



Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage Management
Urban Water Supply & Sanitation (Sector) Project
Project Management Office
Panipokhari, Maharajgunj, Kathmandu

Initial Environmental Examination (IEE)
Of
Panchkhal Water Supply and Sanitation Project
Kavre, Nepal



MAY, 2020

SUBMITTED TO: Ministry of Water Supply, Singhadurbar, Kathmandu

SUBMITTED BY: Project Management Office, Urban Water Supply and Sanitation (Sector) Project, Department of Water Supply and Sewerage Management, Panipokhari, Kathmandu

Prepared by: TAEC Consult P. Ltd. – Integrated Consultants Nepal (P) Ltd. JV

LIST OF ACRONYMS

A.D.	Anno Domini
ADB	Asian Development Bank
AM	Accountability Mechanism
AP	Affected Person
BoQ	Bill of Quantities
B.S.	Bikram Sambat
CAPP	Community and Public Participation Plan
CBS	Central Bureau of Statistics
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
CO	Carbon Monoxide
CRO	Complaint Receiving Officer
CSA	Concerned Sector Agency
DCC	District Coordination Committee
DDR	Due Diligence Report
DEDR	Detailed Engineering Design Report
DHM	Department of Hydrology & Meteorology
DMA	District Metered Area
DMC	Developing Member Countries
DoR	Department of Roads
DRTAC	Design Review and Technical Audit Consultant
DSMC	Design, Supervision and Management Consultant
DWSSM	Department of Water Supply and Sewerage Management
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EO	Environmental Officer
EPA	Environment Protection Act
EPR	Environment Protection Rules
ERDSMC	Eastern Regional Design Supervision and Management Consultant
ES	Environmental Specialist
ESA	Environmental Safeguard Assistant
ESE	Environmental Safeguard Expert

FGD	Focus Group Discussions
FRP	Fibre Reinforced Plastic
GoN	Government of Nepal
GPRS	General Packet Radio Services
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HHs	Households
IBAT	Integrated Biodiversity Assessment Tool
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICG	Implementation Core Group
IEC	Information, Education and Communication
IED	Intelligent Electric Device
IUCN	International Union for Conservation of Nature
IEE	Initial Environmental Examination
LC	Least Concern
MoFE	Ministry of Forest and Environment
MoPE	Ministry of Population & Environment
MoWS	Ministry of Water Supply
MWSS	Manufacturer Waste Scrap Shingles
NAAQS	National Ambient Air Quality Standards
NDWQS	National Drinking Water Quality Standard
NEA	Nepal Electricity Authority
NEPAP	National Environment Policy & Action Plan
no.	Number
NO ₂	Nitrogen Dioxide
NGO	Non-Governmental Organization
NRs	Nepalese Rupees
NTFP	Non-Timber Forest Products
NUDS	Nepal Urban Development Strategy
NVMES	Nepal Vehicles Mass Emission Standards
O&M	Operation and Maintenance
OBA	Output - Based Aid
ODF	Open Defecation Free
OHS	Occupational Health & Safety
P/A	Presence/Absence
PE	Polyethylene
pH	Power of Hydrogen/Potential for Hydrogen
PID	Project Information Datasheet

PID	Proportional Integral Derivative
PLC	Programmable Logic Controller
PM	Particulate Matter
PM _{2.5}	Particulate Matter 2.5 micrometers
PM ₁₀	Particulate Matter 10 micrometers
PMO	Project Management Office
PMQAC	Project Management and Quality Assurance Consultants
PN	Pressure Number
PPE	Personal Protective Equipment
RDSMCs	Regional Design Supervision and Management Consultant
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RoW	Right of Way
RPMO	Regional Project Management Office
RSF	Rapid Sand Filter
RTU	Remote Controller Unit
RVT	Reservoir Tank
SCADA	Supervisory Control and Data Acquisition
SEMP	Site Specific Environmental Management Plan
SDG	Sustainable Development Goal
SO ₂	Sulphur Dioxide
SPS	Safeguard Policy Statement
SS	Site Specific
SSTWSSSP	Second Small Towns Water Supply and Sanitation Sector Project
STWSSSP	Small Towns' Water Supply and Sanitation Sector Project
TDF	Town Development Fund
ToR	Terms of Reference
TSTWSSSP	Third Small Town Water Supply & Sanitation Sector Project
U/S	Upstream
UWSSP	Urban Water Supply & Sanitation (Sector) Project
VDC	Village Development Committee
VU	Vulnerable
WHO	World Health Organization
Wi Fi	Wireless Fidelity
WN	Ward Number
WSP	Water Safety Plan
WSSDO	Water Supply and Sanitation Divisional Office
WTP	Water Treatment Plant

WUA	Water Users' Association
WUSC	Water Users' and Sanitation Committee

WEIGHTS AND MEASURES

°C	Degree Celsius
amsl	Above Mean Sea Level
CFU/100ml	Colony Forming Units per 100 millilitre
dBa	decibel audible
ha	Hectares
HP	Horse Power
hr	Hour
Kg/sq.cm	Kilograms per square centimeter
Kg/day	Kilograms per day
Km	kilometer/s
Kph	kilometer/s per hour
KW	Kilo Watts
kVA	Kilo Volt Ampere
lpcd	Liter per capita day
lps	Liter per second
M	meter/s
m ²	square meter/s
m ³	cubic meter/s
mg/l	milligram/s per liter
mm	millimeters
NTU	Nephelometric Turbidity Unit
PPHA	Person Per Hectare

TABLE OF CONTENTS

TABLE OF CONTENTS	vi
EXECUTIVE SUMMARY	
1. INTRODUCTION	1
1.1. Background	1
1.2. Name and Address of the Individual Institution Preparing the Report.....	1
1.2.1 Name and Address of the Proponent.....	1
1.2.2 Name and Address of the Consultant preparing the Report	2
1.2.3 IEE Study Team.....	2
1.3 Purpose of IEE	2
1.4 Need for the Project	3
1.5 Rationale of the Project and IEE	3
2 DESCRIPTION OF THE PROJECT.....	5
2.1 Location & Accessibility.....	5
2.2 The Proposed Project.....	8
2.3 Salient Features of the Project	11
2.4 Water Supply Project Components/Features	16
2.4.1 Sources/Intakes	16
2.4.2 Electrical System.....	17
2.4.3 Interruption Chamber/ Break Pressure Tank.....	18
2.4.4 Transmission Mains & Pumping.....	19
2.4.5 Thrust Blocks, Saddle Blocks and Thrust Beam	19
2.4.6 Water Treatment Plant & Chlorination	20
2.4.7 Sump Reservoir/Service Reservoir	24
2.4.8 Distribution Mains & District Metered Area.....	24
2.4.9 House Connection.....	27
2.4.10 Appurtenances.....	27
2.4.11 Fire Hydrants	29
2.4.12 Generator House	29
2.4.13 Laboratory Building cum WUSC Office Building, Guard House and Dosing House	30
2.4.14 Boundary Wall & Retaining Wall	30
2.4.15 Miscellaneous Works	30
2.5 Sanitation Components	30
2.6 Construction Planning	31
2.6.1 Land Requirement for the project area.....	31
2.6.2 Energy Requirement.....	35
2.6.3 Human Resource Requirement	35
2.6.4 Construction Materials	35
2.6.5 Worker's Camp Site	36

2.6.6	Stockpiling Site	36
2.6.7	Cut and Fill Volume of Muck.....	36
2.6.8	Spoil Disposal Site	36
2.7	Project Activities	38
2.7.1	Construction Activities.....	38
2.7.2	Operation Activities	38
3	POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK.....	39
3.1	Nepal's Environmental Policy and Legal Framework	39
3.2	Environmental Agreements.....	50
3.2.1	International Environmental Agreements (Conventions & Treaties)	50
3.3	Environmental Standards.....	50
3.4	Environmental Assessment Requirements	53
3.4.1	Environmental Assessment Requirements of the ADB	53
3.4.2	Environmental Impact Assessment Requirements of Government of Nepal	56
4	METHODOLOGY	58
4.1	Literature review.....	58
4.2	Impact Area Delineation.....	58
4.3	Field Study	61
4.3.1	Physico-Chemical Environment.....	61
4.3.2	Biological Environment	62
4.3.3	Socio-economic and Cultural Environment	62
4.4	Public Notice & Public Consultation.....	62
4.5	Collection of Muchulkas (Deed of Inquiry) and Recommendation Letter	63
4.6	Impact Identification, Prediction & Evaluation Methods.....	63
5	EXISTING ENVIRONMENT	65
5.1	Existing Physical Environment	65
5.1.1	Landforms and Topography.....	65
5.1.2	Geology & Soil	65
5.1.3	Land use pattern	65
5.1.4	Water Resources	65
5.1.5	Climate.....	65
5.1.6	Water Quality	66
5.1.7	Air Quality	67
5.1.8	Acoustic Environment.....	67
5.2	Existing Biological Environment.....	67
5.2.1	Flora.....	67
5.2.2	Fauna.....	68
5.2.3	Aquatic Life	70
5.2.4	Protected Area.....	71
5.2.5	Community Forest Area.....	71
5.3	Socio-economic and Cultural Environment.....	71

5.3.1	Demographic Features	71
5.3.1.1	Settlement pattern	71
5.3.1.2	Population Distribution	72
5.3.1.3	Male/Female Ratio	73
5.3.1.4	Trend of Migration	73
5.3.2	Caste/Ethnic Groups.....	73
5.3.3	Household Heads	74
5.3.3.1	Male/Female.....	74
5.3.4	Economic Features.....	74
5.3.4.1	Landholding Size and Ownership.....	74
5.3.4.2	Economy: Occupation/Employment	75
5.3.4.3	Income & Expenditure	75
5.3.3.4	Willingness to Pay	76
5.3.3.5	Affordability.....	77
5.3.5	Education & Skills	77
5.3.6	Health and sanitation	78
5.3.6.1	Health Posts/Hospitals	78
5.3.6.2	Incidence of Water-Borne Diseases and Infectious Diseases	78
5.3.7	Community Infrastructure	79
5.3.7.1	Water Supply	79
5.3.7.2	Sanitation.....	83
5.3.7.3	Transportation	84
5.3.7.4	Irrigation, Communication & Electricity	84
5.3.8	Archeological Areas/Sites.....	84
5.3.9	Local Institutions	85
5.3.9.1	Water Supply and Sanitation User's Association	85
5.3.9.2	Governmental Organizations/NGOs/CBOs.....	86
5.3.10	Other Development Activities	86
6	ANALYSIS OF ALTERNATIVES.....	87
6.1	With and Without Project Alternatives.....	87
6.1.1	Without Project Alternatives or Do-nothing alternatives	87
6.1.2	With Project Alternative	88
6.1.2.1	Alternatives Relative to Planning and Design	88
7	ANTICIPATED ENVIRONMENTAL IMPACTS	90
7.1	Beneficial Impacts	90
7.1.1	Impact on Socio-economic Environment.....	90
7.1.1.1	Construction Phase	90
7.1.1.2	Operation Phase.....	91
7.2	Adverse Impacts	94
7.2.1	Impact on Physical Environment	94
7.2.1.1	Design Phase	94

7.2.1.2	Construction Phase	94
7.2.2	Impact on Biological Environment	96
7.2.2.1	Construction Phase	96
7.2.2.2	Operation Phase.....	97
7.2.3	Impact on Chemical Environment.....	98
7.2.3.1	Construction Phase	98
7.2.3.2	Operation Phase.....	98
7.2.4	Impact on Socio-economic Environment	98
7.2.4.1	Design Phase	98
7.2.4.2	Construction Phase	99
7.2.4.3	OperationPhase.....	101
7.3	Significance of Impact Rating	105
8	MITIGATION & AUGMENTATION MEASURES.....	106
8.1	Mitigation Measures	106
8.1.1	Impact on Physical Environment	106
8.1.1.1	Design Phase	106
8.1.1.2	Construction Phase	106
8.1.2	Impact on Biological Environment	110
8.1.2.1	Construction Phase	110
8.1.2.2	Operation Phase.....	111
8.1.3	Impact on Chemical Environment.....	111
8.1.3.1	Construction Phase	111
8.1.3.2	Operation Phase.....	112
8.1.4	Impact on Socio-economic Environment.....	112
8.1.4.1	Design Phase	112
8.1.4.2	Construction Phase	113
8.1.4.3	Operation Phase.....	115
8.2	Augmentation Measures	116
8.2.1	Impact on Socio-economic Environment.....	116
8.2.1.1	Construction Phase	116
8.2.1.2	Operation Phase.....	117
9	INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION.....	118
9.1	Stakeholder Consultation & Participation.....	118
9.2	Major issues raised by the stakeholders.....	120
10	GRIEVANCE REDRESS MECHANISM	123
10.1	Purpose of the Grievance Redress Mechanism	123
10.2	Proposed Set-Up.....	123
11	ENVIRONMENTAL MANAGEMENT PLAN.....	126
11.1	Introduction	126
11.2	Institutional Arrangement	126

11.2.1	Executing and implementing agencies.....	126
11.2.2	Safeguard Implementation Arrangement	126
11.3	Environmental Management Plan (EMP) Matrix.....	131
11.4	Environmental Monitoring Program	149
11.5	Institutional Capacity Development Program	150
11.6	Staffing Requirement and Budget.....	151
12.	MONITORING AND REPORTING.....	157
13.	CONCLUSION	158
14.	LITERATURE REVIEWED	160

LIST OF TABLES

Table 1-I:Details of IEE Study Team Members	2
Table 1-II: Criteria for Requirement of IEE for Drinking Water Supply Projects as per Schedule 1 (H) of Environment Protection Regulation 1997 Amendment 2017	4
Table 2-I: Panchkhal Municipality Ward Profile	7
Table 2-II:Salient features of the project.....	11
Table 2-III:Capacity and Number of Pump	17
Table 2-IV: Transformer and Diesel Generator.....	18
Table 2-V: Land Requirement & Ownership Details for the project components	32
Table 3-I: Other Relevant Environmental Act, Rules, Plan, Policies, and Guidelines of Nepal	41
Table 3-II: Relevant Environmental Quality Standards	50
Table 3-III: Standards for Ambient Air Quality	51
Table 3-IV: Standards for Ambient Noise Quality	52
Table 3-V: Standards for Drinking Water Quality.....	52
Table 3-VI: National Diesel Generators Emission Standards, 2012.....	53
Table 3-VII:SPS 2009 Safeguard Requirements	54
Table 3-VIII:The GoN IEE Report Preparation, Review, Approval and Implementation Process.....	56
Table 4-II: Significance of Impacts	64
Table 5-I: Average Monthly Rainfall at Panchkhal (Station no. 1036) of 2019 AD	66
Table 5-II:Average Monthly Temperature at Panchkhal (°C) of 2019 AD.....	66
Table 5-III: Plant Life Forms Found in the Project Area	67
Table 5-IV:Mammals in the Project Area.....	68
Table 5-V:List of Birds in the Project Area	69
Table 5-VI: List of Herpito-Fauna Found in the Project Area.....	70
Table 5-VII: List of Fishes Found in the Project Area.....	70
Table 5-VIII: Population and Growth Rate.....	72
Table 5-IX:Population and Growth Rate of Panchkhal Municipality	72
Table 5-X: Population and Growth Rate of Panchkhal Municipality	73

Table 5-XI:Distribution of Trend of Migration by Ward	73
Table 5-XII: Distribution of Households and Population by Ethnic Composition	74
Table 5-XIII: Distribution of Population by Sex and Family Size	74
Table 5-XIV: Land Holding Pattern in Service Area	75
Table 5-XV: Status of Land Ownership in Service Area.....	75
Table 5-XVI: Distribution of Occupation of Households by Ward.....	75
Table 5-XVII: Income Level of Households by Ward	76
Table 5-XVIII: Expenditure Level of Households by Ward	76
Table 5-XIX:Willingness to pay for monthly tariff by Ward.....	77
Table 5-XX:Education Status of Household Head by Ward	78
Table 5-XXI:Details of Existing Water Supply Systems	80
Table 5-XXII:Coverage of sanitary facilities.....	83
Table 5-XXIII:Existing Solid Waste Management Practices	84
Table 5-XXIV: Members of Panchkhal WSSP	85
Table 7-I: Summary of Impact Matrix of Beneficial Issues of the project	93
Table 7-II: Summary of Impact Matrix of Adverse Issues of the Proposed Project	102
Table 9-I:Stakeholder Analysis & Mapping.....	118
Table 11-I:Environmental Management Plan Matrix	131
Table 11-III:Training Program for Environmental Management	150
Table 11-IV:Indicative Cost of EMP Implementation	152
Table 11-V:Environmental Management Implementation Schedule.....	155
Table 11-VI: Proposed Topics for Capacity Building/Training	156

LIST OF FIGURES

Figure 2-I: Location Map of the Project Area.....	6
Figure 2-II: Schematic Layout of the Proposed Project	10
Figure 2-III: Flow Chart of Water Treatment Process	23
Figure 2-IV: District Metered Area (DMA) of the Proposed System	26
Figure 2-V: Location of Project Facilities	37
Figure 4-I: Project Impact Area	60
Figure 10-I: Grievance Redress Mechanism (Formal Approach)	125

LIST OF ANNEXES

Annex 1	: Approved Terms of Reference (TOR)
Annex 2	: Sample Forms, Formats & Templates
	Annex 2A: Rapid Environmental Assessment (REA) Checklist for Panchkhal WSSP and Preliminary Climate Risk Screening Checklist for Sample Project Towns
	Annex 2B: Relevant Environmental Quality Standards
	Annex 2C: Sample Grievance Redress Form
	Annex 2D: Sample Traffic Management Plan
	Annex 2E: Spoil Management Plan
	Annex 2F: Sample Semi-Annual Environmental Monitoring Report Template
	Annex 2G: Sample Environmental Site Inspection Report
Annex 3	: Public Notice, Deed of Inquiry (Muchulka), Recommendation Letters & Minutes of Meeting
Annex 4	: Sample Survey Questionnaire & Checklists
Annex 5	: Chlorine Use Guidelines
Annex 6	: Water Quality Test Reports
Annex 7	: Photographs

कार्यकारी सारांश

परिचय

१. यस पाँचखाल खानेपानी वितरण तथा सरसफाई आयोजना, शहरी खानेपानी तथा सरसफाई आयोजना अर्न्तगत प्रस्ताव गरिएको परियोजनाहरू मध्ये एक हो । एसियाली विकास बैंकबाट ऋण अनुदान तथा सहयोगमा निर्माण गरिएको विगतका तीन आयोजनाहरूको अनुभव र सफलतालाई आधार मानी वीसवटा आयोजनाहरूले विभिन्न शहरहरूमा समुदायद्वारा प्रबन्धित पानी आपूर्ति तथा सरसफाईमा पहुँच विस्तार गर्न नेपाललाई सहयोग पुर्याउने लक्ष्य रहेको छ । नेपालका शहरी नगरपालिकाहरूमा खानेपानी आपूर्ति तथा सरसफाई सेवा वितरणमा सुधार ल्याउने नेपाल सरकारको निरन्तर प्रयासलाई सहायता पुर्याउनको निम्ति यस शहरी आयोजनाको निरूपण भइरहेको छ । नेपाल सरकारको यहीँ प्रयासलाई समर्थन गर्दै एसियाली विकास बैंकले शहरी खानेपानी तथा सरसफाई आयोजनाका निम्ति लगानी गरेको छ । यस आयोजनाका अपेक्षित परिणामहरू निम्न वमोजिम छन् : क) आयोजना कार्यान्वयन गर्ने शहरहरूमा सुधारिएको पानी आपूर्ति र सरसफाईका पूर्वाधार र ख) सुदृढ संस्थागत र सामुदायिक क्षमता अभिवृद्धि
२. स्थलगत अध्ययनको क्रममा विद्यमान खानेपानी प्रणालीको वितरण सेवा अनियमित तथा अपुग रहेको र प्रस्तावित क्षेत्रका केही भागहरूमा मात्र सीमित रहेको पहिचान गरिएको छ । तसर्थ, विद्यमान खानेपानी प्रणालीले पाँचखाल शहरको वर्तमान माग समेत पूरा गर्न सकेको छैन । यसैगरी, विद्यमान खानेपानी आपूर्ति प्रणालीमा प्रशोधन केन्द्रको पनि व्यवस्था छैन । खानेपानीको माग र विद्यमान प्रणालीको अवस्थालाई ध्यानमा राख्दै निजी धारा जडानको बढ्दो मागलाई पूरा गर्न, प्रस्तावित सेवा क्षेत्रका जनतालाई वर्षभरि पिउने पानी उपलब्ध गराउन तथा सुरक्षित एवं विश्वसनीय पानी आपूर्ति सेवामा सहज पहुँच पुर्याउन, विद्यमान खानेपानी आपूर्तिको अवस्थालाई स्तरोन्नति गर्न प्रस्तावित आयोजनाको आवश्यकता रहेको छ ।
३. अध्ययन अनुसार प्रस्तावित आयोजना क्षेत्र नेपालको प्रदेश ३ को काभ्रे जिल्ला अर्न्तगत पाँचखाल नगरपालिकामा अवस्थित छ । प्रस्तावित पाँचखाल शहरको १३ वडाहरू मध्ये प्रस्तावित आयोजना क्षेत्रले वडा नं २, ३, ४, ६, ७, ८, ९, १०, ११ र १२ का आंशिक क्षेत्रहरू समेटेछ ।
४. यस आयोजनाको तर्क विश्वसनीय आयोजनाको बढ्दो माग, सुरक्षित खानेपानीका लागि भोग्नुपरेको कठिनाई, पानी महसुल भुक्तानी गर्न देखाएको इच्छुकता, किफायती, सार्वजनिक स्वास्थ्यमा पर्ने प्रभाव, नीतिगत प्रतिबद्धता र अन्य विभिन्न पक्षमा आधारित छ ।
५. यस आयोजनाको प्रारम्भिक वातावरणीय परीक्षणको अध्ययनको तर्क (EPA (१९९७ र २०१९ मा गरिएको संशोधन) र EPR (१९९७, सन् १९९९, २००७ र २०१७ मा गरिएको संशोधन) मा आधारित छ । यस आयोजनाले आधार वर्ष (२०२१) को करीब ३१,४१५ जनसंख्या तथा डिजाइन वर्ष (२०४०) को ४५,७६८ जनसंख्यालाई सुरक्षित र पिउनयोग्य पानीको विश्वसनीय एवं पर्याप्त आपूर्ति तथा उचित स्वच्छता र सरसफाईको प्रवर्धन मार्फत लाभ पुर्याउने अपेक्षा गरेको छ ।

आयोजनाको विवरण

६. प्रस्तावित आयोजनाले पानी आपूर्ति तथा सरसफाई सेवा प्रदान गर्ने अभिप्राय लिएको छ जसमा समावेश गरिएका संरचनाहरू यस प्रकार छन् ।

i) पानी आपूर्तिका संरचनाहरू

क) स्रोतहरू/इन्टेकहरू : आयोजनाका लागि एकमात्र भरपर्दो स्रोत सुनकोशी नदी रहेको छ । इनफिल्ट्रेसन ग्यालरीको निर्माण मार्फत यस नदीको किनारामा जमिनमुनिको सीपेज पानी निकालिनेछ । प्रस्तावित इन्टेक/सम्प वेल सुनकोशी नदीको दाहिने किनार, विमिरे दोभानको छेउमा अवस्थित छ जुन दोलालघाट

बजारको २.५ कि.मी. तल (अर्थात् सुनकोशी र इन्द्रावतीको संगमबाट २ कि.मी. तल दाँया किनारामा) मा रहेको छ।

ख) विद्युत प्रणाली : पानी प्रशोधन केन्द्रमा पानी पुर्याउनको लागि प्रत्येक पम्पिंग चरणमा पम्पिंग स्टेशन रहेको छ। उक्त पम्पहरु चलाउनको लागि विद्युतीय आपूर्तिको व्यवस्था गरिएको छ। पानी प्रशोधन केन्द्र/पानी टैंकीमा पानी आपूर्ति गर्न सम्प वेल, चरण २, चरण ३ र चरण ४ मा रहेका सबै पम्पहरु एकै पटक सञ्चालन गरिनेछ। सञ्चालनको चरणमा कुनै पम्प विघ्न भए बाँकी पम्पहरुले सम्प वेलबाट पानी प्रशोधन केन्द्र/पानी टैंकीमा पानी वितरण गर्न सक्नेछ।

ग) इन्टेरप्सन च्याम्बर/ब्रेक प्रेसर टैंकी : ब्रेक प्रेसर टैंकी ६ स्थानहरु, ५० घ.मी. क्षमता रहेका ब्रान्च ट्रान्समिशन लाइनमा १० घ.मी. क्षमता रहेको चिसापानी वितरण प्रणालीमा, गैरीगाउँ वितरण प्रणालीमा, RVT 9 को वितरण प्रणालीमा र २ वटा खरेलथोक प्रणालीमा निर्माण हुनेछन्।

घ) मूल प्रसारण लाइन र पम्पिंग : मूल प्रसारण लाइन अर्न्तगत तीन पाइपहरु समावेश छन् १) ग्रेभिटी मार्फत ब्रान्च ट्रान्समिशनमा जाने पाइप; २) पम्पिंग मार्फत पलाञ्चोक भगवतीतर्फ जाने पाइप र ३) पम्पिंग मार्फत भिमसेनथान WTP/ ब्याकवास RVT तर्फ जाने पाइप। सुनकोशी नदी इन्टेक/सम्प वेलबाट प्रस्तावित पानी प्रशोधन केन्द्र/सम्प RVT सम्मको कुल पाइप लम्बाई करीब ९,१३५.०० मी. रहेको छ जसमा २०० मी. मी. को दुईवटा समान्तर पाइप राखिएको छ। पानी प्रशोधन केन्द्र/सम्प RVT बाट ११ वटा RVT सम्मको कुल ब्रान्च ट्रान्समिशनको पाइप लम्बाई ३७,२३७.०० मी. रहेको छ जसमा PE पाइप र DI पाइप प्रयोग गरिएको छ।

ङ) थ्रस्ट ब्लक, स्याडल ब्लक र थ्रस्ट बीम : ट्रान्समिशन लाइन तथा वितरण लाइनका लागि २४ किलोग्राम प्रति वर्ग सेन्टिमिटरको प्रेसरको लागि सामान्य थ्रस्ट ब्लकहरु डिजाइन गरिएको छ। त्यस्तैगरी, भिरालो क्षेत्रहरुमा विछ्याइएको DI पाइपहरु र DI पाइपहरु नगाडिएको स्थानहरुमा थ्रस्ट बीम र स्याडल ब्लकको प्रावधान रहेको छ।

च) पानी प्रशोधन केन्द्र क्लोरिनेसन : प्रस्तावित पानी प्रशोधन केन्द्रमा एलम मिक्सिङ च्याम्बर, रचापिड फ्ल्यास मिक्चर, ब्याफल च्यानल फ्लकुलेटर, सेडिमेन्टेशन टैंकी र रचापिड स्यान्ड फिल्टर समावेश छन्। रचापिड स्यान्ड फिल्टरमा ब्याकवासिङको व्यवस्था रहेको छ। ब्याकवास रिजर्भोयर (RVT १२) को प्रावधान रहेको छ। यस RVT १२ ले ग्रेभिटी मार्फत खरेलथोक RVT ११ मा पानी आपूर्ति गर्नुको साथै फिल्टरलाई ब्याकवास गर्न पानी आपूर्ति गर्दछ। क्लोरिनेसनको लागि आवश्यक पाइप तथा फिटिङ प्रस्ताव गरिएको छ। यसका लागि FRP पम्पको प्रयोग गरिन्छ। डिजाइन अनुसार आधार वर्ष र डिजाइन वर्षको बेला क्रमश ६.६२ किलोग्राम प्रति दिन र ९.६५ किलोग्राम प्रति दिन बलिचिङ पाउडरको आवश्यक रहेको छ।

छ) सर्भिस रिजर्भोयर : यस प्रणाली बहु भण्डार अवधारणा प्रयोग गरी डिजाइन गरिएको हो। प्रत्येक पम्पिंग चरण २, ३ र ४ मा १५० घ.मि. क्षमता रहेको सम्प RVT र पानी प्रशोधन केन्द्र रहेको स्थानमा ४०० घ.मि. क्षमता रहेको एउटा RVT को व्यवस्था रहेको छ। त्यसको अलावा १५० घ.मि. क्षमता रहेको ब्याकवास RVT को पनि व्यवस्था रहेको छ जसले ग्रेभिटी मार्फत खरेलथोक RVT ११ मा पानी आपूर्ति गर्दछ। त्यस्तैगरी, त्यहाँ ११ वटा सर्भिस रिजर्भोयरहरुको प्रावधान रहेको छ जस अर्न्तगत १५० घ.मि. क्षमता रहेको ६ स्थानहरुमा (RVT १ U/S नगरपालिका-थुम्का, RVT २-अनेकोट, RVT ३-सशस्त्र RVT, RVT ४-बाखेलडिही RVT, RVT ७-जारेटार र RVT ८-शिखरपुर) RVTहरु, १०० घ.मि. क्षमता रहेको ३ स्थानहरुमा ३ वटा (RVT ५-राधाकृष्ण स्कुल, RVT ६-नयाँगाउँ र RVT १०-पलाञ्चोक) RVTहरु र ५० घ.मि. क्षमता रहेका २ वटा (RVT ९- 9N29, शाखा प्रसारण लाइनमा रहेका वस्तीहरुको लागी र RVT ११ - खरेलथोक RVT) आदि समावेश छन्। डिजाइन अवधिमा प्रणालीको लागि कुल भण्डारण आवश्यकता २३०० घ.मि हुनेछ।

ज) वितरण लाइन र डिस्ट्रिक्ट मिटरिड एरिया : सम्पूर्ण वितरण प्रणाली GI, DI र PE-100 पाइपको प्रयोग गरेर डिजाइन गरिएको छ । डिजाइनमा प्रयोग गरिएको न्यूनतम पाइप साइज PE-100-५० मि.मि रहेको छ, जसले वेगलाई नियन्त्रण गर्दछ । अनुमानित वितरण पाइपको लम्बाई १८९,३०९.०० मी रहेको छ । वितरण प्रणाली डिस्ट्रिक्ट मिटरिड एरिया (DMA) लाई ध्यानमा राखी डिजाइन गरिएको हो । सम्बन्धित सेवा क्षेत्रमा प्रवाह निर्धारण गर्न प्रत्येक DMA मा बल्क मीटर हुनेछ । प्रत्येक सर्भिस रिजर्भोयरबाट पानी आपूर्ति गर्न प्रस्तावित सेवा क्षेत्र भित्र १/१ वटा DMA हरू रहेका छन् ।

झ) घरधुरीमा धारा जडान : प्रत्येक घरधुरीले वितरण पाइपबाट सिधै घरको धारा जडान गर्नेछन् । प्रत्येक घरधुरी धारा जडानका लागि GI फिटिङ तथा भल्भ सँग जोडिएको फेरुल, कम्प्रेसन ज्वाइन्ट सहितको औसत १५ मीटर लम्बाईको २० मी.मी व्यासको PE-100 PN 16 को पाइप प्रयोग गरिनेछ । निर्माण सम्पन्न हुँदा यस प्रणालीमा ५,९९८ धाराहरु हुनेछन् । डिजाइन वर्षको अवधिमा ९,३१२ धाराहरु जडान हुनेगरी खानेपानी प्रणालीको डिजाइन गरिएको छ ।

ञ) पूरक संरचनाहरु : यसमा बल्कमिटर, वाशवाउट भल्भहरु, एयर भल्भहरु, कन्ट्रोल भल्भहरु, प्रेशर रिलिफ भल्भहरु, SCADA भल्भहरु र फायर हाइड्रन्टहरु समावेश छन् ।

ट) भल्भ च्याम्बर : प्रस्तावित प्रणालीको बहावलाई नियन्त्रण गर्न दुई किसिमका च्याम्बरहरु प्रस्ताव गरिएको छ। गैर-वाहन क्षेत्र र ग्रामीन क्षेत्रमा ईटाबाट बनेका च्याम्बरहरुको व्यवस्था गरिएको छ । अन्य सवारी वाहन र शहरी क्षेत्रमा ढलान गरिएको च्याम्बरहरुको व्यवस्था गरिएको छ । वितरण प्रणालीमा कुल १७९ वटा पाइप भल्भ बक्स र ३६ वटा वाशवाउट /एयर रिलिज/ कन्ट्रोल भल्भ च्याम्बरहरु डिजाइन गरिएको छ ।

ठ) जेनेरेटर हाउस/घर : प्रत्येक पम्पिंग चरण र पानी प्रशोधन केन्द्र रहेको स्थानमा जेनेरेटर हाउस/घर निर्माण हुनेछन् । NEA बाट नियमित बिजुली नभएको खण्डमा जेनेरेटरले प्रत्येक पम्पिंग चरणमा जडान गरिएका पम्पहरुका लागि विद्युत आपूर्ति गर्दछ । प्रत्येक चरणमा राखिएको दुई जेनेरेटरहरुले मागको ५०% पानी पम्प गर्दछ । यदि एक जेनेरेटर बिग्रियो भने केवल एक जेनेरेटर संचालित हुनेछ र २५% पानी आपूर्ति हुनेछ ।

