competitive pressures bring rapid change in working conditions, work processes and organization. Legislation is essential but insufficient on its own to address these changes or to keep pace with new hazards and risks. Organizations must also be able to tackle occupational safety and health challenges continuously and to build effective responses into dynamic management strategies. These *Guidelines on occupational safety and health management systems* will support this effort.

The *Guidelines* were prepared on the basis of a broad based approach involving the ILO and its tripartite constituents and other stakeholders. They have also been shaped by universally agreed occupational safety and health principles as reflected in relevant international labour standards. Consequently, they provide a unique and powerful instrument for the development of a sustainable safety culture within enterprises and beyond. Workers, organizations, safety and health systems and the environment all stand to benefit.

The ILO is pleased to have led the exercise of drawing up these *Guidelines*. I am confident that they will become an invaluable tool for employers and workers and their organizations, national constituents and all those who have a role in ensuring that workplaces are also safe and healthy places.

Juan Somavia
Director-General

Contents

Foreword v
Introduction ix

1. Objectives 1

2. A national framework for occupational safety and health management systems 3
2.1. National policy 3
2.2. National guidelines 4
2.3. Tailored guidelines 4

3. The occupational safety and health management system in the organization 5

Policy 6
3.1. Occupational safety and health policy 6
3.2. Worker participation 6

Organizing 7
3.3. Responsibility and accountability 7
3.4. Competence and training 8
3.5. Occupational safety and health management system documentation 8
3.6. Communication 9

Planning and implementation 9
3.7. Initial review 9
3.8. System planning, development and implementation 10
3.9. Occupational safety and health objectives 11
3.10. Hazard prevention 11
3.10.1. Risk taking and control measures 11
3.10.2. Management of change 11
3.10.3. Emergency prevention, preparedness and response 12
3.10.4. Procurement 12
3.10.5. Contracting 13

Evaluation 13
3.11. Performance monitoring and measurement 13
3.12. Investigation of work-related injuries, ill health, diseases and incidents, and their impact on safety and health performance 14
3.13. Audit 15
3.14. Management review 16

Action for improvement 17
3.15. Preventive and corrective action 17
3.16. Continual improvement 17

Glossary 19
Bibliography 23

Annex
List of participants and observers at the Meeting of Experts on ILO Guidelines on Occupational Safety and Health Management Systems, Geneva, 19-27 April 2001 25

Figures
1. Elements of the national framework for OSH management systems 4
2. Main elements of the OSH management system 5

Introduction

The positive impact of introducing occupational safety and health (OSH) management systems at the *organization*[1] level, both on the reduction of hazards and risks and on productivity, is now recognized by governments, employers and workers.

These guidelines on OSH management systems have been developed by the International Labour Organization (ILO) according to internationally agreed principles defined by the ILO's tripartite constituents. This tripartite approach provides the strength, flexibility and appropriate basis for the development of a sustainable safety culture in the *organization*. The ILO has therefore developed voluntary guidelines on OSH management systems which reflect ILO values and instruments relevant to the protection of workers' safety and health.

The practical recommendations of these guidelines are intended for use by all those who have responsibility for occupational safety and health management. They are not legally binding and are not intended to replace national laws, regulations or accepted standards. Their application does not require certification.

The employer is accountable for and has a duty to organize occupational safety and health. The implementation of an OSH management system is one useful approach to fulfilling this duty. The ILO has designed these guidelines as a practical tool for assisting *organizations* and competent institutions as a means of achieving continual improvement in OSH performance.

[1] See glossary for definitions.

1 Objectives

1.1. These guidelines should contribute to the protection of workers from hazards and to the elimination of work-related injuries, ill health, diseases, incidents and deaths.

1.2. At national level, the guidelines should:

(a) be used to establish a national framework for OSH management systems, preferably supported by national laws and regulations;

(b) provide guidance for the development of voluntary arrangements to strengthen compliance with regulations and standards leading to continual improvement in OSH performance; and

(c) provide guidance on the development of both national and tailored guidelines on OSH management systems to respond appropriately to the real needs of *organizations*, according to their size and the nature of their activities.

1.3. At the level of the *organization*, the guidelines are intended to:

(a) provide guidance regarding the integration of OSH management system elements in the *organization* as a component of policy and management arrangements; and

(b) motivate all members of the *organization*, particularly employers, owners, management staff, workers and their representatives, to apply appropriate OSH management principles and methods to continually improve OSH performance.

2 A national framework for occupational safety and health management systems

2.1. National policy

2.1.1. A competent institution or institutions should be nominated, as appropriate, to formulate, implement and periodically review a coherent national policy for the establishment and promotion of OSH management systems in *organizations*. This should be done in consultation with the most representative organizations of employers and workers, and with other bodies as appropriate.

2.1.2. The national policy on OSH management systems should establish general principles and procedures to:

(a) promote the implementation and integration of OSH management systems as part of the overall management of an *organization*;

(b) facilitate and improve voluntary arrangements for the systematic identification, planning, implementation and improvement of OSH activities at national and *organization* levels;

(c) promote the participation of workers and their representatives at *organization* level;

(d) implement continual improvement while avoiding unnecessary bureaucracy, administration and costs;

(e) promote collaborative and support arrangements for OSH management systems at the *organizational* level by labour inspectorates, occupational safety and health services and other services, and channel their activities into a consistent framework for OSH management;

(f) evaluate the effectiveness of the national policy and framework at appropriate intervals;

(g) evaluate and publicize the effectiveness of OSH management systems and practice by suitable means; and

(h) ensure that the same level of safety and health requirements applies to contractors and their workers as to the workers, including temporary workers, employed directly by the *organization*.

2.1.3. With a view to ensuring the coherence of the national policy and of arrangements for its implementation, the competent institution should establish a national framework for OSH management systems to:

(a) identify and establish the respective functions and responsibilities of the various institutions called upon to implement the national policy, and make appropriate arrangements to ensure the necessary coordination between them;

(b) publish and periodically review national guidelines on the voluntary application and systematic implementation of OSH management systems in *organizations*;

(c) establish criteria, as appropriate, for the designation and respective duties of the institutions responsible for the preparation and promotion of tailored guidelines on OSH management systems; and

(d) ensure that guidance is available to employers, workers and their representatives to take advantage of the national policy.

2.1.4. The competent institution should make arrangements and provide technically sound guidance to labour inspectorates, OSH services and other public or private services, agencies and institutions dealing with OSH, including health-care providers, to encourage and help *organizations* to implement OSH management systems.

2.2. National guidelines

2.2.1. National guidelines on the voluntary application and systematic implementation of OSH management systems should be elaborated based on the model provided in Chapter 3, taking into consideration national conditions and practice.

2.2.2. There should be consistency between the ILO guidelines, the national guidelines and the tailored guidelines, with sufficient flexibility to permit direct application or tailored application at the *organization* level.

2.3. Tailored guidelines

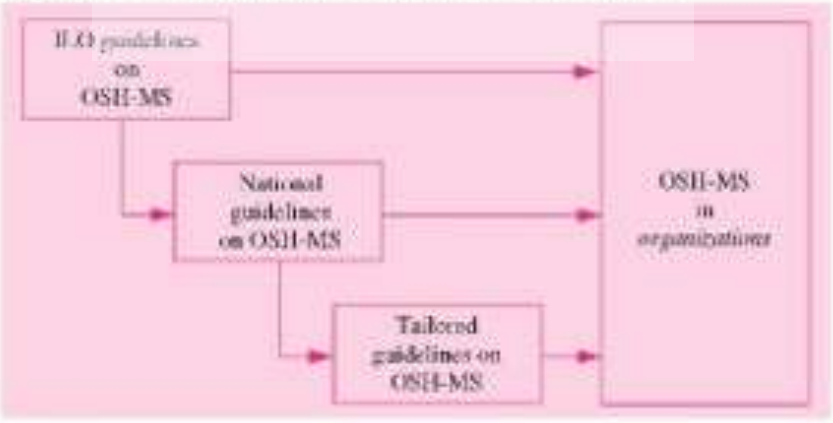
2.3.1. Tailored guidelines, to promote the overall objectives of the ILO guidelines, should contain the appropriate elements of the national guidelines and should be designed to reflect the specific conditions and needs of *organizations* or groups of *organizations*, taking into consideration particularly:

(a) their size (large, medium and small) and infrastructure; and

(b) the types of hazards and degrees of risks.

2.3.2. The links between the national framework for OSH management systems (OSH-MS) and its essential elements are illustrated in figure 1.

Figure 1. Elements of the national framework for OSH management systems



3 The occupational safety and health management system in the organization

Occupational safety and health, including compliance with the OSH requirements pursuant to national laws and regulations, are the responsibility and duty of the employer. The employer should show strong leadership and commitment to OSH activities in the *organization*, and make appropriate arrangements for the establishment of an OSH management system. The system should contain the main elements of policy, organizing, planning and implementation, evaluation and action for improvement, as shown in figure 2.

Figure 2. Main elements of the OSH management system





Policy

3.1. Occupational safety and health policy

3.1.1. The employer, in consultation with workers and their representatives, should set out in writing an OSH policy, which should be:

(a) specific to the *organization* and appropriate to its size and the nature of its activities;

(b) concise, clearly written, dated and made effective by the signature or endorsement of the employer or the most senior accountable person in the *organization*;

(c) communicated and readily accessible to all persons at their place of work;

(d) reviewed for continuing suitability; and

(e) made available to relevant external interested parties, as appropriate.

3.1.2. The OSH policy should include, as a minimum, the following key principles and objectives to which the *organization* is committed:

(a) protecting the safety and health of all members of the *organization* by preventing work-related injuries, ill health, diseases and incidents;

(b) complying with relevant OSH national laws and regulations, voluntary programmes, collective agreements on OSH and other requirements to which the *organization* subscribes;

(c) ensuring that workers and their representatives are consulted and encouraged to participate actively in all elements of the OSH management system; and

(d) continually improving the performance of the OSH management system.

3.1.3. The OSH management system should be compatible with or integrated in other management systems in the *organization*.

3.2. Worker participation

3.2.1. Worker participation is an essential element of the OSH management system in the *organization*.

3.2.2. The employer should ensure that workers and their safety and health representatives are consulted, informed and trained on all aspects of OSH, including emergency arrangements, associated with their work.

3.2.3. The employer should make arrangements for workers and their safety and health representatives to have the time and resources to participate actively in the processes of organizing, planning and implementation, evaluation and action for improvement of the OSH management system.

3.2.4. The employer should ensure, as appropriate, the establishment and efficient functioning of a safety and health committee and the recognition of workers' safety and health representatives, in accordance with national laws and practice.



Organizing

3.3. Responsibility and accountability

3.3.1. The employer should have overall responsibility for the protection of workers' safety and health, and provide leadership for OSH activities in the organization.

3.3.2. The employer and senior management should allocate responsibility, accountability and authority for the development, implementation and performance of the OSH management system and the achievement of the relevant OSH objectives. Structures and processes should be established which:

(a) ensure that OSH is a line-management responsibility which is known and accepted at all levels;

(b) define and communicate to the members of the organization the responsibility, accountability and authority of persons who identify, evaluate or control OSH hazards and risks;

(c) provide effective supervision, as necessary, to ensure the protection of workers' safety and health;

(d) promote cooperation and communication among members of the organization, including workers and their representatives, to implement the elements of the *organization*'s OSH management system;

(e) fulfil the principles of OSH management systems contained in relevant national guidelines, tailored guidelines or voluntary programmes, as appropriate, to which the *organization* subscribes;

(f) establish and implement a clear OSH policy and measurable objectives;

(g) establish effective arrangements to identify and eliminate or control work-related hazards and risks, and promote health at work;

(h) establish prevention and health promotion programmes;

(i) ensure effective arrangements for the full participation of workers and their representatives in the fulfilment of the OSH policy;

(j) provide appropriate resources to ensure that persons responsible for OSH, including the safety and health committee, can perform their functions properly; and

(k) ensure effective arrangements for the full participation of workers and their representatives in safety and health committees, where they exist.

3.3.3. A person or persons at the senior management level should be appointed, where appropriate, with responsibility, accountability and authority for:

(a) the development, implementation, periodic review and evaluation of the OSH management system;

(b) periodic reporting to the senior management on the performance of the OSH management system; and

(c) promoting the participation of all members of the *organization*.

3.4. Competence[1] and training

3.4.1. The necessary OSH competence requirements should be defined by the employer, and arrangements established and maintained to ensure that all persons are competent to carry out the safety and health aspects of their duties and responsibilities.

3.4.2. The employer should have, or should have access to, sufficient OSH competence to identify and eliminate or control work-related hazards and risks, and to implement the OSH management system.

3.4.3. Under the arrangements referred to in paragraph 3.4.1, training programmes should:

(a) cover all members of the organization, as necessary;

(b) be conducted by competent persons;

(c) provide effective and timely initial and refresher training at appropriate intervals;

(d) include participants' evaluation of their competence and evaluation of the training;

(e) be reviewed periodically. The reviews should include the safety and health committee, where it exists, and the elements mentioned as necessary to ensure their relevance and effectiveness; and

(f) be documented, as appropriate and according to the size and nature of activity of the *organization*.