ड) प्रयोगशाला भवनको साथै उपभोक्ता समितिको भवन, पाले घर र डोजिङ हाउस : दुई तले प्रयोगशाला भवनको साथै उपभोक्ता समितिको भवन डिजाइन गरिएको छ । यसलाई पाँचखाल बजारमा निर्माण गरिने प्रस्ताव गरिएको छ । प्रत्येक पम्पिंग चरण, ब्याकवास RVT भएको स्थान र ११ वटा सर्भिस रिजर्भोयरहरु भएको स्थानहरुमा सानो पाले घर (G1) व्यवस्था गरिएको छ । तसर्थ, जम्मा १६ वटा सानो पाले घर (G1) व्यवस्था गरिएको छ । यसैगरी, पानी प्रशोधन केन्द्र रहेको स्थानमा एउटा मध्यम खालको पाले घर (G2)को पनि व्यवस्था गरिएको छ ।

ढ) सीमा पर्खाल तथा टेवा पर्खाल : सम्प वेल भएको स्थान, पम्पिंग चरण २, ३ र ४ तथा पानी प्रशोधन केन्द्र भएको ठाउँहरुमा एवं आवश्यकता अनुसार रिजर्भोयर भएको प्रत्येक स्थानमा टेवा पर्खाल प्रस्ताव गरिएको छ । केही स्थानहरुमा टेवा पर्खालमाथि सीमा पर्खाल हुनेछ, र केहीमा सीमा पर्खाल जगबाटै निर्माण हुनेछ ।

ii) सरसफाई सम्बन्धि संरचनाहरु

७. यस आयोजना शहरको सरसफाईप्रतिको जागरुकताका साथै सरसफाईका गतिविधिको अवस्था सन्तोषजनक रहेको हाम्रो अध्ययनले देखाएको छ । यस आयोजनाले वर्तमान सरसफाईको अवस्थालाई उच्च स्तरमा बढावा दिने अभिप्राय लिएको छ । तसर्थ, प्रस्तावित आयोजनाले यस क्षेत्रको सुविधा सुधारका लागि संस्था एवं सर्वसाधारणलाई लक्षित गरी सार्वजनिक शौचालय निर्माणको प्रस्ताव गरेको छ । प्रस्तावित आयोजनाको सरसफाई सम्बन्धि संरचनाहरु अर्न्तगत एउटा संस्थागत शौचालय तथा एउटा सार्वजनिक शौचालयको

व्यवस्था गरिएको छ । फोहोर मैला संकलनका लागि एउटा ट्रयाक्टरको प्रावधान पनि रहेको छ। यसले फोहोर मैलालाई सही ढंगले डिस्पोज गर्ने कार्यमा चेतना ल्याउन तथा अनियमित ढंगले फोहोर मैला फालिने कार्यलाई नियन्त्रण गर्न मद्दत पुर्याउँदछ । यी सुविधाहरूले विद्यार्थी एवं सर्वसाधारण माभ्र शौचालयको प्रयोग तथा प्रभावकारी फोहोर मैला व्यवस्थापनको बानी बसाल्नेछ । तसर्थ, प्रस्तावित आयोजनाले शौचालय तथा फोहोर मैला व्यवस्थापनको प्रावधानको माध्यम मार्फत आधारभूत सरसफाई सम्बन्धि समस्याहरूलाई केही मात्रामा सम्बोधन गर्नेछ ।

अध्ययनविधि

८. एडीबीको सुरक्षा नीति विवरण (SPS 2009) र नेपाल सरकारको वातावरणीय आवश्यकताहरू (EPA (१९९७) र EPR (१९९७, सन् १९९९, २००७ र २०१७ मा गरिएको संशोधन सहित) को आधारमा यस प्रारम्भिक वातावरणीय परीक्षणको अध्ययन गरिएको छ । यस अध्ययन गर्नको लागि अपनाइएको पद्धतिमा निम्न समावेश छन् ;

क) लेख-रचनाहरूको समीक्षा : प्रस्तावित आयोजनाको बारे दोस्रो तहको जानकारी संकलन गर्न प्रासंगिक नक्शा, सम्भाव्यता प्रतिवेदन, डिटेल इन्जिनियरिङ डिजाइन प्रतिवेदन र ड्यु डेलिजेन्स प्रतिवेदन सहितका प्रतिवेदनहरू र अन्य सम्बन्धित प्रकाशित लेखहरूको समीक्षा गरियो ।

ख) प्रभावित क्षेत्रको चित्रण : आयोजना कार्यान्वयनका गतिविधिहरूबाट हुने महत्वपूर्ण वा नगण्य प्रभावहरूको असर पर्न सक्ने सम्भावित क्षेत्रहरूको पहिचान गर्नका लागि यो प्रभावित क्षेत्रको चित्रण गरियो । प्रस्तावित आयोजनाको गतिविधिका कारण पूर्वानुमानित प्रभावहरूको निकटता र परिमाणको आधारमा “मूल आयोजना क्षेत्र” (Core Project Area) र “आयोजना क्षेत्रको सेरोफेरो”(Surrounding Project Area) को रूपमा प्रभावित क्षेत्रहरूको चित्रण गरिएको छ ।

ग) स्थलगत अध्ययन : आयोजना शहरको मूल र वरपर क्षेत्रहरूको भौतिक-रसायनिक , जैविक र सामाजिक-आर्थिक अवस्थाको बारेमा आधारभूत जानकारी संकलन गर्न स्थलगत अध्ययन गरिएको थियो ।

घ) सार्वजनिक सूचना : प्रस्तावित आयोजनाको कार्यान्वयनबाट हुने सम्भावित असरहरू सम्बन्धि सम्बन्धित व्यक्ति र संस्थाहरूबाट लिखित राय लिनको लागि मिति २०७६/०८/०४ मा राष्ट्रिय दैनिक पत्रिका-आर्थिक अभियान दैनिकमा पन्ध्र दिने सार्वजनिक सूचना प्रकाशित गरियो । यस प्रकाशन अघि, सार्वजनिक सूचनाका प्रतिलिपिहरू वातावरण संरक्षण नियमावली, २०५४ अनुसार सम्बन्धित आधिकारिक कार्यालयमा टाँस गरिएको थियो ।

ङ) सार्वजनिक परामर्श : यो सार्वजनिक सूचनाको सम्बन्धमा इच्छुक सरोकारवालाहरूबाट सुझावहरूको पहिचान गर्नको लागि सार्वजनिक परामर्श गरियो ।

च) मुचुल्का र सिफारिस पत्रको संकलन : सम्बन्धित आधिकारिक कार्यालयहरूमा सार्वजनिक सूचना टाँस गरे लगत्तै सम्बन्धित कार्यालयहरूबाट मुचुल्का संकलन गरिएको छ । त्यस्तैगरी, सार्वजनिक सूचनाको प्रकाशन मितिबाट १५ दिन पछि स्थानीय आधिकारिक कार्यालय (नगरपालिका) बाट सिफारिस पत्र संकलन गरिएको छ ।

छ) प्रभाव पहिचान, पूर्वानुमान र मूल्यांकन : यो पद्धति अपेक्षित प्रभावको प्रतिकूलता निर्धारण गर्न सरल चेकलिष्ट र प्रश्नावली तथा विशेषज्ञको निर्णयको माध्यमबाट गरिएको छ ।

९. यस अध्ययनले अनुमोदित ToR मा उल्लिखित कार्यविधिको अनुसरण गरेको छ र यसमा छलफल गरिएका मुद्दाहरूलाई समेटेको छ ।

नीति, कानुनी र प्रशासनिक रूपरेखां

१०. प्रारम्भिक वातावरणीय अध्ययनको अवधिमा प्रस्तावित आयोजना निर्माणका गतिविधिहरूले सम्बन्धित नीति तथा कानूनको पालना गरेको छ कि छैन भनेर मूल्यांकन गर्नका निम्ति ती सम्बन्धित नीति, कानुनी र प्रशासनिक रूपरेखाको अध्ययनको आवश्यकता पर्दछ । यस आयोजनाको प्रारम्भिक वातावरणीय परीक्षणसँग सम्बन्धित मुख्य वातावरणीय ऐन, नियमहरू, योजना, नीतिहरू, दिशानिर्देशहरू निम्न उल्लिखित छन् :

क) प्रमुख कानुन, ऐन तथा नियमहरू: i) नेपालको संविधान; ii) वातावरण संरक्षण ऐन, वि.सं २०५३ (ई.स. १९९७); iii) वातावरण संरक्षण नियमावली वि.सं २०५४ (ई.स. १९९७) र पाचौं संशोधन वि.सं २०७३ (ई.स. २०१७)

ख) योजना, नीति तथा रणनीतिहरू : i) राष्ट्रिय वातावरणीय नीति तथा कार्य योजना, वि.सं २०५० (ई.स. १९९३); ii) जलस्रोत रणनीति, वि.सं २०५९ (ई.स. २००२); iii) ग्रामीण खानेपानी तथा सरसफाई नीति, तथा ग्रामीण खानेपानी तथा सरसफाई रणनीति, वि.सं २०६० (ई.स. २००४); iv) ग्रामीण खानेपानी तथा सरसफाई क्षेत्रीय रणनीतिक नीति, वि.सं २०६० (ई.स. २००४); v) राष्ट्रिय जल योजना, वि.सं २०६२ (ई.स. २००५); vi) राष्ट्रिय शहरी नीति, वि.सं २०६३ (ई.स. २००७) ; vii) राष्ट्रिय शहरी खानेपानी तथा सरसफाई क्षेत्रगत नीति, वि.सं २०६५ (ई.स. २००९); viii) साना शहर खानेपानी तथा सरसफाई क्षेत्रका लागि परिमार्जित पन्ध्र वर्षे विकास योजना, वि.सं २०६६ (ई.स. २००९ तथा २०१५ मा गरिएको संशोधन); ix) राष्ट्रिय खानेपानी आपूर्ति तथा सरसफाई नीति , वि.सं २०७१ (ई.स. २०१४); x) भूमि अधिग्रहण, पुर्नस्थापना र पुर्नवास नीति, ई.स. २०१५; xi) भु-उपयोग नीति, वि.सं २०७२ (ई.स. २०१५); xii) राष्ट्रिय शहरी विकास रणनीति, वि.सं २०७४ (ई.स. २०१७); xiii) राष्ट्रिय भूमि नीति, वि.सं २०७५ (ई.स. २०१९); xiv) राष्ट्रिय वन नीति, वि.सं २०७५ (ई.स. २०१९); xv) पन्ध्रौं तीन वर्षे योजना (२०७६/७७-२०८०/८१) र xvi) राष्ट्रिय वातावरण नीति, (वि.सं २०७६ (ई.स. २०१९);

ग) कानुन तथा ऐनहरू : i) आवश्यक वस्तु संरक्षण ऐन, वि.सं २०१२ (ई.स. १९५५); ii) जलचर संरक्षण ऐन, वि.सं २०१७ (ई.स. १९६१) तथा संशोधन वि.सं २०५५ (ई.स. १९९७); iii) शहरी विकास ऐन, वि.सं २०४५ (ई.स. १९९८); iv) जल स्रोत ऐन, वि.सं २०४९ (ई.स. १९९२); v) बालश्रम निषेध तथा विनियमन ऐन, वि.सं २०५६ (ई.स. २००१); vi) खानेपानी व्यवस्थापन बोर्ड ऐन, वि.सं २०६३ (ई.स. २००६); vii) फोहोर मैला व्यवस्थापन ऐन, वि.सं २०६८ (ई.स. २०११); viii) श्रम ऐन, वि.सं २०७४ (ई.स. २०१७) ; ix) स्थानिय सरकार सञ्चालन ऐन, वि.सं २०७४ (ई.स. २०१७); x) उपभोक्ता संरक्षण ऐन, वि.सं २०७५ (ई.स. २०१८); xi) वन ऐन, वि.सं २०७६ (ई.स. २०१९); र xii) भूमि प्रयोग ऐन, वि.सं २०७६ (ई.स. २०१९)

घ) नियम तथा नियमावलीहरू : i) फोहोर मैला (व्यवस्थापन तथा स्रोत परिचालन) नियम, वि.सं २०४४ (ई.स. १९८७) तथा संशोधन वि.सं २०४९ (ई.स. १९९२); ii) जलस्रोत नियमावली, वि.सं २०५० (ई.स. १९९३); iii) वन नियमावली, वि.सं २०५१ (ई.स. १९९५); iv) खानेपानी नियमावली, वि.सं २०५५ (ई.स. १९९८); v) फोहोरमैला व्यवस्थापन नियमावली, वि.सं २०७० (ई.स. २०१३) र vi) श्रम नियमावली, वि.सं २०७५ (ई.स. २०१८)

ङ) निर्देशिका तथा पुस्तिका : i) राष्ट्रिय वातावरणीय प्रभाव मूल्यांकन दिशानिर्देश, वि.सं २०४९ (ई.स. १९९३); ii) सामुदायिक ध्वनिका लागि विश्व स्वास्थ्य संस्थाको दिशानिर्देश , वि.सं २०५५ (ई.स. १९९९) ; iii) विश्व स्वास्थ्य संस्थाको वायु गुणस्तर दिशानिर्देश , वि.सं २०६१ (ई.स. २००५); iv) राष्ट्रिय ध्वनि मानक दिशानिर्देश, वि.सं २०६८ (ई.स. २०१२); v) सरकारी जग्गाबाट रुखहरू हटाउनका लागि निर्देशिका, वि.सं

२०७१ (ई.स. २०१४); vi) खानेपानी गुणस्तरका लागि विश्व स्वास्थ्य संस्थाको दिशानिर्देश, चौथो संस्करण, वि.सं २०७३ (ई.स. २०१७) र vii) “राष्ट्रिय प्राथमिकता प्राप्त योजनाको लागि राष्ट्रिय वन क्षेत्र प्रयोग गर्ने सम्बन्धी कार्यविधि-२०७४”

११. प्रस्तावित आयोजनाका पूर्वानुमानित वातावरणीय प्रभावहरूप्रति यस आयोजना क्षेत्रको वातावरणीय पक्षहरूको संवेदनशीलताको पहिचान गर्न यस आयोजना शहरको वर्तमान वातावरणबारे जानकारी आवश्यक पर्दछ। यसै सन्दर्भमा, डेस्क अध्ययनको क्रममा साहित्य समीक्षाको माध्यममार्फत वर्तमान वातावरणको द्वितीयक जानकारी प्राप्त गरिएको छ। यद्यपि, प्रारम्भिक वातावरणीय परीक्षणका लागि यी माध्यमिक तहको जानकारी पर्याप्त भने छैन। तसर्थ, वर्तमान वातावरणीय अवस्थाबारे प्राथमिक जानकारी लिन स्थलगत अध्ययन गरियो।
१२. यसै सन्दर्भमा स्थलगत अध्ययनको समयमा क) भौतिक वातावरणीय पक्ष अन्तर्गत स्थलकृति, भूमि जमिन प्रयोगको वर्गीकरण, भूविज्ञान, जलस्रोतहरू, जलवायु, वायुको गुणस्तर, ध्वनिक वातावरण, भुक्षय संवेदनशीलता; ख) जैविक वातावरण अन्तर्गत वनस्पति, वन्यजन्तु, संरक्षित क्षेत्र, सामुदायिक वन क्षेत्र; जस्ता बारे आवश्यक विवरणहरू साधारण चेकलिस्ट, REA चेकलिस्ट, विशेषज्ञ निर्णय तथा स्थानिय एवं सम्बन्धित निकाय सँगको अन्तर्क्रिया मार्फत संकलन गरियो। आयोजना क्षेत्रभित्र कुनै पनि संरक्षित क्षेत्र तथा सामुदायिक वन क्षेत्रहरू अवस्थित नरहेको स्थलगत अध्ययनको क्रममा देखिएको छ।
१३. त्यस्तैगरी, प्रस्तावित आयोजनामा प्रयोग हुने जलस्रोतहरूको पानीको गुणस्तरबारे विवरण संकलन गर्न पानीको नमुना संकलन गरी स्वीकृति प्राप्त प्रयोगशालामा परीक्षण गरियो।
१४. स्थलगत अध्ययनको क्रममा, सामाजिक आर्थिक वातावरण अन्तर्गत जनसांख्यिक विशेषताहरू, जाति/जातिय समूह, आर्थिक विशेषताहरू, शिक्षा तथा सीप, सामुदायिक पूर्वाधारहरू इत्यादि सम्बन्धि विवरणहरू साधारण प्रश्नावली प्रक्रिया हुँदै घरघुरी सर्वेक्षण र स्थानियसँगको अन्तर्क्रिया मार्फत संकलन गरियो। यसै सन्दर्भमा पानीको मासिक महसुल तिर्ने सम्बन्धि तत्परता, अग्रिम नगद योगदानका लागि तत्परता र तिर्ने सक्ने क्षमताबारे पनि मुल्यांकन गरियो। नमुना घरघुरी सर्वेक्षण अनुसार ३०० घरघुरी मध्ये १००% ले नै र ५९९८ घरघुरी मध्ये ९८.९५% ले कमशः पानीको मासिक पानीमहसुल तिर्ने सम्बन्धि र अग्रिम नगद योगदान सम्बन्धि इच्छुकता व्यक्त गरेका छन्। यसले यस आयोजना शहरका बासिन्दाहरूको विद्यमान पानीको समस्याबाट छुटकारा पाउन लागी सञ्चालन गर्न लागिएको छ। त्यस्तैगरी, सर्वेक्षणले ५९९८ घरघुरी मध्ये ११% (६५९) घरघुरीहरू विपन्न वर्ग अन्तर्गत रहेको देखाएको छ भने २७.९०% (१६७१) घरघुरीले प्रति महिना रु.७,५००.०० भन्दा कम खर्चिने गरेको देखाएको छ। तसर्थ, यसले मासिक आय र व्यय स्तरको आधारमा प्रस्तावित आयोजनाको लागि समुदायको सामर्थ्यताको संकेत गर्दछ।

वैकल्पिक विश्लेषण

१५. प्रस्तावित आयोजनाको वैकल्पिक विश्लेषण, यस प्रारम्भिक वातावरणीय परीक्षणको अर्को मुख्य प्रक्रिया हो जसले प्राविधिक, वातावरणीय तथा सामाजिक पक्षहरूको सन्दर्भमा आयोजनाको सम्भाव्यताको परीक्षण गर्न मद्दत पुर्याउँछ। मुख्यतया यस प्रक्रिया अन्तर्गत “आयोजना विना” विकल्प र “आयोजना सहित” विकल्प जस्ता दुई विकल्पहरू समावेश गरिएका छन्। निरन्तर खानेपानी प्रणाली, प्रशोधन प्रणाली तथा पानीजन्य रोगप्रतिको संवेदनशीलताको सन्दर्भमा “आयोजना विना” विकल्पको सीमितताले “आयोजना सहित” विकल्पको छनौट तर्फ उन्मुख गराएको छ। प्रस्तावित आयोजनाका सम्भावित फाइदाहरूको मनन मार्फत “आयोजना सहित” विकल्पको विश्लेषण गरिएको छ। आधार वर्ष २०१८ कोअनुसार २९,६०३ जनसंख्यामाभू विश्वसनीय, पर्याप्त, सुरक्षित र पिउन योग्य खानेपानीको सुविधाजनक पहुँच प्रदान गर्न आयोजना डिजाइन गरिएको छ।
१६. अध्ययन प्रतिवेदन अनुसार प्रस्तावित शहरको लागि प्रणालीकृत डिजाइन दुई परिदृश्य अन्तर्गत गरिएको छ। प्रस्तावित आयोजनामा विकल्पहरूको विकास, वैकल्पिक प्रणाली लेआउट (खाका) प्रयोग गरेर अन्य प्यारामिटरहरू स्थिर राखी गरिएको छ। सुनकोशी जलस्रोत बाहेक अरु कुनै भरपर्दो स्रोत सेवा क्षेत्रको वरपर नरहेको विश्लेषणले देखाउँदछ। तसर्थ, प्रस्तावित आयोजनाका लागि सुनकोशी नदी मात्र सम्भावित जलस्रोत

रहेको छ । डिजाइनको सम्बन्धमा, दुवै विकल्पहरूमा, पानी प्रशोधन केन्द्र देखि वितरण सञ्जाल सम्मका सरंचनाहरू समान रहेको छ । वितरण सञ्जाल पनि दुवै विकल्पहरूका लागि समान छन् ।

१७. प्रस्तावित विकल्पहरू बीचको मुख्य भिन्नता भनेको ट्रान्समिशन पाइपलाइनको डिजाइन रहेको छ । विकल्प १ मा सुनकोशी नदीबाट दुई समानान्तर पाइपहरूको साथ पम्पिंग मार्फत आवश्यक प्रवाहको प्रयोग तथा ११ वटा पानी टैंकीद्वारा वितरण प्रणालीमा पानी आपूर्ति समावेश छन् भने विकल्प २ मा सुनकोशी नदीबाट एकल पाइपबाट पम्पिंग मार्फत आवश्यक प्रवाहको प्रयोग तथा १० वटा पानी टैंकीद्वारा वितरण प्रणालीमा पानी आपूर्ति समावेश छन् । वातावरणीय रूपमा, यी विकल्पहरूबीच त्यस्तो कुनै ठूलो भिन्नता छैन र दुवै विकल्पहरूमा कुनै पनि त्यस्तो वातावरणीय समस्याहरू छैनन् । सामाजिक रूपले, दुवै विकल्पहरू समान चरणमा छन् । आर्थिक रूपमा, विकल्प २, विकल्प १ भन्दा थोरै किफायती रहेको यस वैकल्पिक विश्लेषणले देखाएको छ । यद्यपि यदि प्रस्तावित आयोजनाका लागि विकल्प २ को छनौट गरियो भने आर्थिक तवरले यो सस्तो लाग्न सक्छ तर प्राविधिक रूपमा यो प्रणाली असफल हुन सक्छ किनकि भविष्यमा पाइप विग्रिएको अवस्थामा पानी आपूर्ति सेवामा अवरोध आउने सम्भावना बढी रहेको छ । तसर्थ, विकल्प १ को लागत विकल्प २ भन्दा अलि बढी भएतापनि थप अध्ययनका लागि विकल्प १ लाई सिफारिश गरिएको छ । सोही अनुरूप समुदायमा प्रतिवेदन प्रस्तुत गरिएकोमा विकल्प १ नै राख्ने निर्णय भएकोले विस्तृत डिजाइन सोही अनुरूप तयार गरिएको छ ।

पूर्वानुमानित वातावरणीय प्रभावहरू

१८. स्थलगत अध्ययनको अवधिमा एकत्रित गरिएको जानकारीहरूको गरिएको विश्लेषणले प्रस्तावित आयोजनाको परिणामस्वरूप देखिने वातावरणीय प्रभावहरूको पहिचान तथा पूर्वानुमान गर्न मद्दत पुर्याउँछ । राष्ट्रिय वातावरणीय प्रभाव मुल्यांकन निर्देशिका, ई. सं. १९९३ अनुसार तय गरिएको स्कोरिङ म्याट्रिक्स प्रयोग गरी अनुमानित प्रभावहरूको प्रकृति, सीमा र परिमाण निर्धारण गर्न यी प्रभावहरूको मुल्यांकन गरियो । यो मुल्यांकनले प्रत्येक प्रभावकालागि उपयुक्त न्यूनिकरण विधि प्रस्ताव गर्न थप मद्दत गर्नेछ ।
१९. यी प्रत्याशित वातावरणीय प्रभावहरूलाई मुख्यतया यिनका नकारात्मक र सकारात्मक महत्वको आधारमा दुई भागमा वर्गीकृत गरिएको छ : क) लाभदायी प्रभाव र ख) प्रतिकूल प्रभाव । यी वर्गीकृत गरिएको प्रभावहरूलाई वर्तमान वातावरणमा पर्ने असरहरूको आधारमा थप चार प्रभावहरूमा वर्गीकृत गरिएको छ: क) भौतिक वातावरणीय प्रभाव ख) जैविक वातावरणीय प्रभाव ग) रासायनिक वातावरणीय प्रभाव र घ) सामाजिक तथा आर्थिक वातावरणीय प्रभाव । यी चार प्रभावहरूलाई आयोजनाको चरण अनुसार पुन तीन भागमा विभाजन गरिएको छ जस अन्तर्गत क) डिजाइन चरण, ख) निर्माण चरण र ग) सञ्चालन चरण समावेश छन् ।
२०. यहाँ लाभदायिक प्रभावहरू अन्तर्गत रोजगार श्रृजना, क्षमता अभिवृद्धि, स्थानीय व्यापार तथा व्यापारिक अवसरहरू, सुधिएको स्वास्थ्य तथा सरसफाई, आर्थिक अवसरहरूमा वृद्धि, प्रणालीको दिगोपनमा पर्ने प्रभाव र सामाजिक सशक्तिकरण जस्ता प्रभावहरू समावेश छन् । त्यस्तैगरी, भूक्षय, माथिल्लो मलिलो माटोमा पर्ने क्षति, वायु प्रदुषण, ध्वनि प्रदुषण, निर्माण क्षेत्र एवं श्रमिक शिविरबाट फोहोर मैला एवं फोहोर पानीको उत्पन्न, जमिन प्रयोगको वर्गीकरणमा पर्ने प्रभाव, प्राकृतिक ढल निकासमा अवरोध, भण्डारण गरिएको दाईन्धन/रसायनको आकस्मिक चुहावट, भत्काइएका अवशेष बाट निस्किएका फोहोरको अनुचित ढँगबाट गरिएको विघटनको प्रभाव, खोला नालामा पर्ने प्रभाव, वनस्पति तथा वन्यजन्तुमा पर्ने प्रभाव, जलचरमा पर्ने प्रभाव, वन डढेलो, वन अतिक्रमण, नजिकैको नदीनालाको पानीको गुणस्तरमा पर्ने प्रभाव, पानी निकायमा पर्ने प्रभाव, सरंचनात्मक अस्थिरता, सामुदायिक स्वास्थ्य र सुरक्षामा हुनसक्ने जोखिमहरू, हाल प्रदान भइरहेको सुविधाहरूमा हुनसक्ने क्षति, ट्राफिक जाम, स्थानिय विक्रेताको व्यवसायमा अवरोध, बाल श्रमको परिचालन, डाउनस्ट्रीम प्रयोगकर्ताहरूमा पर्ने प्रभाव, पेशागत स्वास्थ्य र सुरक्षामा हुनसक्ने जोखिमहरू, खानेपानी वितरण प्रणालीमा आइपर्ने जटिलता, उपभोक्ताको स्वास्थ्यमा पर्ने प्रभाव, कच्चा स्लज जथाभावी तवरले फालिँदा देखिने प्रभाव र आयोजनाका कार्यहरूको दिगोपनमा पर्ने प्रभाव जस्ता प्रभावहरू प्रतिकूल प्रभाव अन्तर्गत समावेश छन् ।

न्यूनिकरण तथा वृद्धि-विकासका उपायहरू

२१. माथि उल्लिखित प्रत्याशित प्रतिकूल वातावरणीय प्रभावहरूको न्यूनिकरण तथा लाभदायिक प्रभावहरूको वृद्धि-विकासका उपायहरूको प्रस्ताव गरिएको छ । यी उपायहरू अर्न्तगत मुख्यतः भिरालो ठाउँहरूको सुरक्षाका उपायहरू, वायु गुणस्तर अनुगमन, ध्वनि गुणस्तर अनुगमन, फोहोर मैला व्यवस्थापन, शीघ्र माटो पुर्ने, इन्धन तथा रसायनको उचित व्यवस्थापन, श्रमिक तथा सामुदायिक स्वास्थ्य एवं सुरक्षा सम्बन्धि हुनसक्ने खतराहरू सम्बन्धि चेतनामूलक कार्यक्रमहरूको सञ्चालन, पानी प्रशोधन प्रणालीको अनुगमन, क्लोरिनको उचित व्यवस्थापन इत्यादि जस्ता उपायहरू समावेश छन् । यी उपायहरू अध्याय ८ मा विस्तारमा वर्णन गरिएको छ । यदि यी प्रस्तावित विधिहरू उचित ढंगले अपनाउने हो भने आयोजनाको निर्माण तथा सञ्चालन चरणमा कुनै उल्लेखनीय वातावरणीय समस्याहरूको सामना गर्नुपर्ने छैन । त्यस्तैगरी, प्रस्तावित आयोजनाका प्रत्याशित लाभदायिक प्रभावहरूलाई अबै माथि उकास्नको निम्ति विभिन्न उपयुक्त वृद्धि-विकासका उपायहरूको पनि प्रस्ताव गरिएको छ ।

सूचना प्रवाह, परामर्श तथा सहभागिता

२२. हितग्राहीहरूसँगको परामर्श तथा सामुदायिक सहभागिता यस आयोजनाको तयारीको क्रममा अपनाइने महत्वपूर्ण प्रक्रिया हो । यो सरोकारवाला तथा प्रभावित व्यक्तिहरूलाई संलग्न गराउने प्रक्रिया हो । यस प्रक्रियामा प्रमुख सूचनादातासँगको अर्न्तवार्ता, सम्बन्धित उपभोक्ता समितिसँगको स्थलगत छलफल तथा उपभोक्ताहरूसँग गरिने स्थलगत छलफल जस्ता प्रक्रियाहरू समावेश छन् । उपभोक्ताहरूसँगको परामर्श अधि सम्भावित उपभोक्ताहरू र आयोजना कार्यान्वयनप्रति यिनको भुमिकाको पहिचान गर्नको निम्ति उपभोक्ता विश्लेषण र म्यापिङ्ग (चित्रण) गरिन्छ । यस पश्चात् आयोजना सम्बन्धि सूचना प्रवाह गर्न, उपभोक्ताहरूको सुझाव तथा सल्लाह संकलन गर्न र आयोजनाप्रति उनीहरूले देखाएका चासोका विषयहरूलाई जोड दिन यी सम्भावित उपभोक्ताहरूलाई परामर्शमा संलग्न गराइन्छ । उपभोक्ताहरूसँगको परामर्शका प्रक्रियाहरू यस आयोजनाको निर्माण तथा सञ्चालनको अवधिभरी जारी रहनेछ । उपभोक्ताहरूको संलग्नतालाई सहज बनाउन आयोजना व्यवस्थापन कार्यालय (PMO) तथा कार्यान्वयन केन्द्रिय समूह (ICG)ले सम्बन्धित उपभोक्ता समिति र नगरपालिकासँग राम्रो सञ्चार तथा सहकार्य कायम गर्नेछ ।

गुनासो सुनवाई संयन्त्र

२३. यस आयोजनाले निम्त्याएका अप्रत्याशित सामाजिक तथा वातावरणीय असरहरूप्रति भएका गुनासाहरूको समाधानको गुनासो सुनवाई संयन्त्र (GRM) रहेको छ । यस संयन्त्र मुख्य हितग्राहीहरूसँग गरिएको परामर्शबाट निर्माण गरिएको हो जसले निम्न उल्लिखित बुँदाहरूको सुनिश्चितता जनाउनेछ :
- क) यस आयोजनाले निम्त्याएको प्रतिकूल सामाजिक तथा वातावरणीय प्रभावहरूबाट पीडित हरेक व्यक्तिको आधारभूत अधिकार र चासोको सुरक्षा
 - ख) ती व्यक्तिहरूको समस्यालाई समयमै प्रभावकारी ढंगले सम्बोधन गर्ने
२४. यस संयन्त्र अन्तर्गत नगरपालिकाको स्तरमा गुनासो सुनवाई समितिको गठन समावेश छन् । यी गठन गरिएको समितिमा निम्न उल्लिखित सदस्यहरू समावेश गरिने छन् :
- क) उपभोक्ता समितिको सचिव
 - ख) क्षेत्रिय आयोजना व्यवस्थापन कार्यालयको इन्जिनियर
 - ग) क्षेत्रिय आयोजना व्यवस्थापन कार्यालयको सामाजिक/वातावरण अधिकारी
 - घ) पीडित पक्षको तर्फबाट एक प्रतिनिधि
 - ङ) क्षेत्रिय डिजाइन, निरीक्षण र व्यवस्थापन परामर्शदाताकोबाट सुरक्षा विद (सामाजिक/वातावरणीय सम्बन्धित विशेषज्ञ)

- च) अतिथिको रुपमा आयोजना क्षेत्रमा सक्रिय कुनै प्रतिष्ठित एवं प्रसांगिक समुदायमा आधारित संस्था(CBO)/स्वयं सहायता समुह (SHG) को एक प्रतिनिधि
छ) ठेकेदारको प्रतिनिधि