3.4.4. Training should be provided to all participants at no cost and should take place during working hours, if possible.

3.5. Occupational safety and health management system documentation

3.5.1. According to the size and nature of activity of the *organization*, OSH management system documentation should be established and maintained, and may cover:

(a) the OSH policy and objectives of the *organization*;

(b) the allocated key OSH management roles and responsibilities for the implementation of the OSH management system;

(c) the significant OSH hazards/risks arising from the *organization*'s activities, and the arrangements for their prevention and control; and

[1] OSH competence includes education, work experience and training, or a combination of these.

(d) arrangements, procedures, instructions or other internal documents used within the framework of the OSH management system.

3.5.2. The OSH management system documentation should be:

(a) clearly written and presented in a way that is understood by those who have to use it; and

(b) periodically reviewed, revised as necessary, communicated and readily accessible to all appropriate or affected members of the *organization*.

3.5.3. OSH records should be established, managed and maintained locally and according to the needs of the *organization*. They should be identifiable and traceable, and their retention times should be specified.

3.5.4. Workers should have the right to access records relevant to their working environment and health, while respecting the need for confidentiality.

3.5.5. OSH records may include:

(a) records arising from the implementation of the OSH management system;

(b) records of work-related injuries, ill health, diseases and incidents;

(c) records arising from national laws or regulations dealing with OSH;

(d) records of workers' exposures, surveillance of the working environment and workers' health; and

(e) the results of both active and reactive monitoring.

3.6. Communication

3.6.1. Arrangements and procedures should be established and maintained for:

(a) receiving, documenting and responding appropriately to internal and external communications related to OSH;

(b) ensuring the internal communication of OSH information between relevant levels and functions of the *organization*; and

(c) ensuring that the concerns, ideas and inputs of workers and their representatives on OSH matters are received, considered and responded to.

Planning and implementation

3.7. Initial review

3.7.1. The *organization's* existing OSH management system and relevant arrangements should be evaluated by an initial review, as appropriate. In the case

where no OSH management system exists, or if the *organization* is newly established, the initial review should serve as a basis for establishing an OSH management system.

3.7.2. The initial review should be carried out by competent persons, in consultation with workers and/or their representatives, as appropriate. It should:

(a) identify the current applicable national laws and regulations, national guidelines, tailored guidelines, voluntary programmes and other requirements to which the *organization* subscribes;

(b) identify, anticipate and assess hazards and risks to safety and health arising from the existing or proposed work environment and work organization; and

(c) determine whether planned or existing controls are adequate to eliminate hazards or control risks; and

(d) analyse the data provided from workers' health surveillance.

3.7.3. The result of the initial review should:

(a) be documented;

(b) become the basis for making decisions regarding the implementation of the OSH management system; and

(c) provide a baseline from which continual improvement of the *organization's* OSH management system can be measured.

3.8. System planning, development and implementation

3.8.1. The purpose of planning should be to create an OSH management system that supports:

(a) as the minimum, compliance with national laws and regulations;

(b) the elements of the *organization's* OSH management system; and

(c) continual improvement in OSH performance.

3.8.2. Arrangements should be made for adequate and appropriate OSH planning, based on the results of the initial review, subsequent reviews or other available data. These planning arrangements should contribute to the protection of safety and health at work, and should include:

(a) a clear definition, priority setting and quantification, where appropriate, of the *organization's* OSH objectives;

(b) the preparation of a plan for achieving each objective, with defined responsibility and clear performance criteria indicating what is to be done by whom and when;

(c) the selection of measurement criteria for confirming that the objectives are achieved; and

(d) the provision of adequate resources, including human and financial resources and technical support, as appropriate.

3.8.3. The OSH planning arrangements of the *organization* should cover the development and implementation of all the OSH management system elements, as described in Chapter 3 of these guidelines and illustrated in figure 2.

3.9. Occupational safety and health objectives

3.9.1. Consistent with the OSH policy and based on the initial or subsequent reviews, measurable OSH objectives should be established, which are:

(a) specific to the *organization*, and appropriate to and according to its size and nature of activity;
(b) consistent with the relevant and applicable national laws and regulations, and the technical and business obligations of the *organization* with regard to OSH;
(c) focused towards continually improving workers' OSH protection to achieve the best OSH performance;
(d) realistic and achievable;
(e) documented, and communicated to all relevant functions and levels of the *organization*; and
(f) periodically evaluated and if necessary updated.

3.10. Hazard prevention

3.10.1. Prevention and control measures

3.10.1.1. Hazards and risks to workers' safety and health should be identified and assessed on an ongoing basis. Preventive and protective measures should be implemented in the following order of priority:

(a) eliminate the hazard/risk;
(b) control the hazard/risk at source, through the use of engineering controls or organizational measures;
(c) minimize the hazard/risk by the design of safe work systems, which include administrative control measures; and
(d) where residual hazards/risks cannot be controlled by collective measures, the employer should provide for appropriate personal protective equipment, including clothing, at no cost, and should implement measures to ensure its use and maintenance.

3.10.1.2. Hazard prevention and control procedures or arrangements should be established and should:

(a) be adapted to the hazards and risks encountered by the organization;
(b) be reviewed and modified if necessary on a regular basis;
(c) comply with national laws and regulations, and reflect good practice; and
(d) consider the current state of knowledge, including information or reports from organizations, such as labour inspectorates, occupational safety and health services, and other services as appropriate.

3.10.2. Management of change

3.10.2.1. The impact on OSH of internal changes (such as those in staffing or due to new processes, working procedures, organizational structures or acquisitions) and

of external changes (for example, as a result of amendments of national laws and regulations, organizational mergers, and developments in OSH knowledge and technology) should be evaluated and appropriate preventive steps taken prior to the introduction of changes.

3.10.2.2. A workplace hazard identification and risk assessment should be carried out before any modification or introduction of new work methods, materials, processes or machinery. Such assessment should be done in consultation with and involving workers and their representatives, and the safety and health committee, where appropriate.

3.10.2.3. The implementation of a "decision to change" should ensure that all affected members of the *organization* are properly informed and trained.