वातावरणीय व्यवस्थापन योजना

२५. वातावरणीय व्यवस्थापन योजनाको तयारी तथा यसको कार्यान्वयन, प्रारम्भिक वातावरणीय परीक्षणको अर्को अत्यावश्यक प्रक्रिया हो । यस योजनाको मूल उद्देश्य भन्नु नै आयोजनाका गतिविधिहरु विना क्षति जिम्मेवार ढंगले भइरहेको सुनिश्चित गर्नु हो । त्यस्तैगरी, यस योजनाका अरु उद्देश्यहरु निम्न उल्लिखित छन् :
- क) स्थलगत वातावरणीय गतिविधिको निगरानीको लागि सक्षम बनाउन एक सक्रिय , सम्भाव्य र व्यावहारिक उपकरण प्रदान गर्नु;
- ख) यस आयोजनाका लागि गरिएको वातावरणीय गतिविधिहरुका खोज तथा सिफारिशहरुको कार्यान्वयनलाई मार्गदर्शन र नियन्त्रण गर्ने ;
- ग) यस आयोजनाको वातावरणीय प्रभावहरुको न्यूनिकरण गर्न सहयोग पुर्याउनका लागि आवश्यक देखिएका विशेष कार्यहरु विस्तार गर्ने तथा लाभदायिक प्रभावहरुको वृद्धि गर्ने ; र
- घ) सुरक्षा सम्बन्धि दिइएका सिफारिशहरुको अनुपालना गरिएको सुनिश्चित गर्ने
२६. यस आयोजनाको लागि तयार पारिएको स्थानिय स्तर निगरानी तथा प्रत्यासित प्रभावको न्यूनिकरणको कूल अनुमानित लागत रु. ३,०००,०००.०० रहेको छ ।

अनुगमन तथा रिपोर्टिङ

२७. यस आयोजनाको वातावरणीय गतिविधिको निगरानी र रिपोर्टिङका लागि आयोजना व्यवस्थापन कार्यालय (PMO) र क्षेत्रिय आयोजना व्यवस्थापन कार्यालय (RPMO)जिम्मेवार रहनेछ । RPMO ले EMP कार्यान्वयनको प्रगतिको अनुगमन तथा मापन गर्नेछ । RPMO ले PMO समक्ष मासिक निगरानी र कार्यान्वयनको प्रतिवेदन पेश गर्नेछ । तदनुसार PMO ले आवश्यक भएमा उचित कदम चाल्नेछ । यस पश्चात् PMO ले एसियाली विकास बैंक समक्ष अर्द्ध वार्षिक निगरानीको प्रतिवेदन पेश गर्नेछ । कानूनी कागजातमा सम्झौता भएअनुसार खानेपानी मन्त्रालयले गरेको प्रतिवद्धताको लेखाजोखा गर्न एसियाली विकास बैंकले आयोजनाको गतिविधिहरुको समीक्षा गरिनेछ । आयोजना सम्पन्न प्रतिवेदन जारी नभएसम्म एसियाली विकास बैंकले आयोजनाको निगरानी गर्नेछ । यसका साथै नेपाल सरकार अर्न्तगत रहेको खानेपानी मन्त्रालय एवं वन तथा वातावरण मन्त्रालयले आयोजना प्रदर्शनको समीक्षा गर्न प्रसांगिक स्थलगत भ्रमणका माध्यमबाट अनुगमन कार्य पनि गर्नेछ ।

निष्कर्ष

२८. निष्कर्षमा, प्रारम्भिक वातावरणीय परीक्षण अध्ययनले प्रस्तावित आयोजना वातावरणीय हिसाबले गम्भीर प्रकृतिको नभएको देखिएको छ । प्रस्तावित आयोजना र यसका संरचनाहरु वातावरणीय हिसाबले संवेदनशील क्षेत्रभित्र वा वरपर अवस्थित छैनन् । साथै, निर्माणको क्रममा सामना गर्नुपर्ने केही प्रतिकूल प्रभावहरु (सम्भवत अधिकतम निर्माण अवधिमा देखापर्ने) अस्थायी र छोटो अवधिका छन् । प्रस्तावित आयोजनाले निम्न उल्लिखित फाइदाहरु दिलाउने छन् :
- क) सुरक्षित र पिउन योग्य पानीको विश्वसनीय आपूर्तिमा पहुँच,
- ख) उचित सरसफाई र स्वच्छताको अभ्यासमा उन्नति र स्वास्थ्य एवं सुरक्षा जोखिममा कमी,
- ग) वर्षौंदेखि निरन्तर खानेपानी आपूर्तिकालागि भोग्नुपरेको कठिनाईबाट मुक्ति र
- घ) परिणाम स्वरुप परिस्कृत सामुदायिक स्वास्थ्य , सुधारिएको जीवन स्तर र सुरक्षित समुदाय

२९. यस आयोजना निर्माण पश्चात् उल्लेखनीय नकारात्मक प्रभावहरु ननिम्त्याएको र एसियाली विकास बैंकद्वारा गरिएको वर्गीकरण अनुसार प्रस्तावित आयोजना **Category 'B'** अर्न्तगत पर्ने र वातावरण संरक्षण नियमावली, २०५४ र २०७३ मा गरिएको नयाँ संशोधनको अनूसुचि-१ लाई पालन गरेको देखिन्छ। २००९ मा लागू गरिएको सुरक्षा नीति विवरण (SPS) तथा वातावरण संरक्षण नियमावली, २०५४ र २०७३ मा गरिएको नयाँ संशोधनको अनुपालन गर्न कुनै विशेष अध्ययन वा वातावरणीय प्रभाव मूल्यांकन (EIA) को आवश्यकता नभएको यस प्रारम्भिक वातावरणीय परीक्षण अध्ययनको निष्कर्ष रहेको छ।

EXECUTIVE SUMMARY

Introduction

1. Panchkhal Water Supply & Sanitation Project is one of the projects proposed under UWSSSP, which will support Nepal in expanding access to community managed water supply & sanitation in 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by ADB. This project is currently being prepared to support further GoN's continuing efforts to provide water supply and sanitation services to selected urban municipalities of Nepal. In support of GoN's endeavor, the Asian Development Bank (ADB) funded this Urban Water Supply and Sanitation (Sector) Project (UWSSSP). This project has the following outputs: i) Improved Water Supply and Sanitation Infrastructure in Project Municipalities and ii) Strengthened Institutional and Community Capacities.
2. During field study, it has been identified that the existing water supply system is intermittent and is limited to only certain parts of the proposed area. Hence, the existing water supply system is not able to meet even the current demand of Panchkhal municipality. Similarly, there is also no provision of treatment system in the existing water supply systems of the proposed town. Considering the water demand and condition of the existing system, there is a need of the proposed project to upgrade the existing water supply situation within the proposed service area to meet the growing demand for private connections, to make drinking water available to the people of service area throughout the year and to provide easy access to safe & reliable water supply service.
3. As per the study, the proposed project area lies in Panchkhal Municipality, Kavre District, a hilly district in the Bagmati Province of Nepal. Out of 13 wards of the project town, the proposed project area covers partial areas of wards 2, 3,4,6,7,8,9,10,11 & 12.
4. The rationale of the project is based on the increasing demand of the reliable project, hardship of people for safe drinking water, willingness to pay for water tariffs, affordability, public health impacts, policy commitments and various other aspects.
5. The rationale of the IEE study of this project is based on EPA 1997 AD (Amendments 2019 A.D.) and EPR 1997 AD, 2054 BS (Amendments 1999 AD, 2007 AD & 2017 AD). The project is expected to benefit a base year population of about 31,415 populations (2021) & a design population of 45,768 (2040) by providing a reliable and adequate supply of safe & potable water and promotion of good hygiene and sanitation practices

Description of the Project

6. The proposed project intends to provide both water supply as well as sanitation service. Hence, it comprises both water supply as well as sanitation components which are as follows:

i. Water Supply Components

- a) **Sources/ Intakes:** The study shows that the only reliable source available within the project area is Sunkoshi River. The seepage water of the river will be tapped through the construction of Infiltration Gallery. The proposed intake/sump well site is located at the right bank of Sunkoshi river at Bimiredobhan, which is about 2.5 km downstream of Dolalghat Bazaar (i.e. 2 km downstream of the confluence of Sunkoshi and Indrawati)

- b) **Electrical System:** The proposed project has pumping station at each pumping stage to reach water at WTP site. The overhead electrical transmission line will run along the proposed pipeline route to supply power to each stage to run the pump. All the pumps at sump well, stage 2, stage 3 and stage 4 will be operated at a time to supply water at WTP/ storage reservoir. These pump stations are connected in series cascade mode. If one of the pumps fails to run due to any technical fault, the remaining pumps can deliver water from sump well to WTP/ storage reservoir.
- c) **Interruption Chamber/Break Pressure Tank:** The proposed Break Pressure Tanks (BPTs) will be constructed at six locations that includes a) 50m³ capacity along Branch Transmission Line, b) 10m³ capacity along RVT-10 distribution system for Chisapani, c) 10m³ capacity along RVT-10 distribution system for Gairigaun, d) 10m³ capacity for RVT-9 distribution system, e) 2 nos -10m³ capacity for Kharelthok distribution system.
- d) **Transmission Main & Pumping:** The main transmission mains comprises three mains that includes a) Mains that goes to branch transmission by gravity; b) Mains that goes to Palanchowk Bhagwati by pumping and c) Mains that goes to Bhimsentahn WTP backwash RVT by pumping. The total pipe length of the main transmission from the proposed Sunkoshi river intake/ Sump well to the proposed treatment plant site/storage reservoir is about 9,135.00m including 5% more than the actual one, which comprises of DI pipe with Flanged End of diameter 200mm. There is also provision of two parallel pipes for water lifting purpose along the transmission mains to avoid the interruption of water supply service if one pipe need repair. The total branch transmission length from WTP/storage reservoir to 11 RVTs is 37,237.00 m including 10% more than the actual one having pipe size PE pipe (63-110) mm dia. and 5% more than the actual having diameter of DI 100mm to 250mm.
- e) **Thrust Blocks,Saddle Blocks and Thrust Beam:** Typical thrust blocks have been designed for a pressure of 24 kg/sq cm for both transmission lines and distribution line. Similarly, theres is also provision of Thrust Beam & Saddle Blocks for DI pipes that will be laid up in sloppy areas and for the portions where DI pipes are unburied.
- f) **Water Treatment Plant & Chlorination:** The proposed water treatment plant comprises of Rapid Flash Mixture, Baffle Channel Flocculator, Plain Sedimentation Tank and Rapid Sand Filter. There is also provision of backwashing of rapid sand filterfor which backwash reservoir (RVT-12) is provisioned. This RVT 12 will supply water to Kharelthok RVT-11 by gravity and this supply water to backwash the filter. An emergency feeder line consisting of a solution tank connected with feeding tank is proposed for the chlorination. FRP pump is used for this purpose. Bleaching powder 6.62kg / day and 9.65 kg / day is required during base year and design year respectively as per design.
- g) **Sump Reservoir/Service Reservoir:** The distribution system has been designed by using multi-reservoir concept. There is provision of sump RVT of 150m³ capacity, each at pumping Stage 2, 3 & 4 and 1no of 400 m³ capacity at WTP site. These reservoirs act as storage reservoirs. Similarly, there is also provision of backwash RVT of 150m³ capacity that will also distribute water to Kharelthok RVT by gravity. There is also provision of eleven service reservoirs that include 6 no RVTs of 150 m³ capacity at six locations (RVT 1-U/S Municipality, RVT 2-Anekot, RVT 3-Sashastra RVT, RVT 4-Bakhrel Dihi RVT, RVT 7-Jaretar and RVT 8-Shikharpur RVT), 3 nos

RVT of 100 m³ capacity at three locations (RVT 5-Radha Krishna School, RVT 6-Nayagaun RVT and RVT 10-Palanchowk RVT) and 2 nos. of 50m³ capacity at RVT-9(9N29) & RVT11-Kharelthok. The total storage requirement for the system at the end of the design period shall be about 2,300m³.

- h) **Distribution Main and District Metering Area:** The entire new distribution system has been designed by using GI, DI and PE-100 pipe. The minimum pipe size for the distribution mains used in the design is PE100- 50mm, which governs the velocity. The estimated length of distribution pipe which is taken as 10% more than the actual one for PE pipe up to 90mm dia. and 5% more than the actual one for remaining all pipes, is 189,309.00m. The design of this distribution system is based on the concept of District Metering Area (DMA). Each DMA will have bulk meter to determine the flow into respective service area. The area served by each service reservoir is considered as one DMA. Hence, there are 11 DMAs within the proposed service area to supply water from each service reservoir.
- i) **Household Connections:** The direct connection from main distribution pipe shall be made for the household connection. The average 15m length of 20mm dia. of PE 100-PN16 pipe with compression joint, joined with GI fittings and valves up to meter for each HH connection. There will be 5,998 taps in the system during base year. Two types of tap stands have been designed for the project. In total, there will be 9,312 connection including institutional 39 connections during design year.
- j) **Appurtenances:** This consists of Bulkmeter, Wash out Valves, Air Valves, Check Valves, Control Valves, Pressure Relief Valves, SCAD Valves and Fire Hydrants.
- k) **Valve Chambers:** Two type of Chambers have been proposed in the project to control or regulate the flow of the proposed water supply system. The chambers constructed by brick masonry have been provided in non-vehicular areas and rural area. In other vehicular carriageway and city area, chambers constructed with RCC has been provided. In total, there are 179nos. pipe valve boxes and 36 washout/ air release/ control valve chambers designed in the distribution system.
- l) **Generator House:** A Generator house will be constructed at each pumping stage and WTP site. The Generator will supply power mainly for pumps installed at each pumping stage, when there is no regular power from NEA. Two generators at each stage will pump 50% of the demand. If one generator gets out of order, only one generator will be operated and supply 25% of water.
- m) **Laboratory Building cum WUSC Office Building, Guard House and Dosing House:** A two storeyed laboratory building cum WUSC office building has been designed and this has been proposed to be constructed in Panchkhal Bazaar. There is provision of Small Guard House (G1) at each pumping stage, at Backwash RVT and at 11 service reservoir locations. Hence, in total, 16 small guard houses have been proposed. Similarly, one Medium Guard House (G2) have also been proposed at WTP site.
- n) **Boundary Wall & Retaining Wall:** The retaining wall has been proposed at sumpwell site, stage 2,3,4 and WTP site and each reservoir site as necessary. In some case, boundary wall will be above retaining wall and some cases boundary will be from foundation.

ii. Sanitation Components

7. Our study revealed that the condition of sanitation awareness as well as sanitation activities of the project town is satisfactory. The project intends to promote the current sanitation condition to higher level. Hence, the proposed project has proposed for the construction of public toilets for institution as well as general public for the betterment of facilities in this area. There is provision of one institutional toilet & one public toilet under the sanitation components of this proposed project. This also involves provision of one tractor for solid waste collection which may help to bring awareness in disposing of solid waste properly and will control haphazard dumping of solid waste. These facilities also inculcate behavior of toilet use as well as of effective solid waste management among students and the general public. Hence, the proposed project also will address basic sanitation issues through the provision of toilets and solid waste management.

Methodology

8. The IEE study has been carried out in accordance with the requirements of the ADB's Safeguard Policy Statement (SPS 2009) and environmental requirements of GoN i.e., EPA (1997) and EPR (1997 with amendments 1999, 2007 & 2017). The methodology adopted to carry out this IEE study involves;

- a) Literature Review/ Desk Study: Relevant Maps & Reports including Feasibility Report, DEDR & DDR and other related published articles were reviewed to collect secondary information regarding the proposed project.
- b) Impact Area Delineation: This impact area delineation is carried out to identify the possible areas that may have either significant or insignificant impacts from the project implementation activities. The impact areas has been delineated as "Core Project Area", and "Surrounding Project Area" on the basis of proximity and magnitude of the impacts due to the proposed project activities.
- c) Field Study: The field study was conducted to collect baseline information on physico-chemical, biological, and socio-economic conditions of the core and surroundings areas of the project town.
- d) Public Notice: A public notice of 15 days was published in Arthik Abhiyan Dainik, a national daily newspaper on 2076/08/04 to seek written opinions from the concerned people and institutions regarding the possible impacts that may result from the implementation of the proposed project. Prior to this publication, copies of the Public Notice has been pasted at the concerned authorized office as per EPR, 1997 AD.
- e) Stakeholder & Public Consultation: This has been carried out to acknowledge any kind of suggestions and to acquire the required information regarding the proposed project from the interested stakeholders. The information acquired was integrated in the identification of anticipated environmental impacts.
- f) Collection of Muchulkas and Recommendation Letter: Deed of Inquiry (Muchulka) from the concerned offices has been collected right after the public notice at the concerned authority offices has been pasted. Similarly, Recommendation Letter from the local authority office (Municipality) has been collected after the completion of 15 days from the date of publication of public notice.

- g) Impact Identification, Prediction & Evaluation Method: This method is carried out through simple checklist & questionnaire method and through professional judgement to determine adversity of the anticipated impacts.
9. The study has followed the procedures outlined in the approved ToR and has covered the issues delineated therein.

Policy, Legal & Administrative Framework

10. The IEE study requires study of the concerned Policy, Legal & Administrative Framework to analyze their compliance with the project construction activities. The major environmental act, rules, plan, policies, guidelines that are relevant for IEE study of this project includes;

- a) Major Law, Acts & Rules:** i) Constitution of Nepal; ii) Environmental Protection Act (EPA), 2053 B.S. (1997 A.D.); iii) Environmental Protection Rules (EPR), 1997 AD, and its fifth amendments in 2017 A.D.
- b) Plans, Policies & Strategies:** i) National Environmental Policy & Action Plan (NEPAP), 2050 B.S. (1993 A.D.); ii) Water Resources Strategy, 2059 B.S. (2002 A.D.); iii) Rural Water Supply and Sanitation Sectoral Strategic Action Plan (Unofficial Translation), 2060 B.S. (2004 A.D.); iv) Rural Water Supply and Sanitation National Policy and Rural Water Supply and Sanitation National Strategy, 2060 B.S. (2004 A.D.); v) National Water Plan, 2062 B.S. (2005 A.D.); vi) National Urban Policy, 2063 B.S. (2007 A.D.); vii) National Urban Water Supply & Sanitation Sector Policy, 2065 B.S. (2009 A.D.); viii) Updated 15-yr Development Plan for Small Towns Water Supply and Sanitation Sector, 2066 B.S. (2009 A.D. and Amendments in 2015 A.D.); ix) National Water Supply & Sanitation Policy, 2071 B.S. (2014 A.D.); x) Land Acquisition, Rehabilitation and Resettlement Policy, 2015 A.D.; xi) Land Use Policy, 2072 B.S. (2015 A.D.); xii) National Urban Development Strategy, 2074 B.S. (2017 A.D.); xiii) National Land Policy, 2075 B.S. (2019 A.D.); xiv) National Forest Policy, 2075 B.S. (2019 A.D.); xv) Fifteenth Five Year Plan FY (2076/77-2080/81) and xvi) National Environmental Policy, 2076 B.S. (2019 A.D.)
- c) Laws & Acts:** i) Essential Goods Protection Act; 2012 B.S. (1955 A.D.); ii) Aquatic Animal Protection Act, 2017 B.S. (1961 A.D.) with Amendments (2055 B.S. (1997 A.D.)); iii) Town Development Act, 2045 B.S. (1988 A.D.); iv) Water Resource Act, 2049 B.S. (1992 A.D.); v) Child Labor Prohibition and Regulation Act, 2056 B.S. (2001 A.D.); vi) Solid Waste Management Act, 2068 B.S. (2011 A.D.); ix) Labour Act, 2074 B.S. (2017 A.D.); x) Local Government Operation Act, 2074 B.S. (2017 A.D.); xi) Consumer Protection Act, 2075 B.S. (2018 A.D.); xii) Forest Act, 2076 B.S. (2019 A.D.); and xiii) Land Use Act, 2076 B.S. (2019 A.D.)
- d) Rules & Regulations:** i) Solid Waste (Management & Resource Mobilization) Rules, 2044 B.S. (1987 A.D.) & Amendments 2049 B.S. (1992 A.D.); ii) Water Resource Regulations, 2050 B.S. (1993 A.D.); iii) Forest Regulations, 2051 B.S. (1995 A.D.); iv) Drinking Water Regulations, 2055 B.S. (1998 A.D.); v) Solid Waste Management Rules, 2070 B.S. (2013 A.D.) and vi) Labor Rules, 2075 B.S. (2018 A.D.)
- e) Directives, Guidelines & Manuals:** i) National EIA Guidelines, 2049 B.S. (1993 A.D.); ii) Guidelines for Community Noise by WHO, 2055 B.S. (1999 A.D.); iii) WHO Air Quality Guidelines, Global Update, 2061 B.S. (2005 A.D.); iv) National

Noise Standard Guidelines, 2068 B.S. (2012 A.D.); v) Guidelines for removal of trees from government land, 2071 B.S. (2014 A.D.); vi) WHO Guidelines for Drinking-water Quality, Fourth Edition, 2073 B.S. (2017 A.D.) and vii) Working procedure for the use of national forest for national priority projects, 2074 B.S. (2017 A.D.)

Existing Environmental Condition

11. This IEE study requires information on the existing environment of the project town to identify the susceptibility of the environmental aspects of the project town towards the anticipated environmental impacts of the proposed project. Regarding this, the secondary information of the existing environment was collected through literature review during desk study. However, the secondary information is not sufficient for IEE study. Hence, the field study was carried out to collect primary information on the existing environmental aspects.

12. Regarding this, details on various physical environmental aspects like Landforms & Topography, Geology & Soil, Water Resources, Climate, Air Quality, Acoustic Environment and biological features like Flora, Fauna, Aquatic Life, Protected Areas & Community Forest Areas were collected through simple checklist, REA checklist, professional judgment and interaction with the locals & the concerned bodies during field study. No existence of protected areas within the project area was observed during the field study. However, the study shows that some portion of transmission mains pass through the community forest despite of which there is no requirement of cutting trees except clearance of some bushes.

13. Similarly, details on water quality of the water sources to be used for the proposed project were collected through sampling process followed by water quality tests on approved laboratory. The test result shows that the water samples taken from the proposed sources have all the required parameters within the permitted value of NDWQS.

14. During field study, details on the socio-economic environment that includes Demographic Features, Caste/Ethnic Groups, Economic Features, Education & Skills and Community Infrastructures were also collected through simple questionnaire method followed by household survey and interaction with the locals. Regarding this, Willingness to Pay for Monthly Tariff, Willingness for Up-front Cash Contribution and Affordability has also been assessed. As per the sampled household survey, 100% of 300 sampled HHs and 98.95% of total 5998 HHs expressed willingness to pay for monthly water tariff and to contribute for up-front cash contribution respectively. This indicates their demand for the proposed project to get rid of the acute water shortage problem they have been facing for years. The survey also shows that 11% (659) of 5998 HHs fall under poor category and only 27.90% (1671) of total 5998 HHs expend less than Rs. 7,500 per month. Hence, this indicates the affordability of the community in terms of monthly income level and the expenditure level.

Analysis of Alternatives

15. Analysis on the alternatives of the proposed project is another important process of IEE study that will help to assess the feasibility of the project in regard to technical, environmental & social aspects. Primarily, this involves two alternatives that includes "Without Project" or "Do-nothing" Alternative and "With Project" Alternative. The limitation of "Without Project" Alternatives regarding continuous water supply system, treatment system and susceptibility to water borne diseases leads to opt for "With Project" Alternative. With

Project Alternative has been analyzed by envisaging the likely benefits of the proposed project. The analysis shows that the proposed project is designed to provide convenient access to reliable, adequate, safe and potable water supply to 29,603 populations as per base year 2018 A.D .

16. This alternative analysis also shows that proposed project has been designed under two scenarios. The development of alternatives in this proposed project has been done using alternate system layouts keeping other parameters constant. The analysis shows that there is no other reliable source nearby service area except Sunkoshi water source. Hence, Sunkoshi River is the only potential water source for the proposed project. Regarding the design, in both alternatives, the structures from WTP to the distribution network remain the same. The distribution network is also same for both alternatives.

17. The main difference between the proposed alternatives is the design of transmission pipe line. The alternative I involves use of Required Flow from Sunkoshi River by Pumping with Double Pipes and Supply Water to Distribution System by Eleven RVTs while the alternative II use of Required Flow from Sunkoshi River by Pumping with Single Pipes and Supply Water to Distribution System by Ten RVTs. Environmentally, there is no such huge difference between these two alternatives and both of the alternatives have no such environmental issues too. Socially, both alternatives are on equal footing. The alternative analysis shows that financially, alternative II is slightly more economical than alternative I. However, if alternative II is selected for the proposed project, financially it may sound feasible but, technically the system may get failed as there is high possibility of interruption of the water supply service under the condition of pipe damage in the future if any. Hence, alternative I is recommended for further study though the cost of alternative I is slightly higher than alternative II.

Anticipated Environmental Impacts and Mitigation Measures

18. The analysis on the information collected during field study helps to identify and predict the likely environmental impacts that may result from the proposed project. These predicted impacts are then evaluated using Scoring matrix as per National EIA Guidelines, 1993 to determine the nature, extent and magnitude. This evaluation will further help to propose the appropriate mitigation measure for each impact.

19. The anticipated environmental impacts have been mainly categorized into two viz., Beneficial Impacts and Adverse Impacts on the basis of its negative and positive significance. This has been further categorized into four impacts that includes i) Impact on Physical Environment, ii) Impact on Biological Environment, iii) Impact on Chemical Environment and iv) Impact on Socio-economic Environment, based upon the effects on the existing environment. These impacts has been sub divided into three categories based upon the project phase that includes i) Design Phase, ii) Construction Phase and iii) Operation Phase.

20. Here, Beneficial Impacts includes Employment Generation, Skill Enhancement, Local Trade & Business Opportunities, Improved Health & Hygiene, Increased Economic Opportunity, Impacts on Sustainability of the system and Social Empowerment. Similarly, Adverse Impacts includes Soil Erosion & Land Surface Disturbances, Spoil Disposal & Gully Erosion, Loss of Top Fertile Soil, Air Pollution, Noise Pollution, Generation of Solid Waste & Waste water from the construction site & worker's camp, Impact on Land Use Pattern, Disruption to Natural Drainage, Accidental Leakage or Spillage of Stored Fuel/Chemicals,

Haphazard Disposal of Dismantled Debris, Impacts on Flora & Fauna, Impact on Aquatic Life, Encroachment, Impact on Water Quality of nearby rivers, Impact on Water Bodies, Structural Instability, Health & Safety of Community & Workers and Damage to the existing Utilities, Traffic Congestion, Public Protests, Disruption to Local Vendor's Business, Mobilization of Child Labour, Impact on Downstream Users, Occupational Health & Safety Hazards, Complications in Water Distribution System, Impact on Consumer's Health, Impacts on Haphazard Disposal of Raw Sludge and Non Sustainability of Services or Completed Works.

Mitigation & Augmentation Measures

21. The mitigation & augmentation measures for each & every adverse impacts mentioned above have been proposed. These measures primarily includes Slope Protection Measures, Air Quality Monitoring, Noise Quality Monitoring, Waste Management, Prompt Backfilling, Handling of fuel & chemicals, Awareness regarding Workers & Community Health & Safety Hazards, Monitoring of Water Treatment System, Proper Handling of Chlorine etc. This has been described in detail in Chapter 8. If these proposed mitigation measures are effectively implemented, no such significant environmental problems have to be encountered during the construction & operation period of the proposed project. Likewise, various suitable augmentation measures have also been proposed to to maximize the anticipated beneficial impacts.

Information Disclosure, Consultation & Participation

22. Stakeholder Consultation and Community Participation is an essential process in project preparation. It is the process of engaging stakeholders and affected people. This process involves Key Informant interviews, On-site discussions with WUSC, and Random Field Interviews of stakeholders. Prior to the stakeholder's consultation, stakeholder analysis and mapping of stakeholders were carried out to identify the potential stakeholders and their roles towards the implementation of the project. The potential stakeholders were then involved in consultation to disseminate information related to the project, to collect their views & suggestions and to prioritize their concerns regarding the project. This will continue throughout the implementation of the projects and operation period. To facilitate the stakeholder consultation, PMO & ICG will maintain good communication and collaboration with WUSC and the Municipality.

Grievance Redress Mechanism

23. The Project-specific grievance redress mechanism (GRM) is also an essential process of the IEE study which is meant for persons seeking satisfactory resolution to their complaints on the social and environmental performance of the projects under STWSSSP. The mechanism, developed in consultation with key stakeholders, will ensure the following mentioned points;

- (i) the basic rights and interests of every person adversely affected by the social and environmental performance of a Project are protected; and
- (ii) their concerns are effectively and timely addressed

24. This GRM involves setting up the Grievance Redress Committee (GRC) at the municipality level. The GRC will comprise of the following mentioned members:

- (1) WUSC Secretary;

- (2) RPMO Engineer;
- (3) RPMO social /environmental (as relevant) officer,
- (4) Representative of affected persons,
- (5) RDSMC's safeguards specialist (social/environment as relevant),
- (6) Representative of reputable and relevant CBO/SHG/organization working in the project area as invitee¹ , and
- (7) Contractor's representative

Environmental Management Plan

25. Preparation and Implementation of the environmental management plan (EMP) is another essential process of the IEE study. The main purpose of EMP is to ensure that the activities are undertaken in a responsible and non-detrimental manner. Similarly, the other objectives of EMP are as follows:

- (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site;
- (ii) guiding and controlling the implementation of findings and recommendations of the environmental assignment conducted for the project;
- (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impacts of the project and in enhancing beneficial impacts; and
- (iv) ensuring that safety recommendations are complied with.

26. The total estimated local level monitoring and mitigation cost for the project is NRs. 3,000,000.00.

Monitoring & Reporting

27. PMO & RPMO will be responsible for environmental monitoring & reporting. RPMO will monitor and measure the progress of EMP implementation. RPMO will submit a monthly monitoring and implementation reports to PMO, who will take follow-up actions, if necessary. PMO will submit semi-annual monitoring reports to ADB. ADB will review project performance against the MoWS's commitments as agreed in the legal documents. ADB will monitor projects on an ongoing basis until a project completion report is issued. Along with this, Ministry of Water Supply (MoWS) as well as Ministry of Forests & Environment (MoFS) under Government of Nepal will also undertake monitoring process through random field visits to review the project performance.

Conclusion

28. In conclusion, the IEE study shows that the proposed project is not an environmentally critical undertaking. The proposed project, its components, are not within or adjacent to environmentally sensitive areas. The few adverse impacts of high magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction periods). The proposed project will bring about the following mentioned benefits:

¹ If the complaints are related with IP/Dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities shall be involved.

- i) Access to reliable supply of safe and potable water;
- ii) Promotion of good hygiene and sanitation practices and reduced health and safety risks;
- iii) Liberation from the hardship for continuous drinking water supply for years and
- iv) Enhanced community health, improved quality of life and safe communities as outcomes.

29. Hence, there are no significant negative impacts of the proposed project, and the classification of the project as Category “B” is confirmed as per ADB and as Schedule -1 is confirmed as per Environment Protection Rules, 2054 (1997) and 2017 (Latest Amendments). No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) and Environment Protection Rules, 2054 (1997) of Nepal.

1. INTRODUCTION

1.1. Background

1. In 2000, the Government of Nepal (GoN) endorsed the 15-year Development Plan for Small towns Water Supply and Sanitation to improve health and economic and environmental living conditions of people in small towns in Nepal. The Plan adopts a community managed demand responsive approach, where the community is involved in all aspects of planning and implementation of its town's project. In support of GoN's endeavor, the Asian Development Bank (ADB) funded the Small Towns' Water Supply and Sanitation Sector Project (STWSSSP) in 2001-2008. Twenty-nine (29) small towns of about 570,000 people benefitted from the improved water supply and sanitation services delivered under the Project. The positive impacts of STWSSSP led GoN to embark on the Second Small Towns' Water Supply and Sanitation Sector Project (2ndSTWSSSP), also financed by ADB and which benefitted another twenty-one (21) small towns. Following these two projects, the Third Small Towns' Water Supply and Sanitation Sector Project (TSTWSSSP) has been implemented to support further GoN's continuing efforts to improve water supply and sanitation service delivery in small towns in Nepal. 26 small towns were benefitted by this TSTWSSSP. The Project follows the government's 15-year Development Plan, as updated in 2009, to develop the water and sanitation sector for small towns. Hence, ADB has supported the government in improving WSS services in 70 of the 176 small towns in Nepal through three earlier projects.

2. Subsequently, ADB and GoN are working together to provide water supply and sanitation services to selected urban municipalities of Nepal through Urban Water Supply Sanitation (Sector) Project (UWSSSP) in accordance with the updated 15-year Development Plan for Small Towns and the National Urban Development Strategy. The Project will support Nepal in expanding access to community managed water supply & sanitation in 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by ADB. UWSSSP will be implemented over a five-year period (indicative implementation period is 2018 to 2023) and will be supported through ADB financing using a sector lending approach. This project has the following outputs: i) Improved Water Supply and Sanitation Infrastructure in Project Municipalities and ii) Strengthened Institutional and Community Capacities.

1.2. Name and Address of the Individual Institution Preparing the Report

1.2.1 Name and Address of the Proponent

3. The name & address of the proponent of the proposed project, Panchkhal Water Supply & Sanitation Project is as follows:

Name of Proponent

Project Management Office
Urban Water Supply and Sanitation (Sector) Project
Department of Water Supply and Sewerage Management (Implementing Agency)
Ministry of Water Supply (Executive Agency)
Government of Nepal

Address of the Proponent

Panipokari, Kathmandu
Tel: 977 1 442388, 977 1 4412348
Fax: 977 1 4413280
E-mail: info@stwsssp.gov.np
Website: www.sstwsssp.gov.np

1.2.2 Name and Address of the Consultant preparing the Report

4. The name and address of the consultant preparing the report is as follows:

TAEC Consultant P. Ltd. / Integrated Consultants Nepal Pvt. Ltd. JV
Shankhamul, Kathmandu
Tel: 977 1 5242846
Fax: 977 1 5242553
E-mail: taec@mos.com.np
Website: www.taecconsult.com.np

1.2.3 IEE Study Team

5. The details of the members involved in the IEE study team is tabulated below:

Table 1-I:Details of IEE Study Team Members

S.No.	Name of the Member	Designation	Educational Qualifications
1	Mr. Ananda Mohan Lal Das	Team Leader	Masters of Science in Public Health Engineering
2	Mr. Srijan Aryal	Design Engineer	Masters in Civil Engineering/Urban Planning
3	Mr. Binod Chandra Devkota	Senior Water Supply & Sanitation Engineer	Masters of Science in Water Resources Engineering
4	Ms. Nirala Kayastha	Environmentalism	Masters of Science in Environmental Management
5	Mr. Shiva Adhikari	Social Safeguard Specialist	Masters in Sociology

Source: IEE Study 2018/019

1.3 Purpose of IEE

6. IEE was conducted to ensure the environmental sustainability of the Project, to integrate environmental considerations into the Project preparation process, and provide for environmental management during Project implementation. ADB and GoN require all projects to undergo environmental assessments. All projects funded by ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. The rapid environmental assessment using ADB's REA Checklist has indicated that the Project is a Category B undertaking, requiring IEE. On the GoN side, the statutory requirement that has to be adhered to is the Environment Protection Act (1997), and Environment Protection Rules (1997) and as amended in 1999, 2007 & 2016). Based on EPR Schedule 1, the Project is within the threshold of activities under the water supply and sanitation sector that will require IEE. This IEE fulfills the policy requirements of both ADB and GoN.

7. The IEE Report primarily: (i) provides information on the Project and its environmental requirements; (ii) provides the necessary baseline conditions of the physical, ecological, cultural and socio-economic environments and/or resources in and surrounding the Project's area of influence; (iii) identifies and assesses potential impacts arising from the implementation of the Project on these environments and/or resources; (iv) recommends measures to avoid, mitigate, and compensate for the adverse impacts; (v) presents information on stakeholder consultations and participation during Project preparation (vi) recommends a mechanism to address grievances on the environmental performance of the Project; and (vi) provides an environmental management plan relevant reports/documents, consultations with communities are included in the report, and reference to relevant government policies, laws and regulations and mainly the Terms of References (ToR) approved by MoWS.

1.4 Need for the Project

8. The existing water supply system is intermittent and is limited to only certain parts of the proposed area. Hence, the existing water supply system is not able to meet even the current demand of Panchkhal municipality. Similarly, there is no provision of treatment system in the existing water supply system of the proposed town.

9. Regarding this, as per the detailed design of the proposed project, domestic consumption at ultimate demand i.e., 100 lpcd has been considered as the proposed project aims to provide safe & reliable water to each HH. This nodal demand also includes the institutional demand, commercial demand and wastage & leakage. Here, the institutional demand consists of water demand pertaining to institutions like schools & colleges. Similarly, the commercial demand consists of water demand pertaining to army barracks, police posts, hotels, lodges, factories, government and non-government offices. Hence, all the parts that includes Residential, Commercial, Institutional along with anticipated wastage & leakage issues within the service area has been covered under the scope of the proposed project.

10. Considering the water demand and condition of the existing system, there is a need of the proposed project to upgrade the existing water supply situation within the proposed service area to meet the growing demand for private connections, to make drinking water available to the people of service area throughout the year and to provide easy access to safe & reliable water supply service.

1.5 Rationale of the Project and IEE

Rationale of the Project

11. The rationale of the project is based on the increasing demand of the reliable project, hardship of people for safe drinking water, willingness to pay, affordability, public health impacts, policy commitments and various other aspects. This all will be discussed in the following chapters.

Rationale of the IEE

12. The proposed water supply and sanitation project is needed to be studied from the environmental point of view as per EPA 1997 AD and EPR 1997 AD, 2054 BS (Amendments 1999 AD, 2007 AD & 2016 AD). The Proposed Water Supply and Sanitation Project is intended to serve drinking water in partial areas of wards 2, 3, 4, 6, 7, 8, 9, 10, 11 & 12. The project is expected to benefit a base year population of about 31,415 populations

(2021) & a design population of 45,768 (2040) by providing a reliable and adequate supply of safe & potable water, promotion of good hygiene and sanitation practices.

13. The proposed project shall use surface water sources. The Project will not involve the construction of any tunnels; relocation of people or households, settlement plan above the gravity source and construction of river training works. As the proposed project falls within the definitions provided in the EPR 1997 (Amendments 1999, 2007 & 2017 A.D.) Schedule 1 (Clause H) for drinking water projects; only an IEE should be done. The regulation stated in Schedule 1 (Clause H) shall only be applicable if the proposal does not fall under the Category "A" through (Clause H) of Schedule 2.

14. The following given table gives the brief details on fulfillment of the criteria for the requirement of IEE as per Schedule 1-Clause H of Environmental Protection Regulations 1997 with latest amendments 2017, by the proposed project.

Table 1-II: Criteria for Requirement of IEE for Drinking Water Supply Projects as per Schedule 1 (H) of Environment Protection Regulation 1997 Amendment 2017

S.N.	Condition described in the Act and Regulations	IEE Required as per the Regulation Schedule 1 (H)	Conditions in the Project
1.	Processing of Water Treatment	More than 25 liters per sec	Within the limit (Total Capacity of all WTPs is 84lps.)
2.	Connection of New Source to supply water to existing water supply system for a population of	10,000 – 100,000	About 31,415 populations (2021) & design populations of 45,768 populations (2040).

Source: EPR,1997(Latest Amendments) & DEDR,2019

2 DESCRIPTION OF THE PROJECT

2.1 Location & Accessibility

15. The proposed project area lies in Panchkhal Municipality, Kavre District, a hilly district in the Bagmati Province of Nepal. The municipality lies between 27° 39' 00" Latitude and 85° 37' 00" Longitude. The project town lies in the west from the proposed water source Sunkoshi river.

16. The town is about 45km away towards east from the capital city, Kathmandu. Panchkhal Bazaar, the project site is linked at Dhulikhel with Barhabise and Kathmandu along Arniko Highway. The project has all-weather black topped road passes from the middle of the service. The internal road in the service are mostly gravel and earthen. A few kilometer road ie zero kilo to Palanchowk Bhagwati road has been black topped.

17. The figure given below depicts the location of the proposed service area:

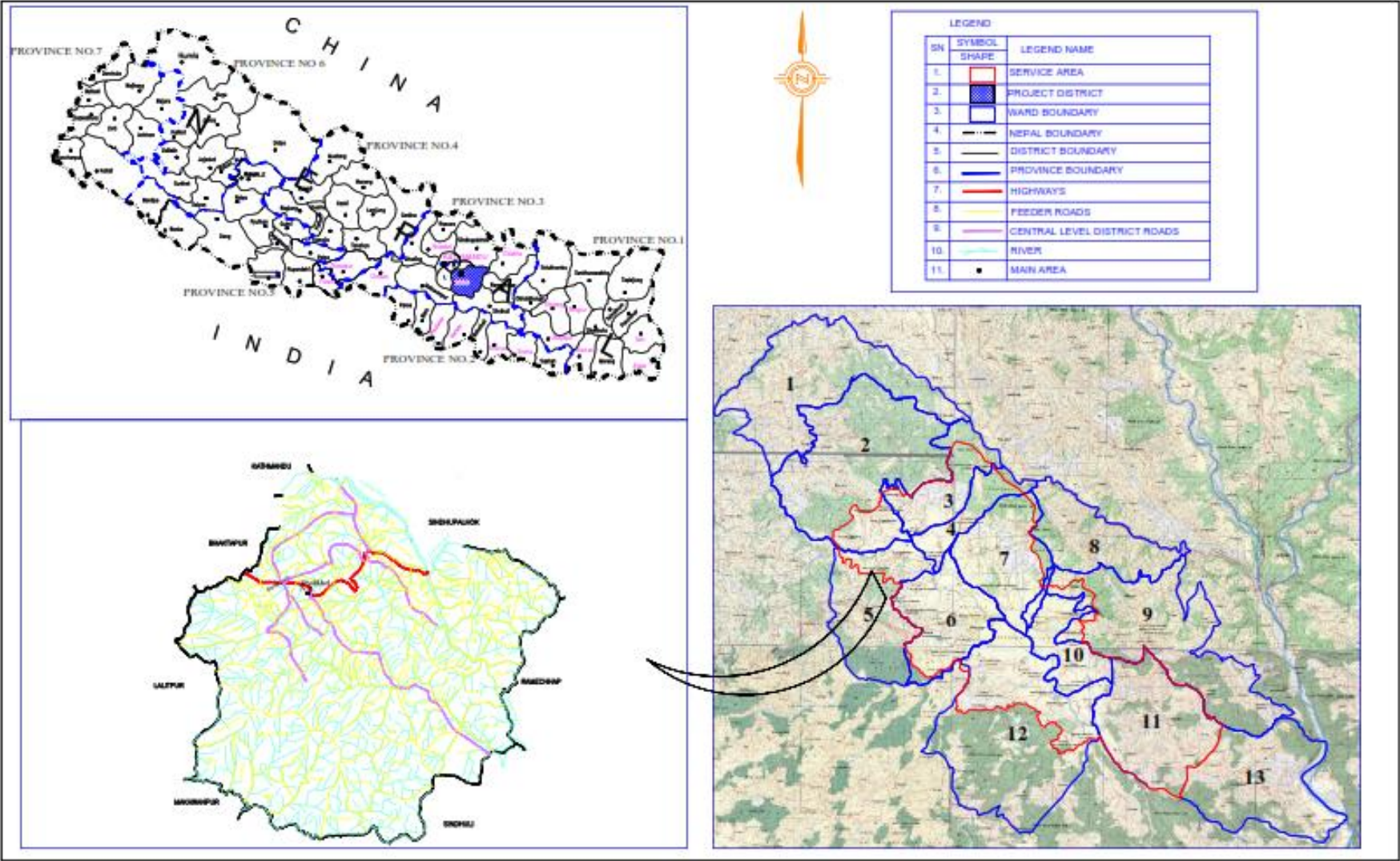


Figure 2-1: Location Map of the Project Area

18. This figure given above shows that the project area belongs to Panchkhal Municipality of Kavrepalanchowk District of Bagmati Province of Nepal. The project town is bounded by Mandandeupur Municipality in the north, Bhumlu Rural Municipality in the east, Temal Rural Municipality in the south east, Namobuddha Municipality in the south and Dhulikhel Municipality in the west. The project area lies in the west from the proposed water source Sunkoshi River. Out of 13 wards of the project town, the proposed project area covers partial areas of wards 2,3,4,6,7,8,9,10,11 & 12.

19. The project town was declared as Municipality by the Government of Nepal, Ministry of Federal Affairs and Local Development from Council of Ministers on May 8, 2014. The Panchkhal Valley, intermontane basin developed in the southeast of the Kathmandu Valley is located within the eastern flank of a synclinorium in Kavre District. At the time of the 2011 Nepal census, it had a population of 40061 & 8948 houses combining of the then VDC that were merged. The then VDC which were merged are Anaekot, Hokse Bazaar, Kharelthok, Koshidekha, Deubhumi Baluwa, Sathighar Bhawagawati & Panchkhal forming agriculturally rich Panchkhal Municipality. Later, again this newly formed municipality is merged with other two VDCs namely Kharelthok VDC & Koshidekha VDC to form a new Panchkhal Municipality with total of 13 wards covering area of 103 sq. km. According to 2011 Nepal census, the total population of this Panchkhal municipality is 37,997. The new administrative division of the proposed project town is given in the table given below:

Table 2-I: Panchkhal Municipality Ward Profile

Present Ward Municipality	Former VDC/Municipality	Former Ward No.
1	Panchkhal Municipality	WN 12 & 13
2	Panchkhal Municipality	WN 14 & 15
3	Panchkhal Municipality	WN 2
4	Panchkhal Municipality	WN 3
5	Panchkhal Municipality	WN 1
6	Panchkhal Municipality	WN 4 & 5
7	Panchkhal Municipality	WN 6
8	Panchkhal Municipality	WN 7 & 8
9	Panchkhal Municipality	WN 16 & 17
10	Panchkhal Municipality	WN 11
11	Kharelthok VDC	WN 1 to 9
12	Panchkhal Municipality	WN 9 & 10
13	Koshidekha VDC	WN 1-9

Source: Final District 1-75 Corrected Last For Rajpatra (www.mofald.gov.np)

20. The table given above shows that the reformed Panchkhal municipality has been divided into 13 wards. The current wards (1-10) of Panchkhal Municipality belong to wards (1-8) & (12-15) of former Panchkhal municipality. Similarly, the current ward 11 belong to ward 1 to 9 of former Kharelthok VDC, ward 12 belong to wards 9 & 10 of the former Panchkhal Municipality and ward 13 belong to wards 1 to 9 of former Koshidekha VDC.

21. The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The mean monthly temperature is 24.9°C. The temperature ranges from 11.66°C to 24.9°C. The average mean annual rainfall is 1020 mm, which is slightly less than 1400 mm, the average precipitation of Nepal.

22. Hokse Bazaar, Zero Km, Anaekot, Deubhumi Baluwa, Sathighar Bhagwati are the local market centers in this area. This project town is famous for vegetables. The main cash crop of Panchkhal is Potato, Tomato, Chilly, Beans, Cauliflower, Paddy and other seasonal vegetables and food crops are Maize, Wheat etc.

2.2 The Proposed Project

23. The proposed sub-project is completely a new system. It comprises of both pumping system and gravity system. Firstly, water will be pumped from the proposed sump well at the proposed river bank to the proposed water treatment plant site with five stage pumping. After this, some quantity of water will be pumped towards Palanchowk Bhagawati RVT. The remaining water from WTP site will be supplied to other ten reservoirs through gravity system.

24. The required flow for the proposed water will be drawn from the seepage of Sunkoshi River by pumping with double pipes and will be supplied to the distribution system by the proposed eleven RVTs.

25. Discussion was held with WUSC for the delineation of service area of the proposed project. Regarding this, the initial discussion was carried out with users committee on various dates. As per WUSC, the following areas of Panchkhal municipality have been selected for the proposed project. The names of the major settlements of the service area of the project town are as follows:

Ward no 2: Tinkune, Bagaladihi, Dwardihi, Majhdihi, Takedihi, Ratopahiro

Ward no 3: Lamidihi, Jantadihi, Kaplidihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok

Ward no 4: Zero Kilo, Lamidanda, Pachkhal, Purano Bazar, Tamaghat

Ward no 6: Dulalthok, Bakhreldihi, Tinpipe Bazar, Ekatabasti, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi

Ward no 7: Sigrampati, Shikharpur, Jorpipe

Ward no 8: Khattar, Padalla, Simradi, Kharani (Madi Gau)

Ward no 9: Bhimsenthan, Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun

Ward no 10: Nayagaun, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar

Ward no 11: Luitelgaun, Devbhumi, Ojhatar, Karketar, Kharelthok, Jaretar, Bakultar, Ranipani, Serabesi

Ward no 12: Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote, Tinghare, Nagbeli, Aapghari

26. The project comprises two major components. The first and the most important component is the construction of new water supply systems to fulfill the increasing water

demand in the proposed service area. The second component is related with the improvement of sanitation system by means of introducing institutional latrines, public latrines and collection & efficient management of solid waste of the town through provision of tractor for solid waste collection.

27. The schematic diagram of the proposed project is presented in the figures given below:

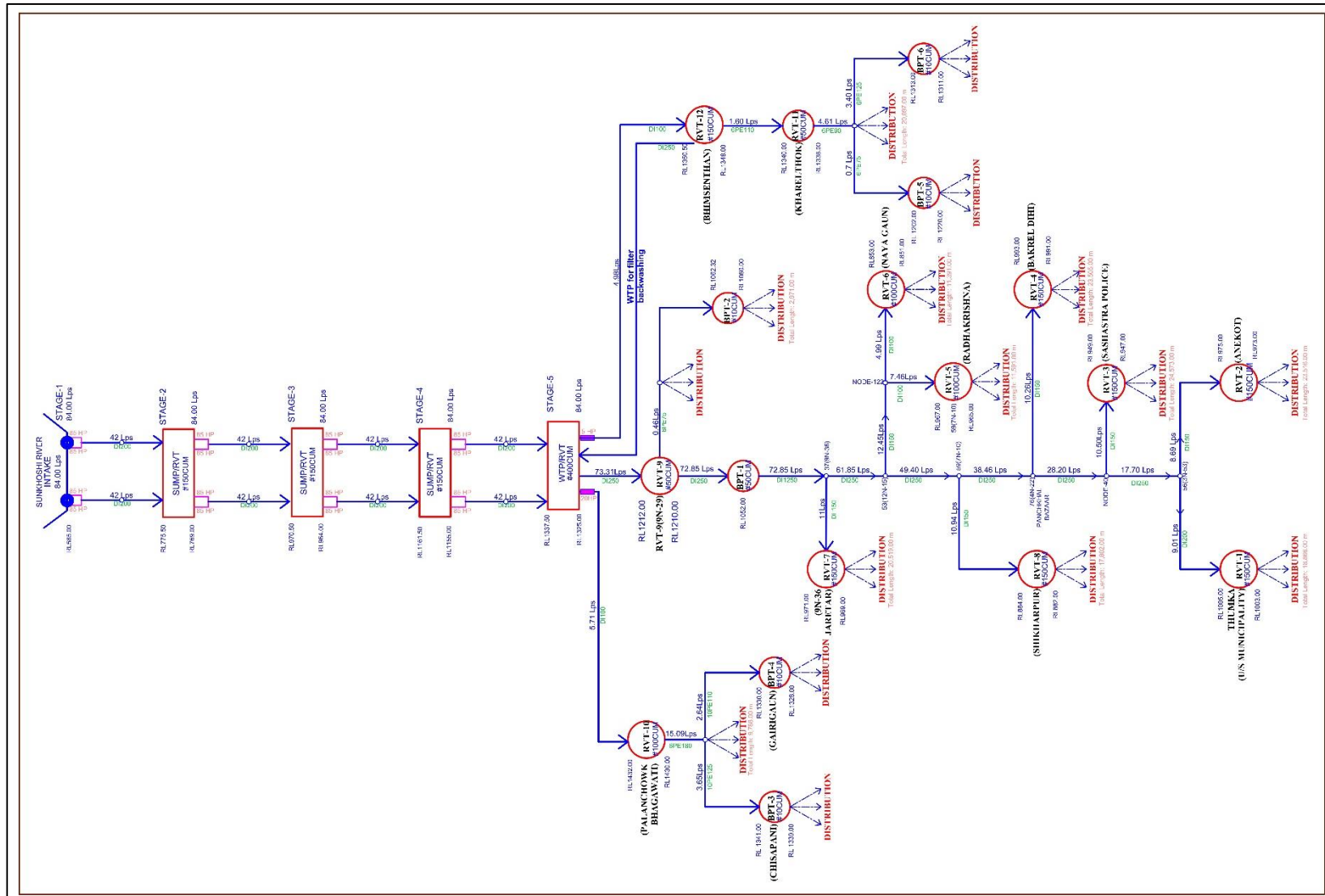


Figure 2-II: The Schematic Layout of the Proposed Project

2.3 Salient Features of the Project

28. The salient features of the project is tabulated below:

Table 2-II:Salient features of the project

SN.	Items	Description
1	Name of Project	Panchkhal Water Supply and Sanitation Project
2	Type	• Pumping System: Stage 1(Sump Well) to WTP site, WTP site to RVT 10 and to Backwash RVT • Gravity System: From WTP site to RVT 1 to RVT 9 and Distribution System • Gravity System:From Backwash RVT to RVT 11 Kharelthok RVT
3	Study Level	Final Detailed Engineering Design
4	Location Area	
	Latitude	27° 39' 00"
	Longitude	85° 37' 00"
	Province	Bagmati
	District	Kavrepalanchowk
	Rural Municipality/Municipality	
	Source to Pumping Stage 3	Bhumlu Rural Municipality
	Pumping Stage 3 to WTP to RVT to Service Areas	Panchkhal Municipality
	Service Area Ward and settlement	Panchkhal Municipality: Ward no 2: Tinkune, Bagaladihi, Dwaredihi, Majhdihi, Takedihi, Ratopahiro Ward no 3: Lamidihi, Jantadihi, Kaplidihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok Ward no 4: Zero Kilo, Lamidanda, Panchkhal, Purano Bazaar,Tamaghat Ward no 6: Dulalthok, Bakhreldihi, Tinpipl Bazar, Ekatabasti, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi Ward no 7: Sigrampati, Shikharpur, Jorpipl Ward no 8: Khattar, Padalla, Simradi,Kharani(Madi Gau) Ward no 9: Bhimsenthan,Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun Ward no 10: Nayagau, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar Ward no 11: Luitelgaun, Devbhumi, Ojhatar,Karketar, Kharelthok, Jaretar,Bakultar, Ranipani, Serabesi, Ward no 12: Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote,Tinghare, Nagbeli, Aapghari.
5	Available Facilities	

SN.	Items	Description
	Road	Arniko Highway (Dhulikhel – Panchkhal- Dolalghat-Barahabise)
	Water Supply System	WUSCs
	Electricity	Available
	Communication	Available
	Health Services	Available
	Banking Facilities	Available
6	Social Status	
	Present HHs Numbers (2018)	5,998
	Present Population (2018)	29,603
	Base Year Population (2021)	31,415
	Design Year Population (2040)	45,768
	Average HHS size	4.94
	Population Growth Rate % (PGR)	2.00
	Projected HHs in Design Year (based on GR)	9,273
7	Water Demand (MLD)	
	Base Year (2021)	3.97 (3, 973,998 ltr per day)
	Design Year (2040)	5.79 (5,789,652 ltr per day)
8	Source Characteristics	
	Source Name	Sunkoshi River (Seepage Water after Infiltration Gallery)
	Source Type	Snow fed Perennial River (Seepage Water)
	Source Location	WN - 10 of Bhumlu Rural Municipality (At boundary of Panchkhal Municipality, Bimire Dobhan about 2.5km downstream of Dolalghat Bazaar (i e., 2km downstream from the confluence of Indrawati and Sunkoshi river))
	Discharge to be tapped (lps)	84.00 (including filter backwash and 20 hr pumping daily)
9	Type of Structures	
a)	Water Supply Components	
	Proposed intakes	1 set (2 sump well/ intakes with 4 collectors) at Sunkoshi river right bank (WN - 10 of Bhumlu Rural Municipality)
	Water treatment plant	Rapid mixture followed by flocculator followed by sedimentation tank followed by rapid sand filter then disinfection. Total Capacity for 84 lps, at WTP location beside transformer about 200m downstream of Bhimsenthan.
	Pumping Details	All pumps run at a time: Stage 1/ Sumpwell: 4 nos-85HP, Transformer 500KVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 2: 4 nos. 85HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 3: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 4: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 9 of Panchkhal Municipality Stage 5 (WTP site): 2no each 20HP (only one run at a time)

SN.	Items	Description
		for RVT-10 and 2 no each 5HP (only one run at a time) for backwash cum Kharelthok (RVT-11) supply-WN 9 of Panchkhal Municipality
	Ground Reservoir (No and Capacity in CUM)	From Sump Well to WTP site: • 1No-150m³ at each 2nd, 3rd & 4th stage of pumping; • 1no @400 m³ at WTP site • Location: WN 10 of Bhumlu Rural Municipality from Stage 1 to 3 and WN 9 of Panchkhal Municipality for Stage 4 & WTP Site Service Reservoir RVT 1: 150 m³ capacity (WN-3 of Panchkhal Municipality, Thumka Upstream) RVT 2: 150 m³ capacity (WN-2 of Panchkhal Municipality, Anekot) RVT 3: 150 m³ capacity (WN-5 of Panchkhal Municipality, Sashastra) RVT 4: 150 m³ capacity (WN-6 of Panchkhal Municipality, Bakhreldihi) RVT 5: 100 m³ capacity (WN-12 of Panchkhal Municipality, Radhakrishna School) RVT 6: 100 m³ capacity (WN-12 of Panchkhal Municipality, Nayagaun) RVT 7: 150 m³ capacity (WN-10 of Panchkhal Municipality, Jaretar) RVT 8: 150 m³ capacity (WN-7 of Panchkhal Municipality, Shikharpur) RVT 9: 50 m³ capacity (WN-9 of Panchkhal Municipality, Bhetwalthok-9N-29) RVT 10: 100 m³ capacity (WN-9 of Panchkhal Municipality, Palanchowk Bhagwati) RVT 11: 50 m³ capacity (WN-9 of Panchkhal Municipality, Kharelthok) Backwash RVT RVT 12: 150 m³ capacity (WN-9 of Panchkhal Municipality, Tapaldanda) Total storage capacity: 2,300 m³
	Pumping Chamber/Sump for pumping	• 3 Compartments at Stage 2 & 3-WN 10 of Bhumlu Rural Municipality • 3 Compartments at Stage 4-WN 9 of Panchkhal Municipality • 2 Compartments at Stage 5 (WTP Site)-WN 9 of Panchkhal Municipality
	Valve Chamber (Bricks/ RCC)	36 Nos
	Pipe valve box	179 Nos
	IC/BPT	6 nos (1 at branch transmission of 50cum, 10cum each at RVT-9 distribution system (1no), RVT-10 distribution system (2nos) and t Kharelthowk distribution system (2nos))
	Office Cum GH (O1) /Guard House (G 1) / Small Guard House (G2) /Dosing House (DS), Generator House, Boundary wall	At Sump Well (1st stage site): Small Guardhouse G1-1no; Generator house (140kVA) -1no; Boundary wall Stage 2,3 & 4 sites: Small Guardhouse G1 -3nos; Generator house (140 kVA) -3nos; Boundary wall At WTP Site (5th stage site): Medium Guard house G2-1no; Generator house (50kVA)-1no; Dosing Pump House-1no; Boundary wall & Retaining Wall At Backwash Reservoir Site: Small Guardhouse G1 –

SN.	Items	Description		
		1no; Boundary wall At service reservoir site: Small Guardhouse G1 – 11nos; Boundary wall Within Service Area (Panchkhal Bazaar Area): Office building O1-1no; Boundary Wall		
	Fire Hydrant (m)	20		
	River crossing (Nos)	12		
	Length of Main Transmission	9135.00m		
	Length of Branch Transmission Main (from WTP/ storage to RVT 1 to RVT 9 (Gravity), Backwash RVT (Pumping) (Filter Backwash and to supply water to Kharelthok RVT-11 by gravity), RVT-10 (Pumping)	37,237.00m		
	Length of Distribution Mains	189,309.00m		
	Features of Pipe	PE- PN6 : (75 to 250)mm PE- PN10 : (40 to 250)mm PE- PN16 : (50 to 225)mm		
		Heavy Class Galvanized Iron (GI) : (25 to 100)mm ND		
		Spigot Socket DI –C40 : (100 to 250)mm ND		
		Both Ends Flanged DI- C40 : 80mm ND		
		Double Flanged ISO DI Pipes-C40 : (100 to 250)mm ND		
		Single Flanged ISO DI Pipes-C40 : (80 to 250)mm ND		
	Pipeline Trench Details	<i>Pipe Diameter-ϕ (mm)</i>	<i>Width (mm)</i>	<i>Depth (mm)</i>
	<i>For PE & GI</i>	<i>Upto 50mm</i>	<i>450</i>	<i>900</i>
	<i>For PE & GI</i>	<i>63 to 1125</i>	<i>600</i>	<i>900</i>
	<i>For PE & GI</i>	<i>140 to 160</i>	<i>Higher of 600 of 3ϕ</i>	<i>1000</i>
	<i>For PE & DI</i>	<i>150 to 250</i>	<i>Higher of 600 of 3ϕ</i>	<i>1000</i>
	<i>For PE & DI</i>	<i>150 & larger</i>	<i>3ϕ</i>	<i>1000</i>
	Number of DMAs	11 Nos		
	Number of HH connection	5,998		
	Number of connections for institution	39		
b)	Sanitation Components			
	Public Toilet	1 no.		
	Institutional Toilet	1 no.		
	Tractor for Solid Waste Management	1 no.		
10	Construction Period	2 years		
11	Total Cost of WS Component Without VAT NRs.	1,740,052,643.07		

SN.	Items	Description
	VAT (13%)	226,206,843.60
	Total Cost of WS Component inclusive of all (NRs.)	1,966,259,486.67
12	Cost Sharing Arrangement (NRs)	
	GON Component (70 %)	1,376,381,640.67
	TDF Loan (25 %)	491,564,871.67
13	WUSC's upfront (Cash contribution 5%)	98,312,974.33
14	Tariff	
	Up to 6 cum/monthly (NRs)	60.00
	7 to 10 cum/monthly (NRs)	70.00
	11 to 15cum/monthly (NRs)	80.00
	16 to 25 cum/monthly (NRs)	90.00
	Institutional	120.00
	Weighted av. Tariff (NRs. /cum)	83.25
15	Financial Indicators	
	EIRR (Base case), %	18.34
	FIRR (Base case), %	14.75
	AIFC (Base case), NRs per cum	72.35
	AIEC (Base case), NRs per cum	77.34
16	Environment	
	ADB Category	B, Only IEE necessary
	IEE finding	No significant adverse impacts
17	Per Capita Cost for W/S component	
	Per Capita Cost (for base year pop.), NRs	62,589.83
	Per Capita Cost (for design year pop.),NRs	42,961.45
18	Total cost of Sanitation Component (Without VAT), NRs	7,547,157.86
	VAT (13%), NRs.	981,130.53
	Total Cost of Sanitation Component inclusive of all (NRs.)	8,528,288.39
19.	Cost Sharing Arrangement (NRs.)	
	GON Component (85 %)	7,249,045.13
	Local Authority (15 %)	1,279,243.26
20	Total cost of Water Supply and Sanitation Component (Without VAT), NRs	1,747,599,800.93
	VAT 13%	227,187,974.12
	Total Cost inclusive of all (NRs.)	1,974,787,775.06

Source: DEDR, Panchkhal WSSP, 2019

2.4 Water Supply Project Components/Features

29. The major water supply components of the proposed project with their characteristic features are described in the sections below:

2.4.1 Sources/Intakes

30. Regarding the water sources, the team had discussed with the WUSC members, local bodies, concerned beneficiaries and key personnel of the project area. As per the information given by the community people during mass meeting and as per our field study, there is only one reliable source available in the area that is not other than Sunkoshi River. The existing source will be used as it is but they are not considered for the new system. Sunkoshi river surface water source is used in the new system. They are demanding to use Sunkoshi river surface water source rather than using small stream water source available in the vicinity of the service area. The yields of these sources are much more than required, so population of the project area become benefited to use water for longer time.

31. The source Sunkoshi river has plenty of water. The seepage water of the river will be tapped through the construction of Infiltration Gallery. The proposed intake/sump well site is located at the right bank of Sunkoshi river at Bimire dobhan, which is about 2.5 km downstream of Dolalghat Bazaar (i.e. 2 km downstream of the confluence of Sunkoshi and Indrawati).

32. The exact location of sump well and collectors will be finalized during implementation after test drilling at site. If the soil strata at the proposed site has layer of rock, the location will be shifted or altered nearby proposed location. Based on the drilling, the collector and sump well site will be finalized with minor modification in design, if necessary. There are two sump wells designed in the system. Each sump well will have two collector wells. The collector well as well as sump well will collect water at the sump well and the water will be pumped. The perforated pipes are designed to flow the water from the filter media to collectors and sump well. The retaining wall at the hill side and river side have been designed to protect the structures. The river side RCC retaining wall will be constructed to prevent the flood into the intake site. It is envisaged that each sump well will collect water more than 42 lps. Accordingly, the perforated pipes are arranged considering the possibility of clogging of perforation in pipes.