3.10.3. Emergency prevention, preparedness and response

3.10.3.1. Emergency prevention, preparedness and response arrangements should be established and maintained. These arrangements should identify the potential for accidents and emergency situations, and address the prevention of OSH risks associated with them. The arrangements should be made according to the size and nature of activity of the *organization*. It also should:

(a) ensure that the necessary information, internal communication and coordination are provided to protect all people in the event of an emergency at the worksite;

(b) provide collaboration in and communication with, the relevant competent authorities, and the neighbourhood and emergency response services;

(c) address first aid and medical assistance, firefighting and evacuation of all people at the worksite; and

(d) provide relevant information and training to all members of the *organization*, at all levels, including regular exercises to maintain preparedness and response procedures.

3.10.3.2. Emergency prevention, preparedness and response arrangements should be established in cooperation with external emergency services and other bodies where applicable.

3.10.4. Procurement

3.10.4.1. Procedures should be established and maintained to ensure that:

(a) compliance with safety and health requirements for the *organization* is identified, evaluated and incorporated into purchasing and leasing specifications;

(b) national laws and regulations and the *organization's* own OSH requirements are identified prior to the procurement of goods and services; and

(c) arrangements are made to achieve conformance to the requirements prior to their use.

3.10.3. Contracting

3.10.3.1. Arrangements should be established and maintained for ensuring that the *organization's* safety and health requirements, or at least the equivalent, are applied to contractors and their workers.

3.10.3.2. Arrangements for contractors working on site should:

(a) include OSH criteria in procedures for evaluating and selecting contractors;

(b) establish effective ongoing communication and coordination between appropriate levels of the *organization* and the contractor prior to commencing work. This should include provisions for communicating hazards and the measures to prevent and control them;

(c) include arrangements for reporting of work-related injuries, ill health, diseases and incidents among the contractors' workers while performing work for the *organization*;

(d) provide relevant workplace safety and health hazard awareness and training to contractors or their workers prior to commencing work and as work progresses, as necessary;

(e) regularly monitor OSH performance of contractor activities on site; and

(f) ensure that on-site OSH procedures and arrangements are followed by the contractor(s).

Evaluation

3.11. Performance monitoring and measurement

3.11.1. Procedures to monitor, measure and record OSH performance on a regular basis should be developed, established and periodically reviewed. Responsibility, accountability and authority for monitoring at different levels in the management structure should be allocated.

3.11.2. The selection of performance indicators should be according to the size and nature of activity of the *organization* and the OSH objectives.

3.11.3. Both qualitative and quantitative measures appropriate to the needs of the *organization* should be considered. These should:

(a) be based on the *organization's* identified hazards and risks, the commitments in the OSH policy and the OSH objectives; and

(b) support the *organization's* evaluation process, including the management review.

3.11.4. Performance monitoring and measurement should:

(a) be used as a means of determining the extent to which OSH policy and objectives are being implemented and risks are controlled;

(b) include both active and reactive monitoring, and not be based only upon work-related injury, ill health, disease and incident statistics; and

(c) be recorded.

3.11.5. Monitoring should provide:

(a) feedback on OSH performance;

(b) information to determine whether the day-to-day arrangements for hazard and risk identification, prevention and control are in place and operating effectively; and

(c) the basis for decisions about improvement in hazard identification and risk control, and the OSH management system.

3.11.6. Active monitoring should contain the elements necessary to have a proactive system and should include:

(a) monitoring of the achievement of specific plans, established performance criteria and objectives;

(b) the systematic inspection of work systems, premises, plant and equipment;

(c) surveillance of the working environment, including work organization;

(d) surveillance of workers' health, where appropriate, through suitable medical monitoring or follow-up of workers for early detection of signs and symptoms of harm to health in order to determine the effectiveness of prevention and control measures; and

(e) compliance with applicable national laws and regulations, collective agreements and other commitments on OSH to which the organization subscribes.

3.11.7. Reactive monitoring should include the identification, reporting and investigation of:

(a) work-related injuries, ill health (including monitoring of aggregate sickness absence records), diseases and incidents;

(b) other losses, such as damage to property;

(c) deficient safety and health performance, and OSH management system failures; and

(d) workers' rehabilitation and health-restoration programmes.

3.12. Investigation of work-related injuries, ill health, diseases and incidents, and their impact on safety and health performance

3.12.1. The investigation of the origin and underlying causes of work-related injuries, ill health, diseases and incidents should identify any failures in the OSH management system and should be documented.

3.12.2. Such investigations should be carried out by competent persons, with the appropriate participation of workers and their representatives.

3.12.3. The results of such investigations should be communicated to the safety and health committee, where it exists, and the committee should make appropriate recommendations.

3.12.4. The results of investigations, in addition to any recommendations from the safety and health committee, should be communicated to appropriate persons for corrective action, included in the management review and considered for continual improvement activities.

3.12.5. The corrective action resulting from such investigations should be implemented in order to avoid repetition of work-related injuries, ill health, diseases and incidents.

3.12.6. Reports produced by external investigative agencies, such as inspectorates and social insurance institutions, should be acted upon in the same manner as internal investigations, taking into account issues of confidentiality.

3.13. Audit

3.13.1. Arrangements to conduct periodic audits are to be established in order to determine whether the OSH management system and its elements are in place, adequate, and effective in protecting the safety and health of workers and preventing incidents.

3.13.2. An audit policy and programme should be developed, which includes a designation of auditor competency, the audit scope, the frequency of audits, audit methodology and reporting.

3.13.3. The audit includes an evaluation of the organization's OSH management system elements or a subset of these, as appropriate. The audit should cover:

(a) OSH policy;
(b) worker participation;
(c) responsibility and accountability;
(d) competence and training;
(e) OSH management system documentation;
(f) communication;
(g) system planning, development and implementation;
(h) prevention and control measures;
(i) management of change;
(j) emergency prevention, preparedness and response;
(k) procurement;
(l) contracting;
(m) performance monitoring and measurement;
(n) investigation of work-related injuries, ill health, diseases and incidents, and their impact on safety and health performance;

(o) audit;
(p) management review;
(q) preventive and corrective action;
(r) continual improvement; and
(s) any other audit criteria or elements that may be appropriate.

3.13.4. The audit conclusion should determine whether the implemented OSH management system elements or a subset of these:

(a) are effective in meeting the *organization's* OSH policy and objectives;
(b) are effective in promoting full worker participation;
(c) respond to the results of OSH performance evaluation and previous audits;
(d) enable the *organization* to achieve compliance with relevant national laws and regulations; and
(e) fulfil the goals of continual improvement and best OSH practice.

3.13.5. Audits should be conducted by competent persons internal or external to the *organization* who are independent of the activity being audited.