33. The system will be pumping system. First of all, water will be pumped from sumpwell (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head about 210m to 220m at each stage to reach the water at treatment plant at an elevation 1,337.50m. The water treatment plant is located at about 250m downstream of Bhimsenthan Mandir beside existing NEA transformer. After treatment, the clear water will be stored at 400cum ground storage reservoir. Small individual pumps are used to pump the required quantity of water towards Palanchowk Bhagwati RVT-10 and filter backwash RVT-12. Another major pipe line goes to the nine reservoirs by gravity system. Filter backwash reservoir will supply water to Kharelthok RVT-11 and back wash of filter by gravity.

34. The perforated lateral pipes are connected at collector and sump well and extended towards the river. Each collector will have 7 m long 20 numbers and sump will have 16 numbers pipe of perforated top half dia. of 140mm dia PE100-PN10 pipe. The perforation

7mm has been provided 25% opening on top half dia of pipe sloping 1% towards collector/ sump well. The pipes covered with layers of filter material.

35. Likewise, arrangement has been made to supply water directly from Sunkoshi river to the collector/ sumpwell, if infiltrated water into sumpwell will not meet the required demand. Also two sump well are connected each other to allow the water from each other.

36. Water pumping required from each sump well is 42 lps. Each sump well shall have two pumps and both will be operated at a time. Each pump will be operated 20hours in a day during design year.

37. River seepage water infiltrate from gravel/ filter media is collected in collector/ directly into sump well. The water may bring small silt particle. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement are made.

38. The proposed water source is deemed to be technically viable regarding the stability, source discharge, less transmission main etc. However, test drilling shall be carried out during implementation to fix the exact location of collectors and sumpwells.

2.4.2 Electrical System

39. The proposed project has pumping station at each stage to reach water at WTP site. The overhead electrical transmission line will run along the pipe line route to supply power to each stage to run the pump. All the pumps at sump well, stage 2, stage 3 and stage 4 will be operated at a time to supply water at WTP/ storage reservoir. These pump stations are connected in series cascade mode. If one of the pumps fails to run due to any technical fault, the remaining pumps can deliver water from sump well to WTP/ storage reservoir. Hence, as per design of the electrical system, there is provision to shut only one pump in a control system if any of the pumps fails to run. Similarly, among the two pumps at WTP site and at backwash RVT, only one will be operated at a time. The capacity and number of pumps at various stages are given in **Table 2-IV**.

Table 2-III:Capacity and Number of Pump

<i>Location</i>	<i>Number and capacity of pump</i>	<i>Remarks</i>
Stage-1 Sump well	4 nos × 85 HP	All pumps run at a time
Stage-2	4 nos × 85 HP	All pumps run at a time
Stage-3	4 nos × 85 HP	All pumps run at a time
Stage -4	4 nos × 85 HP	All pumps run at a time
WTP/RVT Site for RVT-10	2 nos × 20 HP	Only one pump runs at a time
WTP/RVT Site for Backwash RVT	2 nos × 5 HP	Only one pump runs at a time

Source: DEDR,2019

40. There will also be the arrangement of Spare Pumps for Stage 1 to 4 at designated storage area for replacement such that if any pump does not function properly, it can be replaced immediately. The capacity of pump at each pipe will be divided by two to obtain

small size of pump at each alternative; this will be easy for the future operation & maintenance and to obtain spare parts.

41. One transformer with 2 -diesel generator back-up will be arranged at each pumping

[illegible]

stage to supply the power for the pumps at four major stages. Likewise, for minor stage (5th stage i.e. WTP/ storage RVT), one small transformer and generator has been designed. The transformer and diesel generator is designed as given in **Table 2-V**:

Table 2-IV: Transformer and Diesel Generator

Source: DEDR, 2019

42. Distribution System: The power cables from control panels to each load are calculated to satisfy the following criterions:

- Current carrying capacity of the cable is enough to carry the full load current continuously.
- Maximum voltage drop in the cable is less than 2% of the system voltage.
- The control panels at pump house are provided with the Star-Delta starter to reduce the high starting current drawn by the pump-motors.
- It is envisaged that the pump will be operated 97.5% and generator will be operate 2.5% in total operation hour.

2.4.3 Interruption Chamber/ Break Pressure Tank

43. This tank has been proposed at the location where the pressure at the pipe is more than the rated pressure. The proposed Break Pressure Tanks (BPTs) will be constructed at six locations that includes a) 50m³ capacity along Branch Transmission Line, b) 10m³ capacity along RVT-10 distribution system for Chisapani, c) 10m³ capacity along RVT-10 distribution system for Gairigaun, d) 10m³ capacity for RVT-9 distribution system, e) 2 nos - 10m³ capacity for Kharelthok distribution system. Introducing the IC/BPT, the pressure will

become zero at its outlet and pressure in the downstream pipe is designed based on the pressure of IC/BPT. Here, RVT-9 will supply water for distribution system and serve the purpose of IC for branch transmission system.

2.4.4 Transmission Mains & Pumping

44. Transmission mains refer to the pipe line running from intake to reservoir which comprises of two parts i.e. Main Transmission (Sump Well to WTP at the ridge of Bhairab Mandir) & Branch Transmission (WTP to various reservoirs). The transmission line passes via road, barren land and public land. The main transmission main comprises three mains that includes a) Mains that goes to branch transmission by gravity; b) Mains that goes to Palanchowk Bhagwati by pumping and c) Mains that goes to Bhimsentahn WTP backwash RVT by pumping.

45. The total pipe length of the main transmission from the proposed Sunkoshi river intake/ Sump well to the proposed treatment plant site/storage reservoir is about 9,135.00m including 5% more than the actual one, which comprises of DI pipe with Flanged End of diameter 200mm. Submersible pumps of total 4 nos.-85HP (at each stage 1, 2, 3 and 4) capacity are installed in two sumpwells/ intakes to various stages and these pumps will pump water upto the water treatment plant at 5th stage site at the downstream of Bhimsenthan beside NEA transformer. There is also provision of two parallel pipes for water lifting purpose along the transmission mains to avoid the interruption of water supply service if one pipe need repair.

46. Each pump will pump 21.0 lps water to WTP. In total, one pipe will carry 42.0 lps water by pumping. Two pipes will withdraw 84lps water to WTP. The pump capacity is determined accordingly. But, based on the pump catalogue, each pump will pump 22.21 lps and 4 pumps will pump 88.84 lps, which is more than required. After treatment, 5.71 lps water will be pumped to Palanchowk Bhagwati (RVT-10), 4.98 lps will be pumped to Filter Backwash RVT-12 and the remaining 73.31 lps water will be supplied to other proposed nine service reservoirs RVT-1 to RVT-9 by gravity. The Filter Backwash RVT 12 will supply 1.75 lps water to Kharelthok (RVT-11). The remaining 3.23 lps water will be used for the filter backwash purpose. There is also provision of disinfection before the storage of water within the ground storage reservoir at WTP site.

47. The total branch transmission length i.e. from WTP/storage reservoir to 11 RVTs is 37,237.00 m including 10% more than the actual one having pipe size PE pipe (63-110) mm dia. and 5% more than the actual having pipe size DI 100mm to 250mm dia are used. No house connection will be permitted from branch transmission before reaching water to RVTs except RVT-11. Branch transmission for RVT -11 comes from filter backwash RVT. Due to topography, some houses will get water from the branch transmission main before water reaches to RVT-11. Four types of pipes will be used in this branch transmission main system that includes PE-100 PN 6 of diameter 110 mm, PE-100 PN 10 of diameter 63 mm, DI pipe with Socket End of diameter (100-250)mm and DI pipe with Flanged End of diameter (100 to 250) mm.

2.4.5 Thrust Blocks, Saddle Blocks and Thrust Beam

48. Thrust blocks have been proposed for DI pipes (transmission and distribution mains for both alternatives) from being moved by forces exerted within the pipes arising from the

internal pressure of the pipeline or the flow of water hitting bends, tapers and closed or partially closed valves. Typical thrust blocks have been designed for a pressure of 24 kg/sq cm for both transmission lines and distribution line.

49. Similarly, there is also provision of Thrust Beam & Saddle Blocks for DI pipes that will be laid up in sloppy areas and un-buried portions. All saddle blocks are proposed to be anchored with concrete at the center of each pipe to prevent movement. Provision of RCC support for the stretches of buried & un-buried DI pipe line has also been made to prevent pipe movement which are laid-up in sloppy area.

2.4.6 Water Treatment Plant & Chlorination

50. The water quality test has been carried out for the proposed source, Sunkoshi River to ensure the requirement of water treatment plant by the engineering design team. The data obtained from this water quality test has been borrowed from the final design report to assess the necessity of the provision of water treatment plant. As per the design report, this test has been carried out at three different times; i) July & August during which there is chance of accumulation of large amount of suspended particles in river water and ii) January during which there is comparatively less chance of presence of suspended particles. As per the water quality test reports (**Refer Annex 6**), it shows that the water sample taken from the proposed source during January has pH value, hardness value and iron content within the prescribed NDWQS (pH: (6.5-8.5), Total Hardness: 500 mg/L and iron content: (0.30-3)). However, the NTU turbidity value of the water sample comes out to be 20.8 which is a bit higher in comparison to the prescribed value of NDWQS i.e., (5-10)NTU. Similarly, the reports also show that the water samples taken during July & August have a bit higher turbidity value 125 NTU & 110 NTU respectively whereas, other parameters like pH, Color, Total Hardness, Iron & Manganese Content have values within the prescribed limits. Hence, this indicates that the proposed source water has higher turbidity and there is requirement of provision of water treatment plant for the proposed town for the treatment of high turbid water.

51. Similarly, during field study, simple bacteriological tests (Coliform P/A Test Vial) which has been developed by ENPHO to determine the presence of Coliform bacteria at the water source was carried out by the engineering design team. This on-site bacteriological test is based on the principle developed by Manja et. al in 1982. The test is based on the readily observable formation of black precipitate iron sulfide in the test bottle, as a result of the reaction of H_2S with iron. The results of the Coliform P/A Test Vial show that the samples collected are contaminated with bacteria. This also indicates the necessity of the provision of water treatment plant to provide pure, safe & reliable water.

52. However, there is also requirement to carry out water quality tests of seepage water tapped from the proposed water during the construction of the proposed sumpwell.

53. Based upon the water quality, secondary data available and discussion with community in the surrounding of the service area, the final design recommends to construct water treatment plant for the seepage/ infiltrated water pumped from the proposed Sunkoshi river water source.

54. The water quality of the streams/ river varies from time to time at every rain and carries suspended solid, other organic and inorganic impurities. However, it is envisaged

that the seepage water will have better quality than the surface water. As per final design, the first level filtration will be carried out at sump well site while preparing the infiltration gallery surrounding the collector and sumpwell. River seepage water infiltrated from the gravel/ filter media is then collected in collector and directly transferred to the sump well. The water may bring small silt particles. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement has been made. If the quantity of water collected at the sump well is not enough, direct water feed from the river is also provisioned.

55. After pumping, alum mixing chamber followed by the rapid mixing chamber (coagulation) followed by flocculator followed by sedimentation followed by rapid sand filter followed by disinfection are designed in sequence. After the treatment the water will be stored into storage reservoir.

56. Small Alum Mixing Chamber, Small Rapid Flash Mixture with one unit of size 2.0m x 2.0m x 2.0m, Baffle Wall Flocculator with 5 units of each 7.50 x 2.50m x 1.20m; Sedimentation Tank with 4 units 19.50m x 6.50m x 3.00m, Rapid Sand Filter with 2 units of each 8.25m x 6.25m x 3.5m and Disinfection units are designed. Accordingly, the inlet outlet arrangement of each filter units together with necessary valve arrangements are provided in the detailed drawings. The bypass arrangement from each filter inlet/ outlet are also provisioned for the repair and maintenance of the structures or the quality of water available from the infiltration would be good enough for some period during seasonal variation and may not need all filter to operate. Also, the backwash arrangement of rapid filter has been arranged. A backwash reservoir (RVT-12) is provisioned and will supply water to Kharelthok RVT-11 by gravity and supply water to backwash the filter. Only one filter will be backwashed at a time at every 20-24 hours interval for 15 minutes by water. About 129.2 lps water will be used to backwash the filter with pressure head 10-12m. About 4% water is provisioned for filter backwash. Accordingly, the filterback wash reservoir is designed. In addition, air compressor has been kept provisionally to back wash the filter, this will be finalised during implementation. However, pipe and fittings arrangement have been made.

57. The purpose of Alum Mixing Chamber is to mix raw water with the alum i.e., Aluminium Sulphate which serves as flocculant. Alum causes the suspended particles of raw water to clump together so they can settle out of the water.

58. The purpose of rapid flash mixture is to disperse coagulant chemicals uniformly throughout the raw water as rapidly as possible in order to destabilize the colloidal particles (i.e. neutralize the negative charges around the colloid surface) present in water. The chemicals introduced into the water stream will attract any very fine particles, such as silt, that will not readily settle or filter out and make them clump together. These larger, heavier formations are called floc, which are much easier to remove from the water. This mixture optimizes the strength, size and weight of the floc.

59. The purpose of flocculation with the help of baffle walls is to accelerate the pace at which the particles collide, causing the agglomeration of electrolytically destabilized particles into settleable and filterable sizes. It is because the baffle walls with specific amount of spacing help to create the desired velocity gradient.

60. Similarly, the proposed sedimentation tank will allow coarse and heavy suspended particles to settle down through the force of gravity. This settling process will reduce the turbidity of water because lesser the presence of suspended solids, lesser will be the turbidity.

61. Hence, the presence of Rapid Flash Mixture, Baffle Wall Flocculator and Sedimentation Tank aids in the removal of turbidity.

62. Similarly, the proposed Rapid Sand Filter (RSF) followed by sedimentation tank, will enhance the removal of turbidity. This RSF improves water quality by removing water borne parasites, bacteria and suspended solids.

63. An emergency feeder line consisting of a solution tank connected with feeding tank having a constant level is proposed for the chlorination. FRP pump is used for this purpose. Bleaching powder 6.62kg / day and 9.65 kg / day require during base year and design year respectively. After disinfection some part of the lime will be settled at the bottom of the ground reservoir as residue. This residue shall be removed through washout. The washout pipe will be connected with the drain. This chlorination or disinfection unit is required for the removal of complex iron content and complete removal of bacteriological content. As there are no issues regarding the iron content of the proposed source water, this disinfection unit helps to effectively remove the bacteriological content present in the proposed source water that are only partly removed by RSF.

64. Hence, here, Alum Mixing Chamber is the first part of this water treatment process in which alum is mixed with the water to remove the suspended particles in the form of turbidity. Then, this alum mixed water is conveyed to rapid Flash Mixture in which a coagulant/alum is rapidly and uniformly dispersed through the mass of water destabilizing the colloidal particles present in water. This is then conveyed to Baffle Channel Flocculator which will transport this destabilized particles causing collision with the floc. This flocculation is the process in which colloids come out of suspension in the form of floc. The water from flocculator is then conveyed to the sedimentation tank in which the floc settles to the bottom of the tank. Once the floc has settled, the clear water on top is conveyed to Rapid Sand Filter in which water will pass through the filter media consisting of coarse sand and other granular media in order to remove the dissolved particles like dust, bacteria, viruses etc. This filtered water is then conveyed to Dosing Pump House for disinfection in which water will be disinfected by the Chlorine as a disinfectant in order to kill any remaining pathogenic organisms and to protect water from germs. After disinfection, the treated water is supplied to the sump reservoir that act as the collection reservoir to transport water to the pumping chamber that will pump the treated water to the service reservoirs for the distribution to the service area.

65. The flow chart for this water treatment process is given in the following given **Figure 2-III:**

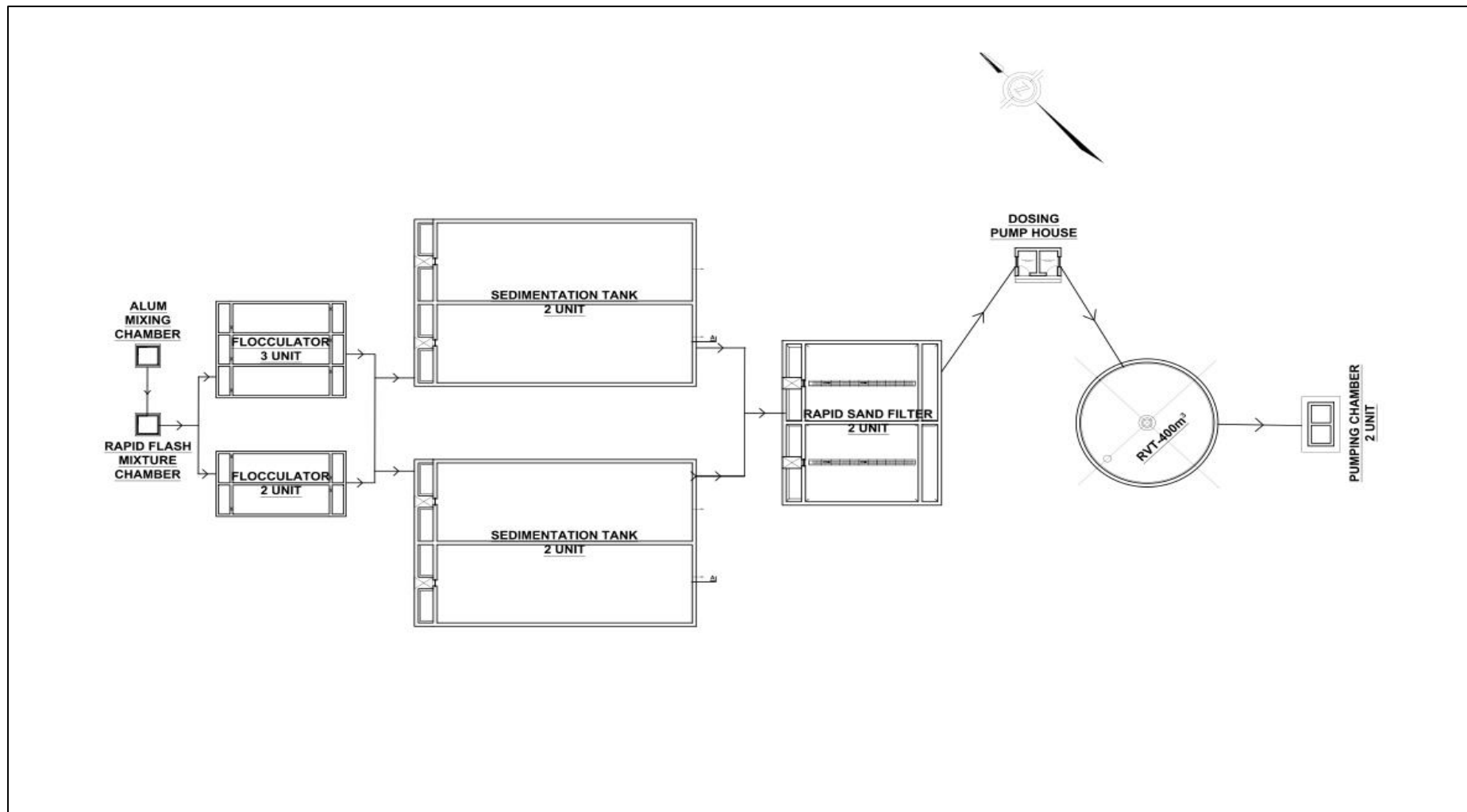


Figure 2-III:Flow Chart of Water Treatment Process

2.4.7 Sump Reservoir/Service Reservoir

66. The distribution system has been designed by using multi-reservoir concept due to topography of the town which was also adopted in the existing system at various elevations. The total storage requirement for the system at the end of the design period shall be about 2,300m³. This capacity will be divided into various reservoirs that will be constructed at various locations. There is provision of sump RVT of 150m³ capacity, each at pumping Stage 2, 3 & 4 and 1no of 400 cum capacity at WTP site. These reservoirs act as storage reservoirs. Similarly, there is also provision of backwash RVT of 150m³ capacity that will also distribute water to Kharelthok RVT by gravity.

67. There is also provision of eleven service reservoirs that include 6 no RVTs of 150 m³ capacity at six locations (RVT 1-U/S Municipality, RVT 2-Anekot, RVT 3-Sashastra RVT, RVT 4-Bakhrel Dihi RVT, RVT 7-Jaretar and RVT 8-Shikharpur RVT), 3 nos RVT of 100 m³ capacity at three locations (RVT 5-Radha Krishna School, RVT 6-Nayagaun RVT and RVT 10-Palanchowk RVT) and 2 nos. of 50m³ capacity at RVT-9(9N29) & RVT11-Kharelthok. The storage at each pumping stage is provided for only 0.5hr and ground storage at WTP site is provided for 1.25hr. All reservoirs will supply water in independent/ separate sub-service area.

2.4.8 Distribution Mains & District Metered Area

68. The distribution system comprises a pipe network, which is designed in loop network system. The entire new distribution system has been designed by using GI, DI and PE-100 pipe. The PE-100 pipes of a) PN 6-(50mm to 250mm) dia.; b) PN 10-(50mm to 250mm) dia and c) PN 16-(50mm to 225mm) dia. have been used in the design. Similarly, DI pipes with socket end of diameter 150mm & 200 mm have been used in the design. GI pipe of 40mm to 100mm dia. are also used in the design. The minimum pipe size for the distribution mains used in the design is PE100- 50mm, which governs the velocity. PE100 pipe above 4 kg/cm² pressure are proposed in the distribution network design as per technical requirement. PE100-PN6 pipe of 50mm and 63mm pipes are not used in the design due to technical difficulties to join the pipe with electrofusion technology. All PE pipes will be joint using electro fusion technology. The washout and air valve have been arranged in the distribution system in control valve/ pipe valve chamber, where possible. In some nodes, the residual head is considered high to maintain the residual head in the downstream node.

69. The flow in each line has been calculated based on the socioeconomic survey data and possibility of rapid increment of settlement in the near future. The Pipe Valve Box/ Valve Chamber have been proposed at suitable junctions to regulate the design flow in each pipe line and to stop the flow in the particular area without affecting the other area during repair & maintenance. All the distribution lines pass along the road network and public land. The distribution lines have been proposed on both sides in core bazaar area while, single pipeline has been designed in other remaining areas. Due to undulations/ irregular topography, two pipes are designed along one road among which one pipe will supply water at the highest level without distributing water to the households and the other pipe will distribute water to the households upto bottom.

70. The pipeline is designed by adding 10% extra length of actual one. The estimated distribution pipe is taken as 10% more than the actual one for PE pipe up to 90mm dia. and

5% more than the actual one for remaining all pipes is 189,309.00m. The design of this distribution system is based on the concept of District Metering Area (DMA). Each DMA will have bulk meter to determine the flow into respective service area. Each service reservoir is treated as one DMA. Hence, there are 11 DMAs within the proposed service area to supply water from each service reservoir. RVT location/ DMA boundary is fixed depending upon the elevation difference, location and easy for operation and maintenance. It is presented in **Figure 2-III** given below:

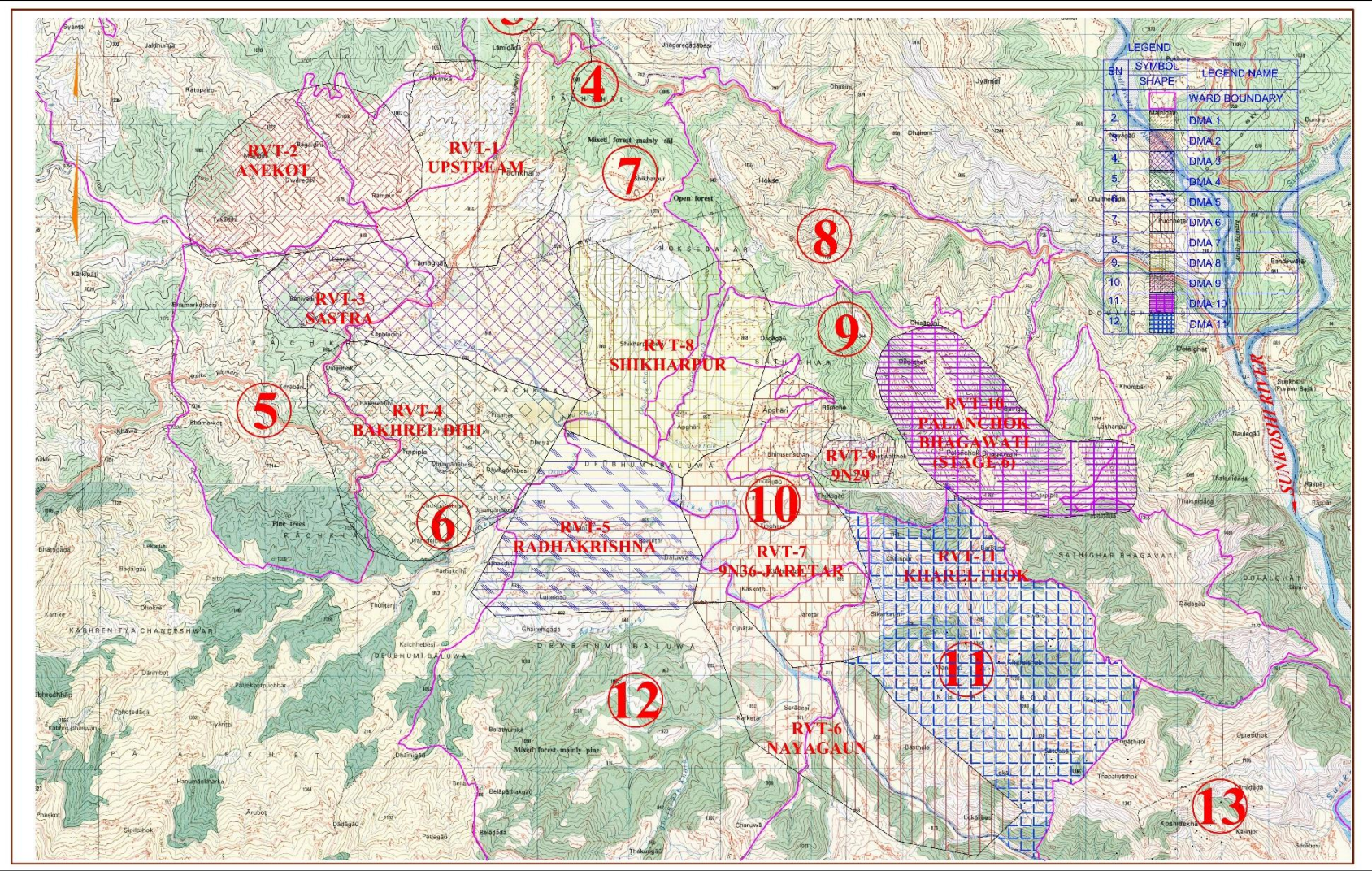


Figure 2-IV: District Metered Area (DMA) of the Proposed System

2.4.9 House Connection

71. The household shall connect the tap to their household by directly from main distribution pipe. The average 15m length of 20mm dia. of PE 100-PN16 pipe with compression joint, joined with GI fittings and valves up to meter for each HH connection. There will be 5,998 taps in the system during base year. The meter shall be kept near and adjoining the compound of the houses. After meter, each HH should extend the pipe themselves as they desire. The necessary fittings have been designed. Electro fusion saddle has been proposed to join the HH connection at main pipe to connect ferrule in the saddle. Likewise, GI and DI saddle clamp are proposed to join the HH connection at main pipe to connect the ferrule for GI or DI pipes.

72. Two types of tap stands have been designed for the project. At the end of the design period, it is anticipated that about 76.50% of the total household shall have fully plumbed, 23.50% of the total household shall be served through yard connection. The poor house connect tap at free of cost through OBA. There will be total 7,094 fully plumbed and 2,179 yard taps will be connected during design year. In total, there will be 9,312 connection including institutional 39 connections during design year.

2.4.10 Appurtenances

a) Bulk Water Meter

73. The bulk water meter is designed at various locations in the distribution system to ascertain the leakage in the distribution system. The main bulk meter is kept at the outlet of service reservoir. Each reservoir is served as DMA. Each bulk meter will provide the quantity of water supplied in the particular area and leakage in that area can be determined calculating the sum of HH water consumption. Accordingly, the repair and maintenance works can be carried out, if the leakages more than the permissible range.

b) Types of Connections

74. Consumers have been classified in three categories depending on their income level. The consumers having high level of income requiring more consumption of water are placed in fully plumbed category, consumers having medium income and medium consumption level and consumers of low income group and who can't afford tariff of fully plumb connections and use less water through tap connection at their household will be benefitted through yard connection. The social survey has been carried out. The poor household will get tap free of cost with OBA programs. However, WUSC has to reconfirm the poor household during implementation of the scheme.

75. The cost estimate of the taps for all household and institution has been included in project cost estimate. During execution of the project, the poor household shall connect tap from OBA facilities with recommend of WUSC.

c) Wash Out Valves

76. Washout valves have been provided at depressions points in the pipeline, where necessary. The purpose of the valve is to clean the debris collected in the pipeline. Sometimes, the valve can also be used for the maintenance of the pipe line without closing the whole distribution system.

d) Air Valve

77. The air valves are provided in transmission and branch transmission main. The air valves have been designed to release the air accumulated in the pipes. The water flowing through pipes always contain some air. This air tries to accumulate at the highest points and may interfere in the flow by narrowing pipe opening area. Air relief valve is provided in the distribution pipe near the overhead reservoir to provide the exit for such accumulated air. Also, the automatic air release valve is provided in distribution system at several locations.

e) Check Valve

78. This type of valve normally allows water to flow through it in only one direction. This valve is a two port valve which has two openings in the body; one for water to enter and other to leave. This valve is mainly for a specified cracking pressure which is the minimum differential upstream pressure between inlet and outlet at which the valve will operate. This type of valve has been proposed at each pumping stage.

f) Control Valve

79. The purpose of the control valve is to regulate the required flow in each distribution main from the junction/ node. Sometimes, it can be used for the maintenance of distribution system in particular area without closing whole distribution system. A control valve is provided in the system where there are more than two branches from one junction or where it is necessary. Control valves have been designed in suitable distribution junctions having more than two mains and in required places to regulate the design flow in the main. The design flow in each pipe line is based on design population, non-domestic demand and system wastage and leakage. The future demand in the main may fluctuate and the control valve/ regulating valve shall be useful to deliver the required flow in pipe line.

g) Pressure Relief Valve

80. The pressure relief valve is a safety valve that keeps the pressure within safety limits to prevent equipment failure, mishaps or other undesirable outcomes. Pressure relief valves will be designed with controls to increase or decrease the level of pressure in a pressure vessel. This type of valve will be installed at each pumping stage.

h) SCADA Valve

81. This type of valve is operated by SCADA (Supervisory Control and Data Acquisition) system. This SCADA system is a control system that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management, but uses other peripheral devices such as Programmable Logic Controller (PLC) and Discrete PID controllers to interface with the process planr or machinery.

82. A collection of equipment that will provide an operator at remote location with enough information to determine the status of a particular piece of a equipment or entire substation and cause actions to take place regarding the equipment or network.

83. Supervisory Control and Data Acquisition (SCADA) achieves this requirement collecting reliable field data through remote terminal units (RTUs), Intelligent Electric Devices (IEDs) and presenting them to user requirement. The user interface or the man machine

interface (MMI) provides various alternatives of data presentation according to specific application and user needs. There are many parts of a working SCADA system. A SCADA system usually includes signal hardware (input and output), controllers, networks, user interface, communications equipment and software. All together, the term SCADA refers to the entire central system. The central system usually monitors data from various sensors that are either in close proximity or on-site.

84. Basic SCADA is proposed/ designed for Panchkhal town. The outlet management system (OMS) from each pumping stage outlet and reservoirs outlets, Reservoir management system (RMS) at each inlet of reservoirs. These are not provided in pumping stage reservoirs inlets. The automation to link all the components through SCADA (Hydraulically Supervised Control and Data Acquisition) and all the mentioned components which shall be capable to enable to control and monitor the parameters from hSCADA room/ master control center for submersible pumps of all for main and one small stages, Water level sensors for all RVTs are provided. Likewise, water supply system operation and maintenance, one year operation and maintenance for SCADA is also provisioned.

85. The proposed system shall work under Wi-Fi coverage area, on the GPRS network or on a given radio frequency. The radio frequency is a free of cost communication media, but the limitations it has are, eye visibility of two connecting devices and the distance between them. Similarly, it would be difficult to reach all equipment within Wi-Fi coverage also. The other way out is the GPRS which shall work with the 3G and above cell phone network area. The services of the network providers having a full network in the given area can be used

i) Valve Chambers

86. Two type of Chambers have been proposed in the project to control or regulate the flow of the proposed water supply system. The chambers constructed by brick masonry have been provided in non-vehicular areas and rural area. In other vehicular carriageway and city area, chambers constructed with RCC has been provided.