3.13.6. The audit results and audit conclusions should be communicated to those responsible for corrective action.

3.13.7. Consultation on selection of the auditor and all stages of the workplace audit, including analysis of results, and action by the worker participation, as appropriate.

3.14. Management review

3.14.1. Management reviews should:

(a) evaluate the overall strategy of the OSH management system to determine whether it meets planned performance objectives;
(b) evaluate the OSH management system's ability to meet the overall needs of the *organization* and its stakeholders, including its workers and the regulatory authorities;
(c) evaluate the need for changes to the OSH management system, including OSH policy and objectives;
(d) identify what action is necessary to remedy any deficiencies in a timely manner, including adaptations of other aspects of the *organization's* management structure and performance measurement;
(e) provide the feedback direction, including the determination of priorities, for meaningful planning and continual improvement;
(f) evaluate progress towards the *organization's* OSH objectives and corrective action activities; and
(g) evaluate the effectiveness of follow-up actions from earlier management reviews.

3.14.2. The frequency and scope of periodic reviews of the OSH management system by the employer or the most senior accountable person should be defined according to the *organization's* needs and conditions.

3.14.3. The management review should consider:

(a) the results of work-related injuries, ill health, diseases and incident investigations, performance monitoring and measurement, and audit activities; and

(b) additional internal and external inputs as well as changes, including organizational changes, that could affect the OSH management system.

3.14.4. The findings of the management review should be recorded and formally communicated to:

(a) the persons responsible for the relevant element(s) of the OSH management system so that they may take appropriate action; and

(b) the safety and health committee, workers and their representatives.

Hira Fatima (Assistant Director EPA)

3.15. Preventive and corrective action

3.15.1. Arrangements should be established and maintained for preventive and corrective action resulting from OSH management system performance monitoring and measurement, OSH management system audits and management reviews. These arrangements should include:

(a) identifying and analysing the root causes of any non-conformities with relevant OSH regulations and/or OSH management systems arrangements; and

(b) initiating, planning, implementing, checking the effectiveness of and documenting corrective and preventive action, including changes to the OSH management system itself.

3.15.2. When the evaluation of the OSH management system or other sources show that preventive and protective measures for hazards and risks are inadequate or likely to become inadequate, the measures should be addressed according to the recognized hierarchy of prevention and control measures, and completed and documented, as appropriate and in a timely manner.

3.16. Continual improvement

3.16.1. Arrangements should be established and maintained for the continual improvement of the relevant elements of the OSH management system and the system as a whole. These arrangements should take into account:

(a) the OSH objectives of the organization;

(b) the results of hazard and risk identifications and assessments;
(c) the results of performance monitoring and measurements;
(d) the investigation of work-related injuries, diseases, ill health and incidents, and the results and recommendations of audits;
(e) the outcomes of the management review;
(f) the recommendations for improvement from all members of the *organization*, including the safety and health committee, where it exists;
(g) changes in national laws and regulations, voluntary programmes and collective agreements;
(h) new relevant information; and
(i) the results of health protective and promotion programmes.

3.16.2. The safety and health processes and performance of the *organization* should be compared with criteria in order to improve health and safety performance.

Rima Fatima (Assistant Director (EIA)-2)
EPA Punjab

Glossary

In these guidelines, the following terms have the meanings hereby assigned to them:

Active monitoring: The ongoing activities which check that hazard and risk preventive and protective measures, as well as the arrangements to implement the OSH management system, conform to defined criteria.

Audit: A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which defined criteria are fulfilled. This does not necessarily mean an independent external audit (an auditor or auditors from outside the *organization*).

Competent institution: A government department or other body with the responsibility to establish a national policy and develop a national framework for OSH management systems in *organizations*, and to provide relevant guidance.

Competent person: A person with suitable training, and sufficient knowledge, experience and skill, for the performance of the specific work.

Continual improvement: Iterative process of enhancing the OSH management system to achieve improvements in overall OSH performance.

Contractor: A person or an *organization* providing services to an employer at the employer's workplace in accordance with agreed specifications, terms and conditions.

Employer: Any physical or legal person that employs one or more workers.

Hazard: The inherent potential to cause injury or damage to people's health.

Hazard assessment: A systematic examination of hazards.

Incident: An unsafe occurrence arising out of or in the course of work where no personal injury is caused.

Organization: A company, operation, firm, undertaking, establishment, enterprise, institution or association, or part of it, whether incorporated or not, public or private, that has its own functions and administration. For *organizations* with more than one operating unit, a single operating unit may be defined as an *organization*.

OSH management system: A set of interrelated or interacting elements to establish OSH policy and objectives, and to achieve those objectives.

Reactive monitoring: Checks that failures in the hazard and risk prevention and protection control measures, and the OSH management system, as demonstrated by the occurrence of injuries, ill health, diseases and incidents, are identified and acted upon.

Risk: A combination of the likelihood of an occurrence of a hazardous event and the severity of injury or damage to the health of people caused by this event.

Risk assessment: The process of evaluating the risks to safety and health arising from hazards at work.

Safety and health committee: A committee with representation of workers' safety and health representatives and employers' representatives established and functioning at *organization* level according to national laws, regulations and practice.

Surveillance of the working environment: A generic term which includes the identification and evaluation of environmental factors that may affect workers' health. It covers assessments of sanitary and occupational hygiene conditions, factors in the organization of work which may pose risks to the health of workers, collective and personal protective equipment, exposure of workers to hazardous agents, and control systems designed to eliminate and reduce them. From the standpoint of workers' health, the surveillance of the working environment may focus on, but not be limited to, ergonomics, accident and disease prevention, occupational hygiene in the workplace, work organization, and psychosocial factors in the workplace.

Worker: Any person who performs work, either regularly or temporarily, for an employer.

Workers' health surveillance: A generic term which covers procedures and investigations to assess workers' health in order to detect and identify any abnormality. The results of surveillance should be used to protect and promote the health of the individual, each exposed worker, and the health of the exposed working population. Health assessment procedures may include, but are not limited to, medical examinations, biological monitoring, radiological examinations, questionnaires or a review of health records.

Workers and their representatives: Where reference is made in these guidelines to workers and their representatives, the intention is that, where representatives exist, they should be consulted or the means to achieve appropriate worker participation. In some instances it may be appropriate to involve all workers and all representatives.

Workers' representative: In accordance with the Workers' Representatives Convention, 1971 (No. 135), any person who is recognized as such by national law or practice, whether they are:

(a) trade union representatives, namely, representatives designated or elected by trade unions or by members of such unions; or

(b) elected representatives, namely, representatives who are freely elected by the workers of the *[organization]* in accordance with provisions of national laws or regulations or of collective agreements and whose functions do not include activities which are recognized as the exclusive prerogative of trade unions in the country concerned.

Workers' safety and health representative: Workers' representative elected or appointed in accordance with national laws, regulations and practice to represent workers' interests in OSH issues at the workplace.

Work-related injuries, ill health and diseases: Negative impacts on health arising from exposure to chemical, biological, physical, work-organizational and psychosocial factors at work.

Worksite: Physical area where workers need to be or to go due to their work which is under the control of an employer.

Hira Fatima (Assistant Director (EIA)-2)
EPA Punjab

Bibliography

Since its foundation in 1919, the ILO has elaborated and adopted a large number of international labour Conventions (and accompanying Recommendations) directly concerned with OSH issues, as well as many codes of practice and technical publications on various aspects of the subject. They represent a formidable body of definitions, principles, obligations, duties and rights, as well as technical guidance reflecting the consensual views of the ILO's tripartite constituents from its 183 member States[1] on most aspects of occupational safety and health.

Relevant ILO Conventions and Recommendations

Conventions

No.	Title
115	Radiation Protection, 1960
135	Workers' Representatives, 1971
136	Benzene, 1971
139	Occupational Cancer, 1974
148	Working Environment (Air Pollution, Noise and Vibration), 1977
155	Occupational Safety and Health, 1981
161	Occupational Health Services, 1985
162	Asbestos, 1986
167	Safety and Health in Construction, 1988
170	Chemicals, 1990
174	Prevention of Major Industrial Accidents, 1993
176	Safety and Health in Mines, 1995
*184	Safety and Health in Agriculture, 2001
*187	Promotional Framework for Occupational Safety and Health, 2006
*P155	Protocol of 2002 to the Occupational Safety and Health Convention, 1981

[1] As of October 2009.
* Added by the Office on the occasion of publication of the second edition (reprint of the first edition with additions to the bibliography).

Recommendations

No.	Title
114	Radiation Protection, 1960
144	Benzene, 1971
147	Occupational Cancer, 1974
156	Working Environment (Air Pollution, Noise and Vibration), 1977
164	Occupational Safety and Health, 1981
171	Occupational Health Services, 1985
172	Asbestos, 1986
175	Safety and Health in Construction, 1988
177	Chemicals, 1990
181	Prevention of Major Industrial Accidents, 1993
185	Safety and Health in Mines, 1995
^193	Safety and Health in Agriculture, 2001
^194	List of Occupational Diseases, 2002
^197	Promotional Framework for Occupational Safety and Health, 2006

Selected ILO codes of practice

Prevention of major industrial accidents (Geneva, 1991).
Safety and health in opencast mines (Geneva, 1991).
Safety and health in construction (Geneva, 1992).
Safety in the use of chemicals at work (Geneva, 1993).
Accident prevention on board ship at sea and in port (Geneva, 2nd edition, 1996).
Management of alcohol- and drug-related issues in the workplace (Geneva, 1996).
Recording and notification of occupational accidents and diseases (Geneva, 1996).
Protection of workers' personal data (Geneva, 1997).
Safety and health in forestry work (Geneva, 2nd edition, 1998).
Ambient factors in the workplace (Geneva, 2001).
**Use of synthetic vitreous fibre insulation wools (glass wool, rock wool, slag wool)* (Geneva, 2001).
**HIV/AIDS and the world of work* (Geneva, 2001).
**Safety and health in the non-ferrous metals industries* (Geneva, 2003).
**Workplace violence in services sectors and measures to combat this phenomenon* (Geneva, 2003).
**Safety and health in ports* (Geneva, 2005).
**Safety and health in the iron and steel industry* (Geneva, 2005).
**Safety and health in underground coalmines* (Geneva, 2009).

* Added by the Office on the occasion of publication of the second edition (reprint of the first edition with additions to the bibliography).

Relevant publications

ILO: *Declaration on Fundamental Principles and Rights at Work and its Follow-up, adopted by the International Labour Conference at its 86th Session, 1998*, Geneva, 1998.

—: *Encyclopaedia of occupational health and safety*, edited by Jeanne Mager Stellman. Geneva, 4th edition, 1998, 4-volume print version and CD-ROM.

—: *Technical and ethical guidelines for workers' health surveillance*. Occupational Safety and Health Series, No. 72. Geneva, 1998.

*—: *Declaration on Social Justice for a Fair Globalization, adopted by the International Labour Conference at its 97th Session, 2008*. Geneva, 2008.

United Nations Conference on Environment and Development (UNCED). Agenda 21 (Chapter 19 on environmentally sound management of chemicals). Rio de Janeiro, Brazil, 1992.

Hira Fatima (Assistant Director (EIA)-2)
EPA
a.dirieia.epa@pu...
9[illegible]

* Added by the Office on the occasion of publication of the second edition (reprint of the first edition with additions to the bibliography).

Annex

List of participants and observers at the Meeting of Experts on ILO Guidelines on Occupational Safety and Health Management System, Geneva, 19-27 April 2001

Experts appointed after consultation with governments

Mr. G.D. Caballero, Manager, Strategic Policy, Occupational Safety and Health Service, Department of Labour, Wellington (New Zealand).

Mr. N. Diallo, National Director of Employment and Labour Regulation, Ministry of Employment and the Public Service, Conakry (Republic of Guinea).

Dr. J.A. Lagunas Velasco, Director General, Secretariat of Labour and Social Protection, General Directorate of Occupational Safety and Health, Federal District (Mexico).

Dr. M. Podyniński, Deputy Director for Management Systems and Certification, Central Institute for Labour Protection, Warsaw (Poland).

Dr. K.U. Pöppelbuß, Federal Institute for Occupational Safety and Health, Dortmund (Germany).

Mr. [illegible], Chief, Section of Labour, Ministry of Labour and Employment, Regional Delegation of Labour and Employment, Belo Horizonte (Brazil).

Mr. M. Suzuki, Director, International Office, Ministry of Health, Labour and Welfare, Tokyo (Japan).

Experts appointed after consultation with the Employers' group

Dr. J. Adamson, Head of Environmental Affairs, Confederation of British Industry (CBI), London (United Kingdom).

Dr. S. Bolten, Head, Occupational Health and Safety Department, Management Systems and Auditing, Bayer AG, Leverkusen (Germany).

Dr. L. Gruss, Member of the Technical Group on Occupational Safety and Health, National Confederation of Industry (CNI), Rio de Janeiro (Brazil).

Mr. T. Jepsen, Danish Employers' Confederation, Copenhagen (Denmark).