87. The chambers shall serve as housing, protection and convenient access to these pipe appurtenances. Inside the concrete chambers, necessary supports shall be provided for pipes and valves at appropriate locations. Access to the valve chamber will be given via lockable cast iron covers with frames. Manhole covers of the heavy-duty type have been recommended in RCC chambers. Covers for manholes in paths may be proposed of medium duty type.

88. In total, there are 179 nos. pipe valve boxes and 36 washout/ air release/ control valve chambers designed in the distribution system

2.4.11 Fire Hydrants

89. Fire hydrants are provided at major road junctions. These fire hydrants are proposed to be used for flushing of the system as required. Fire hydrants, namely, stand post type, conforming to IS908 is recommended.

2.4.12 Generator House

90. A Generator house will be constructed at each pumping stage and WTP site. The Generator will supply power mainly for pumps installed at various stages of pumps, when

there is no regular power from NEA. The generator of capacities will be of 2 nos. of each 160 kVA at each stage 1, 2, 3 and 4 and 50 kVA at WTP site for stage 5. Only two pumps among four will run at a time at stage 1, 2, 3 and 4 and one pump for filter backwash RVT-12, one pump for RVT-10 will run at a time for stage 5 (WTP) site. Two generators at stage each will pump 50% of the demand. If one generator gets out of order, only one generator will be operated and supply 25% of water.

2.4.13 Laboratory Building cum WUSC Office Building, Guard House and Dosing House

91. A two storeyed laboratory building cum WUSC office building has been designed and this has been proposed to be constructed in Panchkhal Bazaar. WUSC will provide the land for the construction of office. The preliminary water quality test kits are arranged for regular water quality monitoring.

92. There is provision of Small Guard House (G1) at each pumping stage (Stage 1 to 4), at Backwash RVT and at 11 service reservoir locations. Hence, in total, 16 small guard houses have been proposed. Similarly, one Medium Guard House (G2) have also been proposed at WTP site.

2.4.14 Boundary Wall & Retaining Wall

93. The retaining wall has been proposed at sumpwell site, stage 2,3,4 and WTP site and each reservoir site as necessary. In some case, boundary wall will be above retaining wall and some cases boundary will be from foundation. The metal post with chain link fencing above brick masonry wall has been proposed to protect the structures such as Sumpwell/ Intake, Office Building, Pumping Stages, Reservoir Sites, Generator House, WTP, Backwash RVT and IC/BPTs etc. as required.

2.4.15 Miscellaneous Works

94. There is also provision of miscellaneous works for this proposed project that includes Construction of Dry Random Rubble Stone Wall, Gabion Wall, Concrete Saddle, Anchor Blocks, Thrust Blocks etc. for River Protection Works, Site Development Works, Drainage for the protection of Intakes, WTPs, RVTs, Guard House and Distribution system.

2.5 Sanitation Components

95. The sanitation component is considered as an integral part of the water supply project so as to minimize the coverage gap between water supply and sanitation components. The main issues that need to be addressed in the sanitation components as they would have consequential impacts on all the activities are:

- i. Toilets/Septage/Sludge Management
- ii. Drainage System
- iii. Solid Waste Management
- iv. Institution Building/Strengthening
- v. Raising Awareness

96. The sanitation practice is directly related with their hygiene consciousness. The socioeconomic survey shows that there is no separate sewerage system within the proposed

service area. But almost, all the households in the urban areas as well as in rural areas have their own latrines with septic tanks. The survey revealed that out of 5998 households, about 53.7% (3222) households have water sealed latrines whereas, 34.4% (2065) households have pit latrines. About 5% (287) HHs have ventilated pit latrines whereas 1% (53) of household are using cistern flush type of pit latrine.

97. The study revealed that the sanitation awareness as well as behaviour of the project town is satisfactory . The project intends to promote the current sanitation condition to next higher level. Hence, the proposed project has proposed for the construction of public toilets for institution as well as general public for the betterment of facilities in this area.. The thrust point will be to avail basic sanitation facilities. The aim of sanitation is universal coverage.

98. There is provision of one institutional toilet & one public toilet under the sanitation components of this proposed project. Similarly, there is also provision of one tractor for solid waste collection. These sanitation components will contribute towards the betterment of sanitation facilities in this area. These facilities also inculcate behavior of toilet use as well as of effective solid waste management among students and the general public. Hence, the proposed project also will address basic sanitation issues through the provision of toilets and solid waste management.

2.6 Construction Planning

99. It provides the basis for the fulfillment of the requirement during construction period of the proposed project. It involves the following described requirement of the project;

2.6.1 Land Requirement for the project area

100. The project requires significant areas of the project town for the construction of project components as well as project facilities. This requirement is either temporary or permanent that is based on the type of requirement of the structures. It is noted that for any kind of project construction activities, there is no requirement of occupying of land of the forest area. Similarly, there is also no requirement of private land acquisition for the construction activities. The land requirement and the ownership details of the land required for the following mentioned project components and project facilities are given below:

Table 2-V: Land Requirement & Ownership Details for the project components

A. Intake & Sump RVT Details

S. No.	Project Components	Land Requirement (m ²)	Type of Source	Requirement	Ownership
1.	Sump well at Sunkoshi river bank.	5403	Perennial River	Permanent	GoN-Bhumlu Rural Municipality
2.	Stage 2 pumping/ Sump RVT150 Cum	764	-	Permanent	GoN
3.	Stage 3 pumping/ Sump RVT150 Cum	764	-	Permanent	GoN
4.	Stage 4 pumping/ Sump RVT150 Cum	764	-	Permanent	GoN

Source: Due Diligence Report, Panchkhal WSSP, 2019

B. WTP, RVT, Transmission Mains & Project Facilities

S. No.	Project Components	Land Requirement (m ²)	Type of Land	Requirement	Ownership
1.	WTP (CC, Mixing Chamber, Flocculator, Sedimentation Tank, RSF, Dosing Pump House, Generator House)	4580	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
2.	Transmission Mains	5481.00	Vacant Barren Land	Permanent	GoN- Bhumlu Rural Municipality & Panchkhal Municipality
3.	Branch Transmission Mains	26065.90	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
4.	RVT-1 & Guard House	127	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
5.	RVT-2 & Guard House	127	Unused Vacant Land	Permanent	Bhainse Khola Community Forest

S. No.	Project Components	Land Requirement (m ²)	Type of Land	Requirement	Ownership
6.	RVT-3 & Guard House	127	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
7.	RVT-4 & Guard House	127	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
8.	RVT-5	127	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
9.	RVT-6 & GH-1	136	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
10.	RVT-7 & GH-1	377	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
11.	RVT-8	377	Barren Land	Permanent	GoN-Panchkhal Municipality
12.	RVT-9	71	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
13.	RVT-10	127	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
14.	RVT-11	71.60	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
15.	RVT-12/Filter Backwash RVT	71	Vacant Barren Land	Permanent	GoN-Panchkhal Municipality
16.	Public Toilet	103	Unused Vacant Land	Permanent	GoN-Panchkhal Municipality
17.	Office Building	150	Vacant Land within the compound of the existing municipality office area	Permanent	Panchkhal Municipality
18.	Camp Site (10 nos.)	100 m ² for each camp site	• Vacant Land • Barren Land	Temporary	GoN

S. No.	Project Components	Land Requirement (m ²)	Type of Land	Requirement	Ownership
19.	Stockpiling Site (10 nos.)	100 m ² for each site	• Vacant Land • Barren Land	Temporary	GoN
20.	Spoil Disposal Site (10 Nos.)	100 m ² for each site	• Vacant Land • Barren Land	Temporary	GoN

Source: Due Diligence Report, Panchkhal WSSP, 2019

2.6.2 Energy Requirement

101. There will be requirement of energy use either for any construction activities or for workers camp. Generally, Petroleum fuel & Electricity is used as a source of energy at the construction site. There is also possibility of use of solid fuel biomass like firewood by workers. However, burning of biomass releases carbon emissions. Hence, burning of biomass should be prohibited. Instead, cooking fuel like kerosene or gasoline fuel should be provided to the workers. For lighting facilities at construction site as well as worker's camp, electricity should be used as source of energy. While, for construction works, On-site Diesel Generators and Concrete Mixing Plant using petroleum fuel as well as electricity can be used.

2.6.3 Human Resource Requirement

102. Human Resources are the main functional units of the construction projects. The contractor should ensure that the project has sufficient human resources. The human resources include Skilled Labours and Unskilled labours. For ensuring punctuality and sincerity in work schedule, hiring local human resources especially labours would be preferable. As per design estimate, the total number of Skilled Labours and Unskilled Labours for the whole project duration are around 1,74,540 and 7,15,010 respectively. Similarly, during operation phase, the human resources for operation & maintenance are mobilized by the concerned WUSC.

2.6.4 Construction Materials

103. For ensuring availability, the local construction materials would be more preferable. The construction materials like stone, sand & aggregates can be locally brought from the authorized local vendor. There is no requirement of quarrying hence, there will be no need of crusher plant for the proposed project.

104. The materials other than Stone, Aggregates and sand including Bricks, Cement, Iron bar and Iron sections have been envisaged to procure from the nearest market centers that includes Dhulikhel and Banepa. Panchkhal town is just 19.80km and 22km far from Dhulikhel & Banepa respectively. Other miscellaneous construction materials like pipe materials, fittings, sanitary items etc. will be purchased from the available and nearest market areas.

105. As per the detailed design estimate, the total quantity of these major construction materials required for the overall project construction activities will be around as follows:

Stone: 9640 m³

Sand: 7500 m³

Aggregate: 8500 m³

Cement: 5020 tonnes

Bricks: 2,50,000 nos.

Reinforcement Bars: 770 tonnes

106. Other miscellaneous construction materials like pipe materials, fittings, sanitary items etc. will be purchased from the available and nearest market areas. As per the detailed design, the total estimated quantity of pipe materials for pipe laying works, house connection

works and for other project components is; a) DI Pipes: Spigot Socket Pipes-26,561m; Both End Flanged Pipes-15m; ISO Double Flanged Pipe-18,161m & ISO Single Flanged Pipe-567m , b) PE pipes: PN6- 47271.00m; PN10-65,690.00m & PN 16-67424.00m and c) GI pipes is 12,624m.

2.6.5 Worker's Camp Site

107. The proposed project has provision of worker's camp site to ensure worker's safety & rights during construction phase. The contractor will temporarily facilitate the construction workers with well equipped worker's camp. The camp site will be located nearby the construction sites at various tentative locations that includes a) Intake/Sump Well Area; b) Near Dhurmus Suntali Basti; c) Near backwash RVt Area-Charpipe; d) RVT 10-Palanchowk Bhagwati; e) Near RVT 7 & RVT 9-Bhimsenthan; f) In between RVT 6 & RVT 11 area-Near Jaretar Simle; g) RVT-Radhakrishna Mandir; h) RVT 3-Sashastra Area; i) RVT 8-Shikharpur Area and j) RVT 1-Upstream/Thumka. This is depicted in the *Figure 2-IV* given below. There will be provision of proper drainage, sanitation and basic utilities at camp site to ensure good health & sanitation behaviour of each workers.

2.6.6 Stockpiling Site

108. There is also provision of the stockpiling site which will be located nearby the construction site so that the stockpiled construction materials would be readily available. Various locations for this stockpiling site have been proposed that is same as that of the location of camp site which has been clearly described in the above section. This is depicted clearly in the *Figure 2-IV* given below. This location ensures that the proposed stockpiling sites do not interfere any natural drainage courses, drain inlets or concentrated flows of storm water. This ensures the control of blockage problems to these features that may be caused by some materials like soil, cement, rubbles etc. These locations are adjacent to worker's camp site so that the stockpiled materials will be under proper supervision of the workers. To control wind erosion, water or dust palliative will be applied to stockpiles and the bagged materials will be placed on ballets under cover.

2.6.7 Cut and Fill Volume of Muck

109. Cut & Fill Volume of muck after earthworks has been estimated during detailed design of this proposed project. After using the excess of cut in filling works, the resulting muck will be disposed off properly to Spoil Disposal Site. As per the detailed design, the total quantity of cut volume of muck is 179,084.74 m³ and of fill volume of muck is 161,603.18 m³. Hence, the remaining volume of muck after backfilling will be 17,481.56 m³ which will remain as excess spoil. This will be managed by disposing into the proposed spoil disposal site.

2.6.8 Spoil Disposal Site

110. There will be also provision of Spoil Disposal Site at various tentative locations that same as that of the location of camp site which has been clearly described in the above section. The location of each Spoil Disposal Site is depicted in the *Figure 2-IV* given below. Each location of this Spoil Disposal Site ensure environmental safety. Each of this location is nearby the existing roads so that it will be easy to transport the excess spoil and to dispose off to the approved landfill sites of the project town .

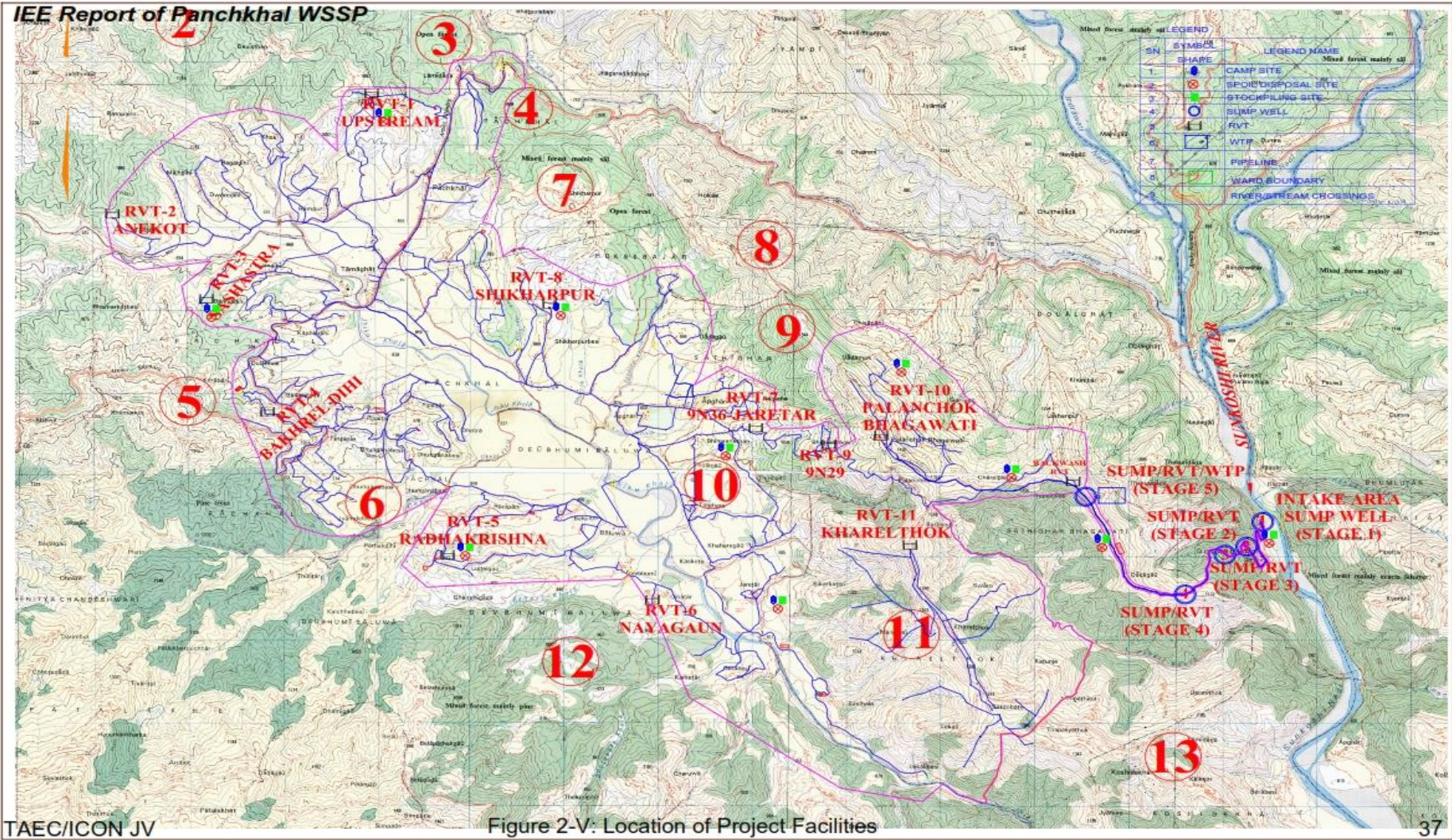


Figure 2-V:Location of Project Facilities

2.7 Project Activities

111. During IEE study, information on the proposed activities of the proposed project that may disturb the surroundings, needs to be collected. This can help to assess the impact identification procedure. The study categorizes the project activities on the basis of project phase. This has been listed below:

2.7.1 Construction Activities

112. The list of construction activities of the proposed project are given below:

- a) Site Clearance including clearing of some bushes and shrubs
- b) Movement of Construction Associated Vehicles
- c) Transportation of Construction Materials
- d) Loading/Unloading of Construction Materials
- e) Construction of Proposed Project Components that includes Sump Well, Sump RVTs, WTP, Service Reservoirs, Office Buildings, Generator House, Guard Houses and Public Toilets.
- f) Use of Diesel Generators
- g) On Site Concrete Mixing
- h) Excavation & Digging of Trenches
- i) Demolition Works
- j) Haulage & Disposal of Spoils to Spoil Disposal Site
- k) Disposal of Dismantled Debris
- l) Waste Generation from the construction sites and worker's camp
- m) Stockpiling of Construction Materials
- n) Dismantling of Temporary Facilities for workers, Stockpiling Areas and Spoil Disposal Sites after the completion of construction works

2.7.2 Operation Activities

113. The list of operation activities of the proposed project are given below:

- a) Cleaning of Sedimentation Tank
- b) Backwashing of Rapid Sand Filter
- c) Occasional Removal of Algae settled down at the bottom of the reservoir tanks

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Nepal's Environmental Policy and Legal Framework

Constitution of Nepal

114. The Constitution of Nepal is the fundamental law of Nepal.

- Article 30 (1) of the Constitution of Nepal guarantees a “clean environment” as a fundamental right, and elaborates that “every citizen shall have the right to live in a clean and healthy environment”.
- Article 30 (3) of the constitution also encourages the state to formulate necessary legal frameworks to balance environment and development.

115. Beside this, the Government of Nepal has passed a series of environmental laws, policies and implementing regulations and standards. Among these, the basic legislations that provide the framework within which environmental assessment is carried out in Nepal are the:

Environmental Protection Act, 2053 B.S.(1997 A.D. with amendments 2019 A.D.)

116. Environmental Protection Act (EPA), 1997, which requires a proponent to undertake IEE or EIA of the proposed project and have the IEE or EIA Report approved by the concerned sector agency , respectively, prior to implementation. This EPA:

- (i) sets out the review and approval process of IEE and EIA Reports, that involve informing and consulting stakeholders;
- (ii) stipulates that no one is to create pollution that would cause significant adverse impacts on the environment or harm to public life and health, or to generate pollution beyond the prescribed standards;
- (iii) specifies for the Ministry in charge of environment (currently the MoFE) to conduct inspection of approved projects to ensure that pollution prevention, control or mitigation is carried out according to the approved IEE or EIA Report;
- (iv) provides for the protection of objects and places of national heritage and places with rare plants, wildlife and biological diversity;
- (v) states that any person/party affected by pollution or adverse environmental impact caused by anybody may apply to the prescribed authority for compensation to be recovered from the polluter/pollution generator.
- (vi) Additionally, the amendment made in 2076 B.S. (2019 AD) mandates several compliances to Project Developers while developing a Proposal of a Project, to ensure that the implementation of the Project does not harm the environment.
- (vii) The Act has also redefined certain terms so that the definitions are more comprehensive. For instance, “Pollution” has been redefined so as to include waste, chemical, heat, sound, electronic, electronic magnet or radioactive radiation that significantly degrade, damage the environment or harm the

beneficial or useful purpose of the environment by changing the environment directly or indirectly.

- (viii) Further, the Act explicitly authorizes the Government of Nepal to set standards to reduce and regulate emission, hazardous waste, Pollution emitted by vehicles, equipment, industries, hotels, restaurants and other institutions or activities.

Environmental Protection Rules, 2054(1997) with Amendments 2073 B.S. (2017 A.D.)

117. Environmental Protection Rules (EPR), 1997 defines the implementing rule and regulations of the IEE/EIA process, elaborating the provisions in the EPA. The preparation, review and approval of IEE and EIA Reports are dealt with in Rules 3 to 7 and 10 to 14. Schedules 1 and 2 list down the projects of activities that requires IEE and EIA, respectively.

118. Other environmental policies, laws, rules, conventions & standards that provide general context in the environmental assessment of water supply & sanitation works are presented in the table given below:

Table 3-I: Other Relevant Environmental Act, Rules, Plan, Policies, and Guidelines of Nepal

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
1.Plans, Policies & Strategies			
National Environmental Policy & Action Plan (NEPAP)	2050B.S. (1993 A.D.)	Of its five objectives, most relevant to the Project are to (i) mitigate adverse environmental impacts; and (ii) safeguard national & cultural heritage & preserve biodiversity, within & outside protected areas.	- The subproject will not encroach any physical & cultural heritage areas and will not affect biodiversity. - EMP provides measures to mitigate anticipated adverse impacts.
Water Resources Strategy	2059 B.S. (2002 A.D.)	Among the ten strategic outputs of this strategy, third output focusses on Adequate Supply of and access to potable water and sanitation & hygiene awareness provided.	This provision will strengthen implementation capacity for the proposed project.
Rural Water Supply and Sanitation National Policy and Rural Water Supply and Sanitation National Strategy	2060 B.S.(2004 A.D.)	Recognizes that all people have a right to access to basic water supply and sanitation services and that these services are necessary for socio economic development and to combat waterborne diseases.	The proposed project ensures easy access to safe, reliable & potable water.
Rural Water Supply and Sanitation Sectoral Strategic Action Plan (Unofficial Translation)	2060 B.S.(2004 A.D.)	- This action plan has proposed "Environmental Aspects" as one of its major components. - This underscores the environmental aspects of all levels of plans and their implementation and consolidates them according to rules & policies to ensure the execution of development works.	Though this action plan has main focus on rural areas and the proposed project is for urban area, the IEE study has duly followed this strategic action plan as a reference.
National Water Plan-Nepal	2062 B.S. (2005 A.D.)	- This includes subsector-wise action programmes in water induced disasters, environmental action plan on management of watershed and aquatic ecosystem, water supply, sanitation and hygiene, irrigation for agriculture, hydropower development, industries, tourism, fisheries, and navigational uses, water-related information systems (Decision Support System for River Basin Planning and Management), legal frameworks, and institutional mechanisms - This also includes Environment Management Plan, a strategic document for the implementation of environmental protection measures (including downstream water pollution and groundwater quality,	This has been considered in IEE study.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		erosion/landslide and sedimentation, water pollution and sanitation, effect on aquatic life and wetland ecosystem), monitoring (baseline, impacts, and compliance), environmental auditing and institutional and procedural arrangements.	
National Urban Policy	2063 B.S. (2007 A.D.)	The policy gives importance to environment conservation while carrying out urban development works and natural resource use; thus, supporting the required environmental conservation and protection in donor-assisted development projects.	The IEE study will meet the provisions of this policy.
National Urban Water Supply & Sanitation Sector Policy (Final Draft)	2065 B.S. (2009 A.D.)	The Policy requires the IEE or EIA of proposed WSS projects by the EPA/EPR to (i) incorporate consultations with key stakeholders, including endpoint users; & (ii) specify measures to mitigate environmental impacts before, during construction & operation, as well as corrective measures.	The IEE study will meet the provisions of this policy.
Updated 15-yr Development Plan for Small Towns Water Supply and Sanitation Sector	2066 B.S. (2009 A.D. and Amendments in 2015A.D.)	The Plan emphasizes monitoring and evaluation as an important component of a project to determine the overall impact of a project.	EMP prescribes performance monitoring & evaluation to minimize the anticipated environmental impacts.
National Water Supply & Sanitation Policy (Draft)	2071 B.S. (2014 A.D.)	The goal of this Policy is to reduce urban and rural poverty by ensuring equitable socio-economic development, improving health and the quality of life of the people and protection of environment through the provision of sustainable water supply and sanitation services.	• The proposed project is solely for provision of sustainable water supply service to Panchkhal Municipality residents. • The IEE study ensures the protection of the environment from the construction activities of the proposed project.
Land Acquisition, Rehabilitation and Resettlement Policy	2015	• Contribute to overall development of the nation and its citizens by creating a conducive environment for implementation of infrastructure development projects • Facilitate timely execution (completion) of development projects by minimizing adverse impacts on economic, social and cultural aspects of affected families/people	There is no issue of any kind of Land Acquisition, Rehabilitation and Resettlement in this project.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		and the project area • Improve social and economic status of project-affected families by providing fair and adequate compensation, appropriate resettlement and rehabilitation assistances/ allowances.	
Land Use Policy	2072 B.S. (2015 A.D.)	• The strategy 3 of Policy 2 has taken into account to maintain a balance between physical infrastructure development and environment. • The strategy 3 of Policy 10 focusses on adalternative of principle of sustainable development in view of the impact of climate change during any construction and/or development works in order to keep balance between land, environment and development.	• The proposed project will maintain balance between construction activities and environmental aspects of the project town. • The IEE study ensures this issue.
National Urban Development Strategy	2074 B.S. (2017 A.D.)	• This strategy assesses the existing conditions of infrastructures,environment,economy and governance,establishes benchmarks and desirable standards. • It identifies prioritized strategic initiatives for investment in infrastructure and environment to realize the comparative advantages of urban areas.	The IEE study has duly followed this.
National Land Policy	2075 B.S. (2019 A.D.)	It has the provisions of ensuring proper access and management of land and land resources for the sustainable prosperity of the development of country. The general objective of this policy is to bring the economic prosperity of the country with land distribution to marginalize people, the maximum utilization and good governance of the land. The vision of the policy is 'Sustainable Land Management, Development and Prosperity'. By implementing this policy, the government of Nepal is planning to provide agricultural and housing land for landless and informal settlers for one time. It addresses land administration and land management reforms under six key pillars - security of tenure; access to land; land use; land valuation; taxation and land market; land acquisition; and modernization of land administration services.	This policy has been reviewed during IEE study.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
National Forest Policy	2075 B.S. (2019 A.D.)	It guides sub sectoral programmes relating to forests, plant resources, wildlife, biodiversity, medicinal plants, and soil and watershed conservation. It also covers periodic assessment and updating of information on forest resources of the country.	The proposed project does not have to deal with forest related adverse issues.
Fifteenth Five Year Plan FY (2076/77-2080/81)	2076/77-2080/81 (2019/20-2023/24)	This plan also has separate provision for water supply & sanitation sector. Regarding this sector, this plan aims to ensure access to safe water supply & sanitation service and to enhance quality service. This plan has also its own strategy, working policy and expected positive outcomes through various development works in the field of water supply & sanitation service.	The successful implementation of the proposed project shall be the expected outcome of this plan.
National Environmental Policy	2076 B.S. (2019 A.D.)	- This encourages the state to control pollution, manage wastes and promote greenery so as to ensure citizens' right to live in a fair and healthy environment. This was framed to guide the implementation of environment related laws and other thematic laws, realize international commitment and enable collaboration between all concerned government agencies and non-government organizations on environmental management actions. - The policy has entrusted the federal government with the responsibility for looking after national-level policy, law and standards related works for environmental protection and management.	This will be followed during the proposed project implementation phase.
2.Laws & Acts			
Essential Goods Protection Act	2012 B.S. (1955 A.D.)	- Deems drinking water an essential commodity and strictly protects drinking water. - Prohibits any unauthorized use or misuse, stealing, damaging etc. of drinking water.	The proposed project ensures safe, reliable & potable water along with the provision of protection works and metering system to prevent any misuses, stealing and damage problems.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
Aquatic Animal Protection Act	2017 B.S. (1961 A.D.) with Amendments (2055 B.S. (1997 A.D.))	This act renders punishment to any party introducing poisonous, noxious or explosive materials into a water source or destroying any dam, bridge or water system with the intent of catching or killing aquatic life. It also emphasizes that GoN empowers to prohibit catching, killing and harming of certain kinds of aquatic animals by notification in Nepal Gazette.	- Information of this act will be delivered to the construction workers, as they may get involved in fishing during construction period. - This issue has been covered by this IEE study.
Town Development Act	2045 B.S. (1988 A.D.)	This act has provision of necessary services and facilities to the residents of the town by reconstructing, expanding and to develop existing towns and by constructing new towns and to maintain health, convenience and economic interest of general public.	The proposed project is solely for provision of continuous water supply facilities as per the increasing demand of water of Panchkhal town.
Water Resource Act	2049 B.S. (1992 A.D.)	- The umbrella Act governing water resource management. - Provides for the formation of water user associations and establishes a system of licensing. - Prohibits water pollution.	WUSC has been formed for this proposed project as per this act and There is provision of control of water pollution through protection works and strict supervision.
Child Labor Prohibition and Regulation Act	2056 B.S. (2001 A.D.)	The section 3 of the Act prohibits a child from engaging in work, sub-clause 1 of the clause 3 states "Nobody shall engage in work a child who has not completed fourteen years of age as a labor and subclause 2 states "Nobody shall engage a child in a risk full occupation or work set forth in the Schedule". The section 4 states "Child not to be engaged in work against his will by temptation or fear or pressure or by any other means.	This provision has been stated in EMP.
Solid Waste Management Act	2068 B.S. (2011 A.D.)	Article 4 provides that the management of hazardous, medical, chemical or industrial waste rests upon the generators of such wastes. Management should be as prescribed in the Act. Article 5 provides that individuals and entities must reduce the amount of solid waste generated while carrying out work or business.	EMP prescribes eco-friendly management of solid and hazardous wastes.
Labour Act	2074 B.S. (2017 A.D.)	- The has provisions for the rights, interest, facilities and safety of workers and employees working in enterprises of various sectors. - The Act emphasizes on occupational health and safety	These provisions are stated in EMP.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		of workers and stipulates provision of necessary safety gears and adopting appropriate precautionary measures against potentially hazardous machine/equipment in the workplace. • It also specifies to arrange such as removal of waste accumulated during production process and prevention of dust, fume, vapor and other waste materials, which adversely affect the health of workers. • It specifies the provision of controlling the communicable diseases at the construction site. It also prohibits mobilization of child as a labor. It emphasizes on the provision of temporary camp, safe drinking water and necessary food supplies to the workers.	
Local Government Operation Act	2074 B.S. (2017 A.D.)	The Act gives Province Government the functions, duties & powers to: (i) entrust municipalities with responsibility of WSS services, (ii) conserve & protect their local environment & natural resources; (iii) plan, implement &/or operate & maintain WS projects at local level; (iv) implement or arrange for implementation local sanitation/sewerage & drainage projects; (v) protect cultural heritage & religious sites; &/or (vi) monitor project activities within their respective jurisdictions.	Provides a basis for Local Government to monitor the environmental performance of the projects. EMP provides the responsibilities of LGs in EMP implementation.
Consumer Protection Act	2075 B.S. (2018 A.D.)	• Article 3 of the act states that every consumer shall have the rights to quality goods and services. • Article 7 talks about compensation to the customer if any kind of damage is caused due to the manufacture of goods and service. • Article 12 has provisions that states that the service provider should provide services without any discrimination.	• In regard to this proposed project, it ensures the rights of water users/beneficiaries as consumers to get easy access to safe, reliable and potable water supply service as well as effective sanitation services. • It also provides basis for the concerned ministry to implement the policy related to proper water supply & sanitation services.
Forest Act	2076 B.S. (2019 A.D.)	• It stipulates that the GoN can develop a land use plan of a forest in order to maintain the balance of environment	It also provides basis for the use of forest land, if required.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		and development. - It also has provisions that states that the government can develop a specific forest conservation plan for a particular section of a national forest. - It also states that the forest area can be used with approval for national priority projects.	However, in regard to this proposed project, there is no requirement of use of forest land for the proposed project construction.
Land Use Act	2076 B.S. (2019 A.D.)	The main aim of the act is to ensure that land is properly used and managed and that land set aside for one purpose is not used for other. The act has assigned the responsibility for implementing the act to not only the federal government but also to the provincial and local governments.	Information on this act is necessary for this project to avoid misuse of land for the construction of project components. However, as this project requires RoW of the public road for the proposed components, land misuse May not be a serious issue.
3.Rules & Regulations			
Solid Waste (Management & Resource Mobilization), Rules	2044 B.S. (1987 A.D.) & Amendments 2049 B.S. (1992A.D.)	- This act focusses on the management of solid waste and mobilization of resources related. - These also ensure the health convenience of the common people by controlling the adverse impact on pollution from solid waste.	- This act needs to be reviewed during construction phase. - EMP covers the requirement of this rule for the proposed project.
Water Resource Regulations	2050 B.S. (1993 A.D.)	- This is the umbrella Regulation governing water resource management. - Sets out the procedure to register a Water User Association and to obtain a license. - Sets out the rights and obligations of Water User Associations and license holders.	The proposed project has followed these provisions.
Forest Regulations	2051 B.S. (1995 A.D.)	This has separate provision for the protection of Community Forest along with the duties & responsibilities of Community Forest User's Group.	The IEE study has considered this forest regulation assuring the protection of the Naule Community Forest.
Drinking Water Regulations	2055 B.S. (1998 A.D.)	- Regulates the use of drinking water. - Provides for the formation of Drinking Water User Associations and sets out the procedure for registration. - Deals with licensing of use drinking water.	The proposed project has followed all these provisions.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
		- Deals with the control of water pollution and maintenance of quality standards for drinking water. - Sets out the conditions of service utilization by consumers.	
Solid Waste Management Rules	2070 B.S. (2013 A.D.)	- GoN has issued these rules by exercising the power conferred by the section 50 of the Solid Waste Management Act, 2068. - Section 3 of this rule focuses on Segregation & management of solid wastes.	EMP for this proposed project covers this matter focused by this rule.
Labor Rules	2075 B.S. (2018 A.D.)	- GoN has issued these rules by exercising the power conferred to it under the section 184 of the Labor Act, 2074. - Section 7 of these rules deals with Occupational Safety & Health Policy.	EMP for this proposed project covers this matter focused by this rule.
4.Directives, Guidelines & Manuals			
National EIA Guidelines	2049 B.S. (1993 A.D.)	This guidelines aims to assess the environmental impacts likely to be caused by a project, and promote its positive impacts and mitigate or eliminate adverse impacts by undertaking preventive and other effective measures after integrating the environmental impacts in the planning cycle of all the projects to be initiated in Nepal, prior to their initiation, so as to make the economic benefits from development projects sustainable.	This has been followed for evaluation of the anticipated environmental impacts.
Guidelines for Community Noise by WHO	2055 B.S. (1999 A.D.)	It provides basis for global standards in noise quality at community level that are designed to offer guidance in reducing the health impacts of noise pollution.	During noise quality monitoring, this guidelines will be followed.
WHO Air Quality Guidelines, Global Update	2061 B.S. (2005 A.D.)	It provides basis for global standards in air quality that are designed to offer guidance in reducing the health impacts of air pollution.	During air quality monitoring, this guidelines will be followed.
National Noise Standard Guidelines	2068 B.S. (2012 A.D.)	It provides basis for national standards in noise quality that are designed to offer guidance in reducing the health impacts of noise pollution.	During noise quality monitoring, this guidelines will be followed.
Guidelines for removal of trees from government land	2071 B.S. (2014 A.D.)	It simplifies the procedure of getting approval from the local authority/government for tree removal.	It needs to be followed if there is requirement of removal of trees for the project construction activities.

Act/ Rule Policy/Law/Guidelines	Year	Relevant Provisions	Remarks
WHO Guidelines for Drinking-water Quality, Fourth Edition	2073 B.S. (2017 A.D.	It provides the recommendation of WHO for managing the risk from hazards that may compromise the safety of drinking water.	During water quality monitoring, this guidelines will be considered and followed.
Working procedure for the use of national forest for national priority projects, 2074	2074 B.S. (2017 A.D.)	It emphasizes on the management regarding the use of national /community forests for the implementation of national priority project.	During construction activities within the community forest area, this will be followed

Source:IEE Study,2018/019

3.2 Environmental Agreements

3.2.1 International Environmental Agreements (Conventions & Treaties)

119. Nepal is a signatory to many international agreements and conventions related to environmental conservation. However, all of those conventions are not interrelated to the proposed project. The conventions related to the proposed project are as follows:

- a) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
- b) International Covenant on Economic, Social and Cultural Rights (ICESCR), 1976
- c) Worst Forms of Child Labour Convention, 1999

120. The relevance of the aforementioned environmental agreements to the Subproject are with their emphasis on human activities to (i) take measures to protect local, as well as global, natural resources and environment; (ii) prevent or reduce the causes of climate change; and (iii) anticipate and mitigate the adverse impacts of climate change. The country is also committed to the Millennium Development Goals, the seventh goal of which is to “ensure environmental sustainability” targeting the reverse of loss of forest and environmental resources, reduction of biodiversity loss, and increase in the proportion of the population with sustainable access to safe drinking water and basic sanitation.

121. The Panchkhal Water Supply & Sanitation Project does not and will not break or go against Nepal's commitment to these international agreements.

3.3 Environmental Standards

122. The key environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are listed below and their details are featured in **Annex 2B**:

- National Drinking Water Quality Standards 2062 B.S. (2005 A.D.)
- National Ambient Air Quality Standards, for Nepal (NAAQS), 2003 A.D. & Updated in 2012 A.D.
- National Diesel Generator Emission Standard, 2012
- Nepal Vehicle Mass Emission Standard, (NVMES), 2069 B.S. (2012 A.D.)
- The key environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are listed in **Table 3-II** and their details on the acceptable level criteria of these standards are featured in *Annex 2B*.

Table 3-II: Relevant Environmental Quality Standards

Particular	National Standard	International Standard
Ambient air quality	National Ambient Air Quality Standards, for Nepal, 2003	WHO Air Quality Guidelines, Global Update, 2005
Noise	National Noise Standard Guidelines, 2012	WHO Noise Level Guidelines
Drinking water quality	National Drinking Water Quality Standards, 2005	WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011
Emission standard for diesel generator discharge	National Diesel Generator Emission Standard, 2012	

Particular	National Standard	International Standard
to ambient Air		

* For surface and groundwater quality monitoring, the National Drinking Water Quality Standard shall be applied since these resources are used for drinking.

Source: IEE Study, 2018/019

123. As shown in the above **Table 3-II, National Ambient Air Quality Standards, for Nepal, 2003** is enforced by GoN that has set quality standards for seven parameters TSP, PM₁₀, Sulphur Dioxide(SO₂), Nitrogen Oxide(NO₂), Carbon Mono-oxide (CO), Lead (Pb) and Benzene at national level. Similarly, *WHO Air Quality Guidelines, Global Update, 2005* enforced by WHO has set quality standards for four parameters PM₁₀, PM_{2.5}, SO₂ and NO₂ at international level. Both standards provide guidelines to follow and comply the set standards for the ambient air quality during construction period. The acceptable level criteria for ambient air quality as per both standards are given below:

Table 3-III: Standards for Ambient Air Quality

Parameter	Averaging Period	Nepal's Ambient Air Quality Standard (µg/m ³) *	WHO Air Quality Guidelines (µg/m ³) **	
			Global Update 2005	Second Edition [^] 2000
TSP	Annual	-	-	-
	24-hour	230	-	-
PM ₁₀	Annual	-	20	-
	24-hour	120	50	-
PM _{2.5}	1-year	-	10	-
	24-hour	-	25	-
SO ₂	Annual	50	-	-
	24-hour	70	20	-
	10-minute	-	500	-
NO ₂	1-year	40	40	-
	24-hour	80	-	-
	1-hour	-	200	-
CO	8-hour	10,000	-	10,000
	15-minute	100,000	-	100,000
Pb	1-year	0.5	-	0.5
Benzene	1-year	20	-	-

Source:

* National Ambient Air Quality Standards for Nepal, 2003. Obtained from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

** Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

[^] Air Quality Guidelines for Europe, Second Edition, 2000. WHO Regional Office for Europe, Copenhagen.

Parameter that either has no national standard value for 24-hour observation or with WHO guideline value for 24-hour observation as more stringent than that specified in the national standards.

124. Similarly, *National Noise Standard Guidelines, 2012* has set the standard noise levels measured in dBA for Industrial area, Commercial Area, Rural Residential Area, Urban Residential Area, Mixed Residential Area and Quiet Area. This also has provision of standard values for the noise level generated by Water Pumps and Diesel Generator also. This is limited within the country only. For international level, *WHO Noise Level Guidelines* has set the standard noise levels measured in dBA for two areas that includes residential and commercial areas. The standard values for ambient noise quality are given in the table given below:

Table 3-IV: Standards for Ambient Noise Quality

Receptor / Source	National Noise Standard Guidelines, 2012 (dB)		WHO Guideline Values for Noise Levels Measured Out of Doors * (One Hour L _{Aeq} in dBA)	
	Day	Night	07:00 - 22:00	22:00 - 07:00
Industrial area	75	70	70	70
Commercial area	65	55		
Rural residential area	45	40	55	45
Urban residential area	55	50		
Mixed residential area	63	55		
Quiet area	50	40	-	-
Water pump	65		-	-
Diesel generator	90		-	-

* Guidelines for Community Noise, WHO, 1999.

Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

125. Similarly, *National Drinking Water Quality Standards, 2005* provides guidelines for various parameters for the required frequency of water quality monitoring. This is acceptable at the national level only. For international standards, WHO has set standards for drinking water quality. This is shown in detail in the following table:

Table 3-V: Standards for Drinking Water Quality

Group	National Drinking Water Quality Standards, 2006			WHO Guidelines for Drinking-water Quality, 4th Edition, 2011*
	Parameter	Unit	Max. Concentration Limits	
Physical	Turbidity	NTU	5 (10) **	-
	pH		6.5 - 8.5	none
	Color	TCU	5 (15)	none
	Taste & Odor		Would not be objectionable	-
	TDS	mg/l	1000	-
	Electrical Conductivity	µc/cm	1500	-
	Iron	mg/l	0.3 (3)	-
	Manganese	mg/l	0.2	-
	Arsenic	mg/l	0.05	0.01
	Cadmium	mg/l	0.003	0.003
	Chromium	mg/l	0.05	0.05
	Cyanide	mg/l	0.07	none
	Fluoride	mg/l	0.5 - 1.5 ^	1.5
	Lead	mg/l	0.01	0.01
Chemical	Ammonia	mg/l	1.5	none established
	Chloride	mg/l	250	none established
	Sulphate	mg/l	250	none
	Nitrate	mg/l	50	50
	Copper	mg/l	1	2
	Total Hardness	mg/l	500	-
	Calcium	mg/l	200	-
	Zinc	mg/l	3	none established
	Mercury	mg/l	0.001	0.006
	Aluminum	mg/l	0.2	none established
Micro Germs	Residual Chlorine	mg/l	0.1 - 0.2	5 ^^
	E-coli	MPN/100ml	0	must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml	0 in 95% of samples taken	

* Health-based guideline values

** Figures in parenthesis are upper range of the standards recommended.

^ These standards indicate the maximum and minimum limits.

^^ From WHO (2003) Chlorine in Drinking-water, which states that this value is conservative.

Parameter with WHO guideline value as more stringent than national standard value.

National Drinking Water Quality Standards was obtained from the Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

Source: *National Drinking Water Quality Standards, 2005 and Implementation Directives for NDWQS, 2005*

126. *National Diesel Generator Emission Standard, 2012* has been introduced by the Government of Nepal in 2012 for new and in use diesel generators with a capacity of 8 kW-560kW (under the 1997 Environment Protection Act). The emissions standards set for new diesel generator imports is equivalent to Bharat Stage III standards and, for in-use diesel generators, is equivalent to Bharat Stage II. The Diesel Power Generation: Inventories and Black Carbon Emissions in Kathmandu Valley, Nepal 60 emissions limits are set for four major pollutants: CO, HC, NO_x, and PM. This is given in detail below:

Table 3-VI: National Diesel Generators Emission Standards, 2012

1. Emissions Limits (g/kWh) for Imports of New Diesel Generators

Category (kW)	CO	HC+NO _x	PM
kW < 8	8.00	7.50	0.80
8 = kW < 19	6.60	7.50	0.80
19 = kW < 37	5.50	7.50	0.60
37 = kW < 75	5.00	4.70	0.40
75 = kW < 130	5.00	4.00	0.30
130 = kW < 560	3.50	4.00	0.20

Note: This standard is equivalent to Bharat III standards.

2. Emissions Limits (g/kWh) for In-use DG Sets

Category (kW)	CO	HC	NO _x	PM
kW < 8	8.00	1.30	9.20	1.00
8 = kW < 19	6.60	1.30	9.20	0.85
19 = kW < 37	6.50	1.30	9.20	0.85
37 = kW < 75	6.50	1.30	9.20	0.85
75 = kW < 130	5.00	1.30	9.20	0.70
130 = kW < 560	5.00	1.30	9.20	0.54

Note: This standard is equivalent to Bharat II standards.

- a) Sampling collection point should be located at one-third of the DG set stack height.
- b) kW = Power Factor * kW
- c) Testing Methodology: Should be according to ISO 8178 or equivalent to ISO 8178 standard set by the manufacturing country.

Source: Diesel Power Generation, 2014 by The World Bank

3.4 Environmental Assessment Requirements

127. The Project is subjected to the environmental safeguard requirements of both the ADB and Government of Nepal.

3.4.1 Environmental Assessment Requirements of the ADB

128. All projects funded by the ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects funded under ADB loan are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. Concerning the environment, the SPS 2009 is underpinned by the ADB Operations Manual, Bank Policy (OM Section F1/OP, 2010). The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health, and Safety Guidelines³.

129. ADB's Environmental Safeguards policy principles are defined in SPS (2009), Safeguard Requirements as per **Table 3-VII** and the IEE is intended to meet these requirements.

³ New Version of the "World Bank Group Environmental, Health, and Safety Guidelines", April 30, 2007, Washington, USA. <http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines>

Table 3-VII:SPS 2009 Safeguard Requirements

SPS 2009 - Safeguard Requirements	Remarks
Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.	REA has been undertaken, indicating that the Project is NOT : (i) environmentally critical; and (ii) adjacent to or within environmentally sensitive/critical area. The extent of adverse impacts is expected to be local, site-specific, confined within main and secondary influence areas. Significant adverse impacts during construction will be temporary & short-term, can be mitigated without difficulty. There is no adverse impact during operation. Hence, IEE is sufficient.
Conduct EA to identify potential direct, indirect, cumulative, & induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical, cultural resources in the context of the project's area of influence. Assess potential transboundary global impacts, including climate change.	IEE has been undertaken to meet this requirement. (Chapter 7 & 8). No transboundary & global impacts, including climate change.
Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also, consider the no project alternative.	Analysis of alternatives is presented in Chapter 6
Avoid, and where avoidance is not possible, minimize, mitigate, &/or offset adverse impacts and enhance positive impacts using environmental planning & management. Prepare an EMP that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.	An EMP has been prepared to address this requirement.
Carry out meaningful consultation with affected people & facilitate their informed participation. Ensure women's participation. Involve stakeholders, including affected people & concerned NGOs, early in the project preparation process & ensure that their views & concerns are made known to & understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to EA. Establish a GRM to receive & facilitate resolution of affected people's concerns & grievances on project's environmental performance.	Key informant and random interviews have been conducted. A grievance redress mechanism for the resolution of valid Project-related social and environmental issues/concerns is presented in Chapter 10.

SPS 2009 - Safeguard Requirements	Remarks
Disclose a draft EA (including the EMP) promptly, before project appraisal, in an accessible place & a form & language(s) understandable to affected people & other stakeholders. Disclose the final EA, & its updates if any, to affected people & other stakeholders.	The draft IEE will be disclosed on ADB's website before Project appraisal. Copies of both SPS-compliant IEE and GoN-approved IEE will be made available at the offices of the PMO, ICG and WUSC for public consultation.
Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.	EMP implementation, reporting and disclosure of monitoring reports are in this IEE.
Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.	The project does not encroach on areas of critical habitats. No trees will be cut. However, ground cover and low shrubs in the project footprint and some work easement will have to be removed from the transmission main. Although in due time, ground cover is expected to grow over the backfilled affected area naturally, EMP recommends seeding of the re-surfaced area to accelerated re-growth.
Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health, and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	This requirement is only minimally applicable to the Project in the aspect of waste generation, e.g., effluent from septic tanks and generated sludge and sludge disposal from water supply and sanitation structures. The Project will not involve hazardous materials subject to international bans/phase-outs.
Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.	EMP provides measures to mitigate health and safety hazards during construction and operation.

SPS 2009 - Safeguard Requirements	Remarks
Conserve physical, cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during the environmental assessment. Provide for the use of “chance find” procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.	The Project will not affect any physical, cultural resource. The EMP recommends the measure/s mitigate the adverse impact on PCRs in case of the chance find.

Source: Safeguard Policy Statement, ADB, 2009 and IEE Study, 2018/019

3.4.2 Environmental Impact Assessment Requirements of Government of Nepal

130. The Environmental Protection Rules (EPR) defines the environmental impact assessment process that should be followed in the preparation, review, and approval of environmental assessment reports. The process applicable to the Project is summarized in **Table 3-VIII** given below.

Table 3-VIII: The GoN IEE Report Preparation, Review, Approval and Implementation Process

Steps in the Process	Remarks
A proponent shall be required to carry out the initial environmental examination of the proposals mentioned in Schedule (1)	The proponent carries out IEE study as mentioned in Schedule (1).
Approval of Work Schedule or initial environmental examination or environmental impact assessment to be made : (1) In cases where the proposal requires initial environmental examination, the proponent shall prepare a work schedule in the format as mentioned in Schedule 3 for a report relating to such proposal, and shall have it approved by the concerned body.	The proponent has prepared the work schedule and included in ToR that has already been approved.
The proponent shall, on the basis of the approved work schedule pursuant to Rule 5, prepare the report of initial environmental examination in the format as mentioned in Schedule 5.	This IEE report has been prepared on the basis of approved work schedule and as per Schedule 5.
The proponent shall, in the cases of initial environmental examination affix a notice in the concerned Village Development Committee or Municipality, Office of the District Development committee school, hospital, and health post requesting the Village Development committee or Municipality and District Development Committee or concerned individuals or institution to offer their written opinion and suggestions within Fifteen days with regard to the possible impact of the implementation of the proposal on the environment where the proposal is to be implemented and prepare a deed. The said Fifteen days notice shall also be published in a national level daily newspaper. After the publication of such notice the opinions and suggestions so received in relation to the same shall also be included in the report. The proponent shall organize a public hearing about the proposal at the area of Village Development Committee or Municipality where the proposal is to be implemented and collect opinions and suggestions.	Publication of 15 days public notice followed by public hearing has been carried out during this IEE study.
The proponent, who wishes to implement a proposal pursuant to Section 5 of the Act, shall Submit Fifteen copies of the report prepared under Rules 7 along with the recommendation of the concerned Village Development Committee or Municipality to the concerned body for the approval of	The proposed project submitted 15 copies of this IEE report accordingly for review and approval along with the

Steps in the Process	Remarks
proposal.	recommendation of the Panchkhal Municipality.
CSA conducts review and grants approval of IEE Report.	
➤ If thereview reveals project implementation to have no substantial adverse impact on the environment, CSA approves within 21 days from receipt of thereport.	
➤ If thereview reveals the necessity to carry out an EIA, Proponent conducts an EIA following the prescribed EIA process.	
Proponent implements approved IEE Report and any terms and conditions given with the approval.	The project has not started and being implemented. Once the project starts, this step will be followed.
CSA monitors and evaluates the impact of project implementation. When necessary, issue directives to the Proponent to institute environmental protection measures.	The project has not started and being implemented. Once the project starts, this step will be followed.
MoWS conducts the environmental audit after two years of project commissioning/operation.	Project has not started and being implemented. After the two years of project commissioning, this step will be followed.

Source: EPR, 1997 with amendments in 1999, 2007 and 2017 and IEE Study,2018/019

4 METHODOLOGY

131. To meet the objectives of the IEE study a systematic and integrated methodology was followed by the legal requirements of GoN. The Ministry of Water Supply has already approved the Terms of Reference (ToR) for the IEE study of Panchkhal Water Supply and Sanitation Project. The IEE study has followed basically the procedures outlined in the approved ToR.

132. The IEE study was conducted as per provisions of the Environmental Protection Rules (1997 with amendments 1999, 2007 & 2017) following the provision of Rules 5, 7, 10 & 11 in compliance with the schedule 1, 3 & 5.

133. The IEE study has followed the procedures outlined in the approved ToR and has covered the issues delineated therein. The principal steps undertaken in the IEE methodology to accomplish the assignment are briefly discussed below:

4.1 Literature review

134. Available primary and secondary literature in the form of reports and maps; topographic maps, land use maps, aerial photographs, cadastral survey maps, etc. were collected and reviewed to obtain secondary information. Feasibility Study Report, Detailed Engineering Design Report, Due Diligence Report and Socioeconomic Profile were the key documents collected and reviewed to determine the nature and scope of activities of the project that influences the environmental conditions of the proposal area. Likewise, data on climate, rainfall and other meteorological conditions were also collected from Department of Hydrology & Meteorology (DHM), Kathmandu. Similarly, published and unpublished reports about environmental standards, Acts, Regulations, etc. were also collected and reviewed. Published and unpublished literature of the project area about biological, social, chemical, physical, and cultural environments in the form of maps, and reports, etc. were collected from various sources and reviewed to get information on the coverage of the studies and fulfill the data gaps.

4.2 Impact Area Delineation

135. To carry out IEE study, the possible areas where the anticipated impacts have either significant or insignificant effects, need to be delineated. To specify the area that would be covered by the assessment, the geographical boundary of the influence area is delineated on the topographical map. This delineating methodology is called Impact Area Delineation. The impact areas have been delineated on the basis of proximity of the construction site to the nearby surrounding areas. The impact areas have been delineated as “Core Project Area”, and “Surrounding Project Area” on the basis of proximity and magnitude of the impacts due to the proposed project activities.

136. *Core Area:* Here, the Core Area indicates the area required permanently as well as temporarily for the proposed project. This area refers to the service area as well the area where the construction of the project components will be carried out and has the highest magnitude impact from the proposed project activities. Hence, here, regarding this proposed project, this core area includes the service area of the proposed project which comprises partial areas of wards 2, 3, 4, 5, 6, 7, 9, 10, 11 & 12 of Panchkhal Municipality which has been clearly depicted in the **Figure 4-1** given below:

137. This also includes the construction area where the proposed project components will be constructed. Hence, this also covers the following areas:

- a) Intake Areas: WN 10 of Bhumlu Rural Municipality
- b) Sump RVT: WN 10 of Bhumlu Rural Municipality
- c) WTP Areas; WN 9 of Panchkhal Municipality
- d) Transmission Mains: WN 9 of Panchkhal Municipality
- e) RVT 1: WN 2 ; RVT 2: WN 2 ; RVT 3: WN 5; RVT 4: WN 6; RVT 5: WN 12;
RVT 6: WN 12; RVT 7: WN 9; RVT 8: WN 7; RVT 9: WN 9; RVT 10: WN 9;
RVT 11: WN 11 and Backwash RVT: WN 9 of Panchkhal Municipality

138. *Surrounding Area:* Here, the Surrounding Area indicates the area within the immediate surroundings of the core area of proposed project. It includes the area of the project town which is closely associated with the core area of the project and has spill-over effects of those effects that occur within the core area. This has low to medium magnitude impact from the proposed project activities. Hence, here in this proposed project, the surrounding area covers the partial areas of wards 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 & 12 of Panchkhal Municipality

139. The Core Area & Surrounding Area of the proposed project is depicted in the figure given below:

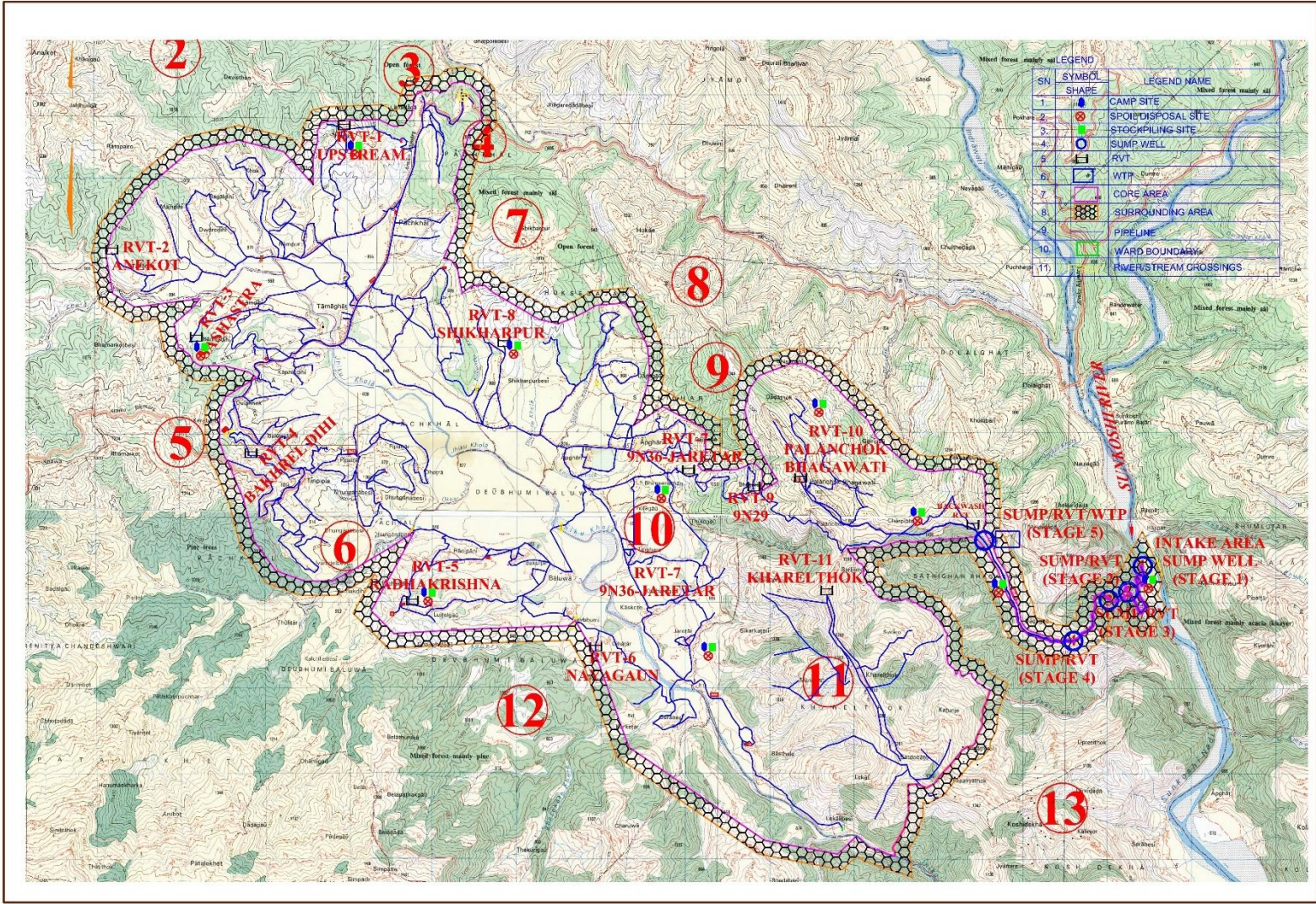


Figure 4-I: Project Impact Area

4.3 Field Study

140. The field study was carried out in the project service areas in an extensive manner by a multidisciplinary team, comprising a) an Environmental Specialist; b) Water Supply & Sanitation Engineer; c) Sociologist; d) Geo-hydrologist and e) Botanist. During the visit, baseline information on physico-chemical, biological, and socio-economic & cultural conditions of the core area and surrounding areas of the project area were collected using Simple Checklist and Survey Questionnaire method (Refer Annex 4). Similarly, during field study, Rapid Assessment Checklist (**Refer Annex 2A**) as recommended by ADB as per SPS, 2009 has been duly followed in which data regarding physico-chemical, biological, socio-economic & cultural environment has been filled up. The sub-sections below briefly describes the various approaches and methodological tools used during the field study.

4.3.1 Physico-Chemical Environment

141. An extensive physico-chemical environment survey was carried out by delineating the project impact area to collect the baseline information through simple checklists method. Topographic and geomorphological features were observed and documented. Physical features such as topography, air quality, erosion and land stability & land use pattern were also observed and Information in regard to these features were recorded in the simple checklists (**Refer Annex 4**). These data on physico-chemical environment were collected through field survey & investigation by the team of experts, expert's judgement and stakeholder consultations.

142. Similarly, the baseline information regarding water quality was borrowed from the final design report. This data has been collected by sampling process by the engineering team. This involved collection of water sample from the proposed source Sunkoshi River. This sampling process has been carried out at three different times; i) July & August during which there is chance of accumulation of large amount of suspended particles in river water and ii) January during which there is comparatively less chance of presence of suspended particles. These first two water samples were taken to the certified laboratory i.e., Nepal Environmental & Scientific Services (P) Ltd. located at Thapathali, Kathmandu for further analysis. Similarly, the third sample was tested at Aastha Scientific Research Service Pvt. Ltd. Located at Dillibazar, Kathmandu.

143. Along with this, the water samples were also taken from the two existing RVTs at Thumka & Lamdi respectively and from Thokre Khola, from where the people of the proposed town has been consuming water.

144. The laboratory analysis primarily measures the value of important parameters that includes pH, Color, Taste & Odor, Total Hardness, Calcium and Iron. Besides this, other parameters were also measured. The values of these parameters were then compared to the value prescribed as per NDWQS to measure the equivalence of the water quality of the proposed sources with NDWQS. This has been presented in a tabular form and has been attached in **Annex 6**.

145. Similarly, information on air quality and noise quality condition was collected through field observation and expert's judgement. For convenience, simple checklist for Physical environment has been prepared and this checklist as included in **Annex 4** is duly followed and filled up during field study. The consultations with the local communities and interviews with a few government officials, schools and representatives of the local bodies also provided aid to assess the physico-chemical aspects.

4.3.2 Biological Environment

146. The baseline information regarding biological environment was collected through walkthrough survey throughout the core & surrounding areas of the project area by adopting simple checklist method (**Refer Annex 4**), through professional judgement and local interaction. Types of vegetation and forests were identified based on the species composition. Information on rivers of the project area were also collected through interaction with the locals and through field observation. The protected vegetation (rare, endangered, indigenous, etc.) of the project area as per IUCN Red Book, CITES Appendices, IBAT Report generated by ADB and GoN list species were enumerated based on consultation with the local people and the expert judgement. Similarly, information on the aquatic species were also collected through the expert judgement and discussions with the locals.

4.3.3 Socio-economic and Cultural Environment

147. Household surveys were conducted through interviews by simple questionnaire method to collect information on the socio-economic & cultural environment that includes demography, ethnicity, education, health & sanitation, drinking water condition of the project area, irrigation facility, local traditions, religions, land use patterns, incomes & expenditures and to acquire their perception towards the proposed project, etc. Information on Migratory patterns of the local people and the Impact of river on settlements & agriculture were also collected. Information on the people residing within the core area of the proposed project town has also been collected through socio-economic survey.

148. For the basic information of the project town, Census Survey has been carried out in which complete set of population is selected. Hence, this survey covered 100% of the total HHs. But, for the detailed information, random sampling method has been adopted. It is well known that Random Sampling is a part of sampling technique in which each sample has an equal probability of being chosen. Hence, here, only 5% of the total HHs was taken as sample of census and surveyed in detail for this study. The sample of Household Survey Questionnaire that has been filled up during field study through this sampling method has been included in **Annex 4**.

149. Focussed Group discussions (FGD) were also conducted to obtain suggestions and comments from all the potential stakeholders. The checklist followed for FGD and its findings have been included in **Annex 4**. Transect Walk Method was also conducted to ascertain the existence of the cultural sites, and public institutions such as temples, cremation grounds, historical & archaeological sites, schools, and health posts within the project core areas and to determine the effect on their existence due to project construction activities. During this, findings on the existence of Project Affected Families (PAFs, families whose land or property will be impeded by the project construction activities) were made. Our findings show that no such PAFs exist as the project construction activities will not hinder any of the families residing within the project area. The Consultations with the village elites and Group discussions were done to assess the current situation of the project area community.

4.4 Public Notice & Public Consultation

150. A public notice of 15 days was published in Arthik Abhiyan Dainik, a national daily newspaper on 2076/08/04. The main aim of the notice is to seek written opinions from the concerned people and institutions regarding the possible impacts that may result from the implementation of the proposal. The public consultation program was conducted in the

concerned ward offices according to which no dissatisfaction regarding the proposed project has been felt.

4.5 Collection of Muchulkas (Deed of Inquiry) and Recommendation Letter

151. Deed of Inquiry (Muchulka) is prepared by Panchkhal Municipality in regard to the public notice that has been affixed at the premises of Panchkhal Municipality right before the day of the date of publication of public notice in the above mentioned newspaper. It was collected within the 15 days from the date of public notice publication. This has been included in **Annex 3**.

152. Similarly, Recommendation Letter from the local authority (Municipality) was collected after the completion of 15 days from the date of publication of public notice that mentions no objection regarding the project implementation. This has been attached in **Annex 3**.