Mr. L.A. Mattar, Executive Director, Federation of Egyptian Industries (FEI), Cairo (Egypt).

Mr. T. Ott, Senior Corporate Manager, Environment, Health and Safety, Motorola Labs., Tempe, Arizona (United States).

Mr. S. Tanaka, General Manager, Safety and Health Administration Section, Nissan Motor Co. Ltd., Yokohama City (Japan).

Experts appointed after consultation with the Workers' group

Dr. D. Bennett, National Director, Health, Safety and Environment, Canadian Labour Congress, Ottawa, Ontario (Canada).

Ms. C. Chiu, Director, Economic and Social Policy Department, International Confederation of Free Trade Unions (ICFTU) Asian and Pacific Regional Organization, Singapore (Singapore).

Mr. R. Eriksen, Industrial Hygienist, Norwegian Confederation of Trade Unions, Oslo (Norway).

Mr. P. Goguel-Chapuis, Technical Adviser in Health, Safety and Working Conditions (HSWC) and responsible for trade union training in HSWC, Trade Union Training Institute of the French Confederation of Christian Workers (CFTC), Paris (France).

Mr. T. Mellish, Trades Union Congress, London (United Kingdom).

Ms. F. Murie, Director of Occupational Health and Safety, International Federation of Building and Woodworkers (IFBWW), Carouge (Switzerland).

Ms. R. Rigotto, Professor, Federal University of Ceará (UFC), Fortaleza, Ceará (Brazil).

International governmental and non-governmental organizations represented

World Health Organization (WHO)
(Dr. D. Nelson, Occupational and Environmental Health Unit)

European Union
(Mr. D.R. Carruthers, DG Employment and Social Affairs, European Commission)

World Confederation of Labour (WCL)
(Ms. B. Fonclère, Permanent Representative)

International Confederation of Free Trade Unions (ICFTU)
(Mr. D. Cassiah, Director, ICFTU Geneva)
(Ms. A. Biondi, Assistant Director, ICFTU Geneva)

International Organisation of Employers (IOE)
(Ms. B. Perkins, Assistant to the Secretary General)

International Social Security Association (ISSA)
(Mr. R. David, Representative)

International Commission on Occupational Health (ICOH)
(Professor Alain Cantineau, Representative)
(Ms. I. Fanducchi, Representative)

International Occupational Hygiene Association (IOHA)
(Mr. H.G.H. Wilson, Representative)

International Metalworkers' Federation (IMF)
(Mr. L. Powell, Director of Occupational Health and Safety)

International Council of Nurses (ICN)
(Dr. M. Kingma, Representative)

International Construction Institute (ICI) and International Commission on Occupational Safety and Health (ICOH)
(Dr. B. Gochet, Representative)

American Industrial Hygiene Association (AIHA)
(Dr. C. Redinger, Representative)
(Dr. Z. Mansdorf, Representative)

Occupational Safety and Health Administration (OSHA), US Department of Labor
(Mr. Z. Bagdy, Deputy Director of Federal State)

Institution of Occupational Safety and Health (IOSH), United Kingdom
(Mr. J. Waldron, Representative)

Korea Occupational Safety and Health Agency (KOSHA)
(Mr. H. N. Choi, Representative)

International Labour Office (ILO)
(Mr. M.J. Chadwick, Representative)

ILO secretariat

Dr. J. Takala, Director, SafeWork – InFocus Programme on Safety and Health at Work and the Environment

Dr. J. Sedlatschek, Chief Editor, Occupational Safety Cluster, SafeWork – InFocus Programme on Safety and Health at Work and the Environment

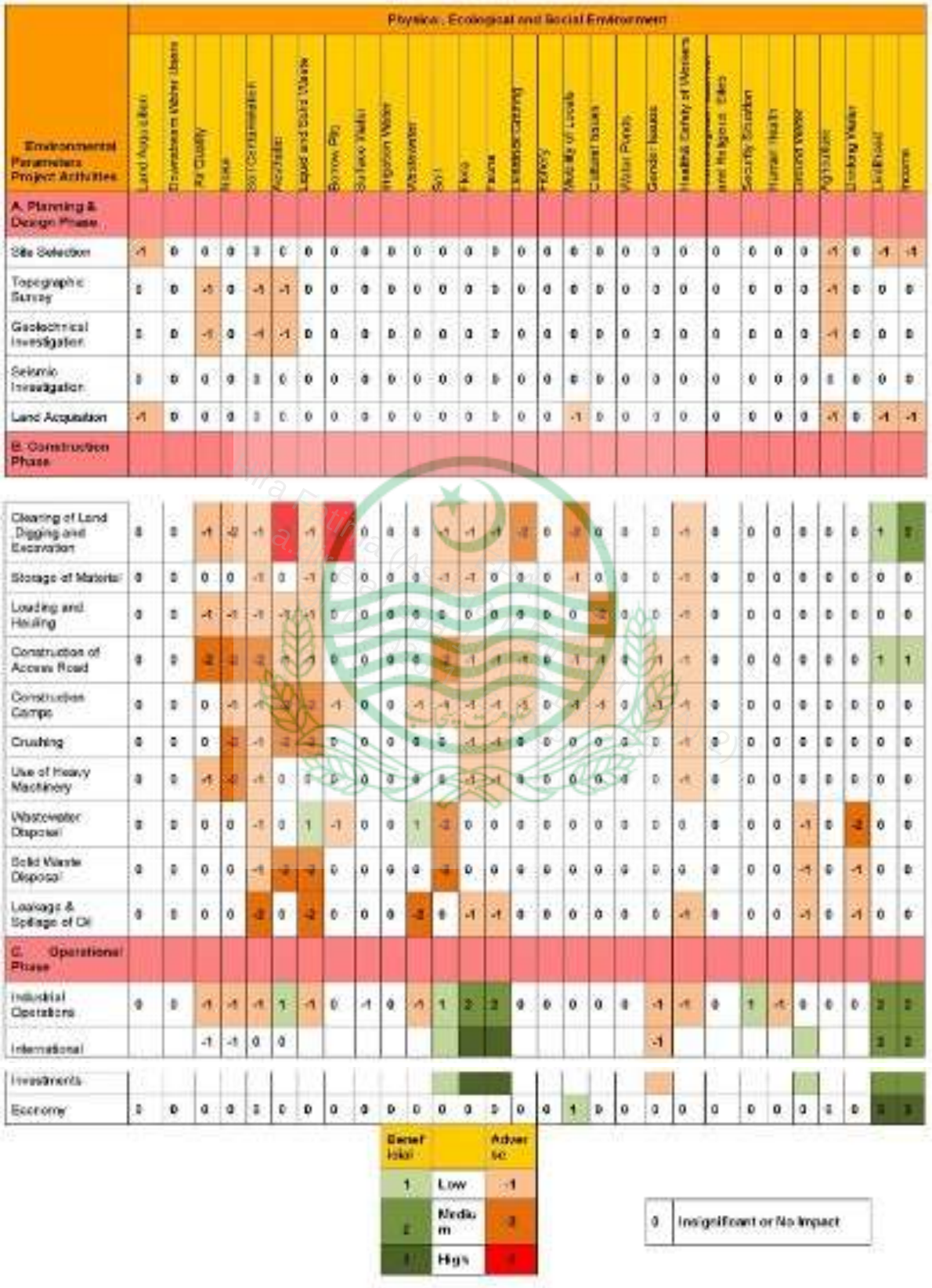
Mr. S. Machida, Chemical Safety Engineer, Occupational Safety Cluster, SafeWork – InFocus Programme on Safety and Health at Work and the Environment

Mr. P. Baicheu, Technical Specialist, Occupational Safety Cluster, SafeWork – InFocus Programme on Safety and Health at Work and the Environment

Ms. Johanna Boncador, Administrative Coordinator, SafeWork – InFocus Programme on Safety and Health at Work and the Environment

Dr. N. Byrnes, ILO Consultant, H.M. Principal Inspector, Health and Safety Executive, Bootle, United Kingdom

ANNEXURE - K: IMPACT MATRIX



ANNEXURE - L: SCREENING CHECKLIST

Adverse Impact -, Significant Adverse --, Beneficial Impact +, Highly Beneficial ++, No Impact 0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Sub-project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
1	**Atmosphere**					
a	Ambient Air	0	--	0	-	0
b	Primary Pollutants	0	--	0	-	0
c	Secondary Pollutants	0	-	0	0	0
d	Noise	0	--	0	-	0
e	Vibration	0	-	0	-	0
2	**Climate**					
a	Temperature	0	0	-	0	-
b	Precipitation	0	0	0	0	0
c	Relative Humidity	0	0	0	0	0
e	Evaporation	0	0	0	0	0
3	**Water Resources**					
a	Surface Water	0	0	0	0	0
	Rivers	0	0	0	0	0
	Streams	0	0	0	0	0
	Springs	0	0	0	0	0
	Wetland	0	0	0	0	0
	Flow	0	0	0	0	0
	Quality	0	0	0	0	0
	Usage	0	0	0	0	0
	Sediments	0	0	0	0	0
	Chemicals	0	0	0	0	0
	Pollution	0	0	0	0	0
	Erosion	0	0	0	0	0
b	Ground Water					
	Sources	0	0	++	+	++
	Depth	0	0	++	+	++

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Sub-project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
	Quantity	0	0	++	+	++
	Potential Extraction	0	0	++	+	++
	Usage	0	0	++	+	++
	Domestic Supply	0	0	0	0	0
	Industrial Water Supply	0	0	+	0	+
	Irrigation	0	0	0	0	0
	Hydropower Generation	0	0	0	0	0
	Quality	0	-	+	0	+
4	**Land Resources**					
a	Topography	0	0	0	0	0
b	Soil	0	-	0	0	0
c	Major Land use	0	0	0	0	0
5	**Ecological Environment**					
a	Terrestrial Ecology					
	Flora	0	-	0	0	+
	Fauna	0	0	0	0	0
b	Aquatic Ecology					
	Aquatic Flora	0	-	0	0	0
	Aquatic Fauna	0	0	0	0	0
	Fisheries	0	0	0	0	0
c	Wildlife	0	0	0	0	0
d	Forestry	0	0	0	0	0
e	Beneficial Plants and Animals	0	0	0	0	+
f	Endangered Species	0	0	0	0	0
6	**Socio-economic Environment**					
a	Institutional and Administrative Setup	0	0	0	0	+
b	Demography	0	0	0	0	0
c	Gender issues	0	0	0	0	0
d	Social Equity	0	0	0	0	0
e	Settlement Patterns	0	0	0	0	0
f	Land Holdings & Titling	0	0	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Sub-project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
g	Common Resource Rights	0	0	0	0	0
h	Fish	0	0	0	0	0
i	Wood	0	0	0	0	0
j	Grazing	0	0	0	0	0
k	Fodder	0	0	0	0	0
l	Domestic Energy and Fuel	0	0	0	0	0
m	Domestic Water Supply	0	0	0	0	0
n	Sanitation	0	0	0	0	0
o	Health	0	-	0	0	0
p	Waterborne Disease	0	-	-	0	+
q	Common Diseases	0	0	0	0	0
r	Mental Health	0	0	0	0	0
s	Human Nutrition	0	0	0	0	0
t	Education & Literacy	0	0	0	0	0
u	Cultural & Historical Sites	0	0	0	0	0
v	Religious Sites	0	0	0	0	0
w	Aesthetics	0	0	0	0	0
x	Landscape	0	0	0	0	0
y	Livelihood	0	0	0	0	0
z	Agriculture	0	-	0	-	0
	Livestock	0	0	0	0	0
	Forestry	0	0	0	0	0
	Fisheries	0	0	0	0	0
	Industry	0	0	0	++	++
	Other Cash Income	0	+	+	+	++
7	**Transport, Infrastructure & Communication**					
a	Roads	0	-	0	0	0
b	Tracks	0	-	0	0	0
c	Bridges	0	0	0	0	0
d	Pedestrian Tracks	0	-	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Sub-project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
e	Navigation	0	0	0	0	0
f	Energy and Power	0	-	0	0	0
g	Telecommunication	0	0	0	0	0
8	**Natural Risks and Hazards**					
a	Earthquake	0	0	0	0	0
b	Landslides	0	0	0	0	0
c	Storms	0	0	0	0	0
d	Floods	0	0	0	0	0
e	Erosion	0	0	0	0	0
f	Drought	0	0	0	0	0
g	Human Disease	0	0	0	0	0
h	Pollution	0	--	0	-	0
i	Social Instability	0	0	0	0	+
j	Economic Instability	0	+	+	0	++
k	Political Instability	0	0	0	0	0
9	**External Constraints**					
a	Upstream Constraints	0	0	0	0	0
b	Upstream Impacts	0	0	0	0	0
c	Downstream Constraints	0	0	0	0	0
d	Downstream Impacts	0	0	0	0	0

ANNEXURE - M: PPES ACCORDING TO HAZARDS

Objective	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic Helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.