4.6 Impact Identification, Prediction & Evaluation Methods

153. The information regarding Physico-chemical, Biological and Socio-economic & Cultural aspects as mentioned above has been collected to identify the susceptibility of these aspects to be affected by the proposed project activities. This helped to identify the anticipated environmental impacts of the proposed project. For this, Simple Checklist method has been adopted for the impact identification. This has been carried out by using Rapid Environmental Assessment (REA) Checklist prepared by ADB (**Refer Annex 2A**) and by using simple household survey questionnaire (**Refer Annex 4**) prepared during the desk study. These checklists explain the environmental features or factors that need to be addressed when identifying the impacts of projects and activities.

154. Once all the important impacts had been identified, their potential characteristics were predicted. The baseline data on physical, biological, socio-economic and cultural aspects were used to estimate the likely characteristics and parameters of impacts that includes Nature, Magnitude, Extent and Duration.

155. The nature of each predicted impact has been classified into Direct (D) and Indirect (ID). The magnitude of the impact has been classified into High (H), Medium (M) and Low (L). The extent has been classified into Site-Specific (SS), Local (L), and Regional (R). Similarly, the duration of impact has been classified into Short Term (ST), Medium term (MT), and Long term (LT).

156. Impact predictions are generally made against a baseline established by the existing environment. Hence, during our field study, the baseline data were used as reference point against which the characteristics and parameters of impact related changes were analysed. Impact predictions were also made by considering the future state of the environment. This also requires professional judgement for accuracy.

157. After the impact identification and prediction method, these impacts need evaluation to assess the adversity of adverse impacts and efficiency of beneficial impacts within the project core & surrounding areas. The impacts were evaluated regarding the significance of the predicted impacts. This was done by following the *National EIA Guidelines 1993* according to which scoring for each likely parameters of the impacts was carried out and the level of significance was assessed as recommended by this guidelines.

158. The scoring of impacts as per *National EIA Guidelines 1993* is tabulated below:

Table 4-I: Scoring of Impacts

S. No.	Likely Parameters of Impacts	Type	Scoring as per National EIA Guidelines, 1993
1.	Nature	Direct	No Scoring Required
		Indirect	
2.	Magnitude	High (H)	60
		Medium/Moderate (M)	20
		Low (L)	10
3.	Extent	Regional (R)	60
		Local (L)	20
		Site Specific (SS)	10
4.	Duration	Long Term (LT)	20
		Medium Term (MT)	10
		Short Term (ST)	5

Source: National EIA Guidelines 1993

159. Then, the significance level of Impact rated will be assessed as per the following table:

Table 4-II: Significance of Impacts

S. No.	Scoring as per National EIA Guidelines, 1993	Level of Significance as per National EIA Guidelines, 1993
1.	Less than 50	Insignificant
2.	50 to 75	Significant
3.	More than 75	Very Significant

Source: National EIA Guidelines 1993

160. This evaluation was done as per the professional judgement by the key expert team involved in the IEE study.

5 EXISTING ENVIRONMENT

5.1 Existing Physical Environment

5.1.1 Landforms and Topography

161. It is an intermontane basin developed in the Central Nepal East of the Kathmandu Valley with two sets of neo-tectonic lineaments. It is located within the eastern flank of a synclinalorium in Kavre District. The project area lies between 27° 39' 0" Latitude and 85° 37' 0" Longitude.

5.1.2 Geology & Soil

162. The project area comprises mainly micaceous quartzite, psammitic schist, metasandstone and metasilstone. The rock masses consist mainly of three to four major joint sets including the joint parallel to foliation. Basically, sand, silt, and clay are the main sediments of the soils of this zone.

5.1.3 Land use pattern

163. Panchkhal municipality is a newly formed municipality and a local federal unit after adding various former VDCs along with Panchkhal VDC as per decision made by GoN on March 10, 2017. No new municipality profile has been prepared by the municipality till date. Hence, there is no specific data in regard to this. The study on the land use pattern of the project town is done on the basis of the field observation. Generally, the field observation shows that the agricultural land dominates the land use pattern of the project area. This is followed by forests and residential areas. Likewise, the remaining area has been used by rivers & rivulets and commercial areas.

5.1.4 Water Resources

164. Sunkoshi is the only reliable surface water source of the project area. Besides this, Jhiku Khola which is the tributary of the Sunkoshi River and Thokre Khola are other sources of water. However, it is the seasonal river which gets affected by flash flood during rainy season whereas, during summer, it almost gets dry. Similarly, people of the project town also rely on kuwa & stream available within their area.

165. The field observation also shows that the available water resources are not contaminated. As the locations of these rivers are near the settlement area, the main source of pollution of these rivers can be human behaviours that includes dumping wastes, littering activities, throwing sewage etc. Along with this, animal intrusion also pollutes the water bodies. However, the settlement near the water resources is scattered type, hence, the pollution level may not be significant enough to affect the environment.

5.1.5 Climate

166. The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. The mean monthly temperature is 24.9°C. The temperature ranges from 11.66°C to 24.9°C. There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The average mean annual rainfall is 1020 mm, which is slightly less than 1500 mm, the average precipitation of Nepal.

167. The driest month is November, with 32.20 mm of rain. The rainy season starts from June and ends in September when the monsoon blows across the Bay of Bengal and delivers about 80 % of the annual rainfall. The most precipitation falls in July. The average monthly average rainfall (in mm) is presented in **Table 5-I**.

Table 5-I: Average Monthly Rainfall at Panchkhal (Station no. 1036) of 2019 AD

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Average Rainfall (mm)	68.6	160.60	37.50	206.20	98.80	417.60	1216.60	1117.20	1149.60	155.60	32.20	38

Source: Worldweatheronline.com, 2019

168. May is the warmest month of the year. The temperature in May averages 27 °C. December has the lowest average temperature of the year. It is 12 °C. December and January are cooler months with average temperatures of 12°C and 13°C respectively. The monthly average temperature is presented in **Table 5-II**.

Table 5-II: Average Monthly Temperature at Panchkhal (°C) of 2019 AD

Average Monthly Temperature (°C)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	13	15	19	23	27	25	23	24	21	19	17	12

Source: Worldweatheronline.com, 2019

5.1.6 Water Quality

169. During the survey, respondents were asked in term of existing water quality in the project area. The survey revealed that out of total 5998 respondents, about 46.53% (2791) feel as good quality, 50.77% (3045) feel satisfactory or moderate, and 1.53% (92) respondents feel bad in term of water quality.

170. Similarly, the baseline information regarding water quality was borrowed from the final design report. This data has been collected by sampling process by the engineering team. This involved collection of water sample from the proposed source Sunkoshi River located at Bhumlu Rural Municipality. This sampling process has been carried out at three different times; i) July & August during which there is chance of accumulation of large amount of suspended particles in river water and ii) January during which there is comparatively less chance of presence of suspended particles. These first two water samples were taken to the certified laboratory i.e., Nepal Environmental & Scientific Services (P) Ltd. located at Thapathali, Kathmandu for further analysis. Similarly, the third sample was tested at Aastha Scientific Research Service Pvt. Ltd. Located at Dillibazar, Kathmandu.

171. Along with this, the water samples were also taken from the two existing RVTs located at Thumka & Lamdi respectively and from Thokre Khola, from where the people of the proposed town has been consuming water.

172. The test reports show that all parameters of water quality of the sample collected are observed to be within the permitted value of NDWQS. The result of this water quality test is shown in detail in **Annex 6**.

173. Similarly, during field study, simple bacteriological tests (Coliform P/A Test Vial) which has been developed by ENPHO to determine the presence of Coliform bacteria at the water source was carried out. This on-site bacteriological test is based on the principle developed by Manja et. al in 1982. The test is based on the readily observable formation of black precipitate iron sulfide in the test bottle, as a result of the reaction of H_2S with iron. The results of the Coliform P/A Test Vial shows that the samples collected are contaminated with bacteria.

5.1.7 Air Quality

174. Air pollution is caused by fugitive dust from vehicle movements, particularly over unpaved roads and other unpaved grounds, construction activities, and wind action on unpaved exposed surfaces. Gas emissions generally comes from household cooking, open burning, and moving vehicles. Emissions from these sources are scattered/spread apart, both in terms of locations and timing. Though there is a lack of secondary information on air quality for the project area, the ambient air quality is observed to be within the National Ambient Air Quality Standards of Nepal as there are no such big industries and the traffic volume is also very low.

5.1.8 Acoustic Environment

175. The sources of noise in the project town are the construction activities and vehicle movement. The anthropogenic noise is confined in few clustered settlements and in market places. Noise levels in the project area are observed to be within permissible standards prescribed by the Ministry of Forest & Environment under GoN.

5.2 Existing Biological Environment

5.2.1 Flora

176. The major plant life forms available in the project area are given in **Table 5-III** below:

Table 5-III: Plant Life Forms Found in the Project Area

Local name	English Name	Botanical Name	Life Forms
Aasuro	Malabar Nut	<i>Adhotoda vasica</i>	Shrub
Aiselu	Raspberry	<i>Rubus ellipticus</i>	Shrub
Amliso	Tiger Grass	<i>Thysanolaena maxima</i>	Grass
Bakaino	China Berry	<i>Melia azedarach</i>	Medium Sized Shrub or Tree
Bans	Bamboo	<i>BabusaVulgaris</i>	Grass
Bar	Banyan	<i>Ficus benghalensis</i>	Tree
Bot Dhaiyanro	Small Flowered Crape Myrtle	<i>Lagerstroemia parviflora</i> Roxb.	Tree
Champ	Golden Michelia	<i>Magnolia champaca</i>	Tree
Chilaune	Needlewood	<i>Schima wallichii</i>	Tree
Dhale Katus	Indian Chestnut	<i>Castanopsis indica</i>	Tree
Dudhe Jhaar	Asthma Plant	<i>Euphorbia hirta</i>	Herb
Dudhilo	Willow Leaf Ficus	<i>Ficus neriifolia</i>	Tree
Gulaf	Rose	<i>Rosa rubiginosa</i>	Shrub
Kafal	Bayberry	<i>Myrica esculenta</i>	Large Shrub/Tree

Local name	English Name	Botanical Name	Life Forms
Kalimunte	Crofton Weed/Sticky Snakeroot	<i>Ageratina adenophora</i>	Shrub
Kamle	False Nettle	<i>Boehmeria platyphylla</i>	Grass
Lajjavati	Shame Plant	<i>Mimosa pudica L.</i>	Weed
Lapsi	Hog Plum	<i>Choerospondias axillaries</i>	Tree
Paiyun	Wild Himalayan Cherry/Sour Cherry	<i>Prunus ceratoides</i>	Tree
Peepal	Sacred Fig	<i>Ficus religiosa</i>	Tree
Sal	Sal	<i>Shorea robusta</i>	Tree
Sallo	Chir Pine	<i>Pinus roxburghii</i>	Tree
Sajivan/Kadam	Oregano	<i>Origanum vulgare L.</i>	Herb
Simali	Chinese Chaste Tree	<i>Vitex negundo</i>	Shrub
Sisno	Stinging Nettle	<i>Urtica dioica</i>	Herb/Flowering Plant
Paulownia	Empress Tree	<i>Paulownia Tomentos</i>	Tree
Titepati	Mugwort	<i>Attermesia vulgaris</i>	Herb
Uttis	Nepal Alder	<i>Alnus nepalensis</i>	Tree

Source: IEE Field Visit Survey, 2018

177. As per the above given table, Sal & Chilaune are found at the lower elevation and Pine, Uttis & Chilaune are found at higher elevation. Earlier, Pine trees used to be the most common trees of the project area which are mostly useful for afforestation. However, pine needles on the ground promote rainwater runoff reducing infiltration capacity thus reducing groundwater recharge. These pine needles do not give good quality compost. The pine trees cannot be used for fodder too. Regarding this, more emphasis are given to the indigenous species like Chilaune, Champ, Uttis, Bakaino, Paiyun & Lapsi. Recently, an exotic tree native to China called Paulownia (Paulownia Tomentos) has been introduced in regard to its greater economic value. Similarly, high value species i.e., Amriso has also been introduced in the project area.

178. The project area is rich in shrubs and small tree species with medicinal and aromatic values and performs important soil conservation functions. They provide close canopy cover to the ground and thereby prevent losses through surface run-off and soil erosion even during the high intensity of rainfall.

5.2.2 Fauna

179. Some species of mammals available in the project area is given below. The status of these mammals are as per IUCN & IBAT reports.

Table 5-IV: Mammals in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Herpetes auro-punctatus</i>	Small Indian Mongoose	Nyauri Musa	LC
2	<i>Macaca mulatta</i>	Rhesus Monkey	Rato Badar	LC
3	<i>Felis Chaus/Prionailurus bengalensis</i>	Jungle Cat	Ban Dhade	LC

S. No.	Scientific Name	English Name	Local Name	Status
4	<i>Funambulus Pennantii</i>	Five Stripped Palm Squirrel	Paanch Dharke Lokharke	LC
5	<i>Canis lupus</i>	Gray Wolf	Bwanso	LC
6	<i>Panthera pardus</i>	Common Leopard	Chituwa	VU*
7	<i>Rattus Rattus</i>	House Rat	Musa	LC
8	<i>Vulpes Bengalensis</i>	Bengal Fox	Fyauo	LC
9	<i>Canis aureus</i>	Golden Jackal	Syaal	LC
10	<i>Sus Scrofa</i>	Wild Boar	Bandel	LC
11	<i>Paguma Larvata</i>	Masked Palm Civet	Bharse	LC
12	<i>Cynopterus sphinx</i>	Greater Short Nosed Fruit Bat	Chamera	LC
13	<i>Martes flavigula</i>	Yellow Throated Marten	Malsapro	LC
14	<i>Semnopithecus schistaceus</i>	Nepal Gray Langur	Kalomukhe Badar	LC

Source: Field Survey, 2018

180. According to the local people, local and migratory birds are found within the project area. However, none of these are protected or endangered. Species The commonly found species of birds are given in the table given below:

Table 5-V: List of Birds in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Acridotheres tristis</i>	Common Myna	Dangre Rupi	LC
2	<i>Aethopyga Siparaja</i>	Crimson Sun Bird	Sipraja Bungechara	LC
3	<i>Amaurornis Phoenicurus</i>	White Breasted Water Hen	Sim Kukhura	LC
4	<i>Ardeola Grayii</i>	Indian Pond - Heron	Aaskote Bakulla	LC
5	<i>Athene Brama</i>	Spotted Owlet	Kochalgaade Latokoshero	LC
6	<i>Bubulcus Ibis</i>	Cattle Egret	Bakulla	LC
7	<i>Columba Livia</i>	Rock Dove (Blue Rock Pigeon)	Malewa	LC
8	<i>Copsychus Sacularis</i>	Oriental Magpie Robin	Dhobini Chara	LC
9	<i>Corvus macrorhynchos</i>	Large Billed Crow	Kaalo Kaag	LC
10	<i>Corvus Splendens</i>	House Crow	Kaag	LC
11	<i>Lophura leucomelanos</i>	Kalij Pheasant	Kalij	LC
12	<i>Cuculus Canorus</i>	Common Cuckoo	Cuckoo Koili	LC
13	<i>Cuculus Micropterus</i>	Indian Cuckoo	Kafal Pakyo	LC
14	<i>Dendrocopus Macei</i>	Fulvous breasted Woodpecker	Kaasthakut	LC
15	<i>Dicrurus Macrocerus</i>	Black Drongo	Keshraj Chibe	LC
16	<i>Egretta Garzetta</i>	Little Egret	Sano Seto Bakulla	LC
17	<i>Eudynamys Scolopaceus</i>	Western (Asian) Koel	Koili	LC
18	<i>Francolinus Francolinus</i>	Black Francolin	Titra	LC
19	<i>Halcyon Smyrnensis</i>	White Breasted Kingfisher	Matikire	LC
20	<i>Hirundo Rustica</i>	Barn Swallow	Ghar Gauthali	LC
21	<i>Megalaima zeylanica</i>	Brown Headed Barbet	Nyuali	LC
22	<i>Megalaima lineate</i>	Lineated Barbet	Kuthurke	LC
23	<i>Merops Leschenaulti</i>	Chestnut Headed Bee Eater	Katus Tauke Murali Chara	LC

S. No.	Scientific Name	English Name	Local Name	Status
24	<i>Milvus Migrans</i>	Black Kite	Kalo Chil	LC
25	<i>Motacilla Alba</i>	White Wagtail	Seto Tiktike	LC
26	<i>Motacilla Mederaspatensis</i>	White Browed Wagtail	Khole Tiktike	LC
27	<i>Parus Major</i>	Great Tit	Chichilkote	LC
28	<i>Passer Domesticus</i>	House Sparrow	Ghar Bhangera	LC
29	<i>Passer Montanus</i>	Eurasian Tree Sparrow	Rukh Bhangera	LC
30	<i>Pavo Cristatus</i>	Indian Peafowl	Mujur/Mayur	LC
31	<i>Psittacula cyanocephala</i>	Plum headed Parakeet	Tuisi Suga	LC
32	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Jureli	LC
33	<i>Saxicola caprata</i>	Pied Bushcat	Kale Jhyapsi	LC
34	<i>Saxicola torquatus</i>	Common Stonechat	Jhekjhek Jhyapsi	LC
35	<i>Streptopelia orientalis</i>	Oriental Turtle Dove	Dhukur	LC
36	<i>Upupa epops</i>	Common Hoopoe	Fapre Chara	LC
37	<i>Urocissa flavirostris</i>	Yellow billed Blue Magpie	Sunthude Lampuchhre	LC
38	<i>Vanellus cinereus</i>	Grey-headed Lapwing	Raj Hutittyau	LC

Source: IEE Field Visit Survey, 2018

181. As per Wikipedia - List of Butterflies of Nepal based on the list prepared by Colin Smith in 2006, there are 690 species or sub species of butterflies in Nepal. The project area also provides habitats for a variety of butterflies, and during the walkover surveys, various types of butterflies were observed.

182. The commonly found Herpito-fauna (reptiles & amphibians) observed in the project area are shown in **Table 5-VI** given below:

Table 5-VI: List of Herpito-Fauna Found in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Ptyas mucosus</i>	Rat snake	Dhaman	LC*
2	<i>Atretium Schistosum</i>	Olive Keelback Water Snake	Pani Sarpa	LC
3	<i>T. albolabris</i>	Green Pit Viper	Hariyo Sarpa	LC*
4	<i>Varanus Bengalensis</i>	Common Indian Monitor	Bhainse Gohoro	LC
5	<i>Calotes versicular</i>	Garden lizard	Chheparo	LC*
6	<i>Hemidactylus Flaviviridis</i>	House Lizard	Mausuli	LC*
7	<i>Bufo melanostictus/Duttaphrynus Himalayanus</i>	Common toad/Himalayan Toad	Khasre Bhyaguto	LC
8	<i>Rana cyanophylectis</i>	Stream Frog	Bhyaguto	LC*

Source: IEE Field Visit Survey, 2018

5.2.3 Aquatic Life

183. Similarly, the list of common fishes found in the project area is given below in **Table 5-VII**. These species are found in the nearby water bodies of the project area that includes Sunkoshi River (Proposed Source) and Jhiku Khola.

Table 5-VII: List of Fishes Found in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Garra Annandalei</i>	Stone Roller	Chuche Buduna	LC
2	<i>Glyptothorax Indicus</i>	Catfish	Mungri/Kavre	LC
3	<i>Heteropneustes fossilis</i>	Stinging Catfish	Singhi	LC
4	<i>Neolissocheilus hexagonolepis</i>	Katli	Katle	LC
5	<i>Mastacembelus Armatus</i>	Spiny Eel	Bam	LC
6	<i>Psilorhynchus Pseudecheneis</i>	Stone Carp	Tite	LC
7	<i>Schizothorax Progastus</i>	Dinnawah Snowtrout	Chuhhe Asala	LC
8	<i>Channa Gachua</i>	Dwarf Sankehead	Hile	LC

Source: IEE Field Study, 2018

184. There will be no significant effects on the lives of fish species as well as fisheries by the proposed project activities.

*Note:

(LC= Least Concern; VU= Vulnerable)

*Note: Though some species fall under VU category, the project activities will not affect the habitat of these species as the construction area does not interfere their habitats.

LC* are the status of the species according to IUCN Red List of Threatened Species however it is not included in IBAT report

5.2.4 Protected Area

185. The study shows that the project area is not located in or near any national park, wildlife reserve, conservation area, hunting area, including a buffer zone area, world heritage site, and other protected areas. Hence, there is no possibility of intervention into any of the protected areas by the construction activities of the proposed project.

5.2.5 Community Forest Area

186. The field study shows that some of the project components requires some portion of land of the three community forests of the project area. Like, some portion of transmission mains pass through the Naule Community Forest. Similarly, RVT -2 requires land of Bhainse Khola Community Forest while RVT-6 requires land of Karketar Community Forest. However, the study shows that there is no requirement of cutting trees. There will also be requirement of clearing of some bushes and shrubs. Hence, there will be no such significant effect on these community forests.

5.3 Socio-economic and Cultural Environment

5.3.1 Demographic Features

5.3.1.1 Settlement pattern

187. The settlement pattern of project area is mixed type. The core bazaar area which is located in ward no 7 is dense and populated. Similarly, the settlement pattern of other wards is scattered type due to semi urban and rural in character. The settlement pattern is gradually changing and the rural clusters are developing as market. The rate of migration in to the service area from the surrounding villages and from other districts is increasing during the last few years.

5.3.1.2 Population Distribution

188. According to the social survey, the present permanent population is 29,603 and the rental population is 960 out of total 5,998 households (HHs) in the proposed service area. The population growth rate of the Panchkhal Municipality of Kavre district is taken as 2%. The growth rate is based upon the population census 1998 to 2011 of Kavre district, Dhulikhel (nearest municipality) and Panchkhal town. The population may increase more in comparison to the present growth rate in that area after availability of water supply facilities in the future. The growth rate of Kavre district and neighboring Municipality, Dhulikhel is compared to establish the growth trend. The **Table 5-VIII** gives brief details on the population growth rate of the project district and the neighboring municipality, Dhulikhel.

Table 5-VIII: Population and Growth Rate

Description	Population	Growth	Population	Growth	Population	Growth	Population
	1981 AD	Rate %	1991 AD	Rate %	2001 AD	Rate %	2011 AD
Kavre District	307150	0.55	324329	1.75	385672	-0.1	381937
Dhulikhel Municipality			9664	1.77	11521	2.17	14283

Source: Socio-economic Survey 2018

189. The annual growth rate of Panchkhal Municipality is ranging from -2.5% to 1.55% in proposed service area wards. The growth rate is different at each ward as shown in **Table 5-IX**. It is envisaged that the population will be increased than the present scenario after implementation of the scheme. With this assumption and referring NUDS documents, the growth rate 2% is adopted considering that the number of household will be constructed along both sides of major road within design year.

Table 5-IX: Population and Growth Rate of Panchkhal Municipality

Ward	Ward Area (Ha)	Census 2001			Census 2011			Growth Rate	Remarks
		HHs	Pop	P. Densities (PPHA)	HHs	Pop	P. Densities (PPHA)		
1	1079.05	482	2665	2.47	794	3825	3.54	3.68	Not in-service area
2	1373.34	771	4124	3.00	699	3275	2.38	-2.28	
3	392.39	458	2198	5.60	519	2221	5.66	0.10	
4	294.29	606	2998	10.19	796	3498	11.89	1.55	
5	686.67	465	2380	3.47	527	2543	3.70	0.66	Not in-service area
6	588.58	835	4296	7.30	924	4077	6.93	-0.52	
7	588.58	381	1941	3.30	431	2208	3.75	1.30	
8	588.58	519	2528	4.30	539	2405	4.09	-0.50	
9	1177.15	608	3111	2.64	650	2657	2.26	-1.57	
10	294.29	383	2084	7.08	431	1839	6.25	-1.24	
11	1569.53	653	2939	1.87	626	2389	1.52	-2.05	
12	686.67	845	4689	6.83	1147	5299	7.72	1.23	
13	980.96	454	2016	2.06	461	1761	1.80	-1.34	Not in-service area
Total	10300.00	7460	37969	3.69	8544	37997	3.69	0.01	

Source: CBS, 2001 and 2011

190. As per socioeconomic survey (2018), the present permanent population in the proposed service area is 29,603 in 5,998 HHs. Out of the total 29,603 permanent population, there are 14,748 male and 14,855 females living in 5,998 HHs. The permanent population of the project area at the end of design period of 23 years (1-year survey year + 2-year

construction + 20 years project life) is projected as 45,768 with an average annual growth rate 2%. The rental population is very less i.e. 960 in comparison with permanent population. The water demand for this insignificant rental population is kept in non-domestic demand category.

191. The population growth rate percentage of the project area is determined based upon population census 1991 A.D., 2001 A.D. and 2011 A.D. of Kavre district, Panchkhal Municipality and possibility of population migration from surroundings in the proposed service area. This has been consulted with WUSC.

5.3.1.3 Male/Female Ratio

192. The survey revealed that total permanent households and population in the service area are 5,998 and 29,603 respectively. Out of total population 29,603, 51% are female and 49% are male. This is shown in the table given below:

Table 5-X: Population and Growth Rate of Panchkhal Municipality

S. N.	Sex	Total Population	Percent
1	Male	14,748	49.82
2	Female	14,855	50.18
	Total	29,603	100

Source: Socio-economic Survey 2018

5.3.1.4 Trend of Migration

193. The trend of migration of the proposed project town has been studied during the socioeconomic survey. The study revealed that migration from adjoining towns and district for different purposes. About 253 households (4%) has been migrated for acquiring education for livelihood, business and family conflict reason. The details of migration trend is tabulated below:

Table 5-XI: Distribution of Trend of Migration by Ward

S.N.	Status of Migration	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Local inhabitant	507	549	719	738	484	82	834	225	201	1,406	5,745	95.8
2	Migrated	4	47	71	46	44	2	35	1	3	0	253	4.2
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100

Source: Socio-economic Survey 2018

194. The data as given above shows that the trend of in-migration is increasing day by day, due to better physical facilities and accessibility to health, education and marketing facilities as the project town is developing very fast as an emerging town.

5.3.2 Caste/Ethnic Groups

195. The composition of community by caste/ethnic is heterogeneous in nature. So, diversity of culture, custom, tradition, norms and values exists in this project area. The household survey of the sub project area has also reflected the cross section of major ethnic groups of the country.

196. The survey revealed that Janajati/ethnic (Tamang, Danuwar, Magar, Newar, etc.) are major group comprising of 48.3% (2896) households in the service area. Similarly, Brahmin/Chhetri are the second largest group comprising of 40% (2402) of total household

where as, Dalit and other cast (Madeshi, Musalman etc.) comprising 9.4% (565) and 2.3% (135) respectively. Details of information are presented in the table given below:

Table 5-XII: Distribution of Households and Population by Ethnic Composition

S. No.	Caste/Ethnic Status	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Brahmin/ Chhettri	316	370	277	377	253	29	295	156	115	214	2,402	40.0
2	Janajati	172	99	405	329	168	52	390	68	84	1,129	2,896	48.3
3	Dalit	22	67	45	76	104	3	181	2	2	63	565	9.4
4	Others (Madhesi)	1	60	63	2	3		3		3		135	2.3
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100.0

Source: Socio-economic Survey, 2018

5.3.3 Household Heads

5.3.3.1 Male/Female

197. According to the survey, family size (4.97) of the service area is more than national size of 4.8 (CBS Nepal-2011). The detailed information of population by sex and family size are given in the tables below:

Table 5-XIII: Distribution of Population by Sex and Family Size

S.N.	Ward #	Total Household	Male	Female	Total	Average Family Size
1	2	511	1,117	1,142	2,259	4.42
2	3	596	1,402	1,453	2,855	4.79
3	4	790	1,933	1,995	3,928	5.0
4	6	784	1,969	1,954	3,923	5.0
5	7	528	1,488	1,501	2,989	5.7
6	8	84	199	198	397	4.7
7	9	869	2,211	2,091	4,302	5.0
8	10	226	610	638	1,248	5.5
9	11	204	528	473	1,001	4.9
10	12	1,406	3,291	3,410	6,701	4.8
	Grand Total	5,998	14,748	14,855	29,603	4.97

Source: Socio-economic Survey 2018

5.3.4 Economic Features

5.3.4.1 Landholding Size and Ownership

198. This is one of the major indicators to assess the economic status of a household within the community. Hence, the land holding pattern as well as the land ownership status has been recorded and assessed so far.

199. The survey shows that about 50.53% of households are holding 5-20 Ropani of land where as 46% are holding 20-50 Ropani of land so far. The survey shows that about 98.20 %(5893) of total households have their own land whereas only 1.8%(105) do not own land. The details of landholding pattern of each ward of project area is presented in the table given below:

Table 5-XIV: Land Holding Pattern in Service Area

S.N.	Range of Land Holding	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	<5 Ropani	45	6	2	3	13	1	19	4	4	11	108	1.80
2	5-20 Ropani	401	409	593	311	313	26	211	153	134	480	3031	50.53
3	20-50 Ropani	53	163	169	445	200	57	629	69	66	915	2766	46.12
4	>50 Ropani	12	18	26	25	3		10				94	1.57
	Total	511	596	790	784	528	84	869	226	204	1406	5998	100.00

Source: Socio-economic Survey 2018

Table 5-XV: Status of Land Ownership in Service Area

S.N.	Ownership of Land	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Yes	504	582	758	777	505	83	853	224	204	1,403	5,893	98.2
2	Landlessness	7	14	32	7	23	1	16	2	0	3	105	1.8
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100

Source: Socio-economic Survey 2018

5.3.4.2 Economy: Occupation/Employment

200. During the socioeconomic survey, detailed information has been collected regarding the major occupation of all the household heads. As a result of the survey as illustrated in the table given below shows that the highest number of population i.e., 72.04% engaged in agriculture, whereas 11.45% population depend on business, 9.5% of population are engaged in service. Similarly, about 0.78% and 2.15% of household head are dependent upon industry and remittance respectively. Similarly, 2.77% of total HHs are engaged as labour while the remaining 1.30% of total HHs are involved in other activities. The detailed information on the occupation of the household head has been presented in the table given below:

Table 5-XVI: Distribution of Occupation of Households by Ward

HH Occupation	Ward										Total	%
	2	3	4	6	7	8	9	10	11	12		
Agriculture	337	364	384	563	381	74	567	208	132	1311	4321	72.04
Business	70	70	217	58	30	5	181	8	17	31	687	11.45
Service	74	92	106	85	42	2	75	9	46	39	570	9.50
Industry	4	2	11	3	5	2	16	0	1	3	47	0.78
Remittance	20	22	25	15	20	1	6	1	5	14	129	2.15
Labour	5	46	43	17	34	0	12	0	3	6	166	2.77
Other	1	0	4	43	16	0	12	0	0	2	78	1.30
Grand Total	511	596	790	784	528	84	869	226	204	1406	5998	100

Source: Socio-economic Survey 2018

5.3.4.3 Income & Expenditure

d) Monthly Income

201. The survey revealed that main sources of household income of the service area are agriculture, service, remittance and wage labour, respectively. Among the total households, 24.6% have monthly income of more than Rs. (20,001-50,000) and about 38.8% of household have monthly income of Rs. (10,876 - 20,000). Likewise, 3% of households are earning more than Rs. 50,000. The study shows that only 11%(659) of households falls under

poor category that covers the households with income less than Rs 7,500 per month. The monthly income of HHs in the service area is given in table below:

Table 5-XVII: Income Level of Households by Ward

S. N.	Income Level Range	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	<Rs.7500	25	39	32	127	41	13	191	26	17	148	659	11.0
2	Rs. 7,501-10,875	40	53	146	240	86	33	189	78	50	437	1352	22.5
3	Rs. 10,876-20,000	237	258	217	263	224	27	340	60	67	633	2,326	38.8
4	Rs. 20,000-50,000	193	227	346	132	151	9	134	52	70	163	1,477	24.6
5	>Rs. 50,000	16	19	49	22	26	2	15	10	0	25	184	3.1
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100

Source: Socio-economic Survey, 2018

ii) Monthly Expenditure

202. The socioeconomic survey has also assessed the details on the monthly expenditure of each households of the service area. The survey revealed that among 5998 households, 27.90% (1671) HHs expend less than Rs. 7500 per month. Similarly, 29.70% (1781) households have monthly expenditure level of the range (Rs. 7,500-10,875) whereas 31.30% (1877) of total household's expenses are in the range of Rs. (10,876 to 20,000). Likewise, about 10.30% (616) of total households expend within the range (Rs 20,001-50,000) per month. Similarly, only 0.90% (53) of household's expenses are more than Rs. 50,000. Hence, it is found that expenditure level is less than income level of households within the service area. So, it can be assumed that capacity for upfront cash contribution and affordability of community for regular tariff collection after implementation seems high. Details of monthly expenditure level are presented in the table below:

Table 5-XVIII: Expenditure Level of Households by Ward

S.No.	Monthly Expenditure	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	<Rs.7500	46	58	146	221	91	40	276	85	54	654	1,671	27.9
2	Rs. 7501-10875	197	201	161	236	163	23	267	51	58	424	1,781	29.7
3	Rs. 10876-20000	199	261	317	236	182	18	264	56	75	269	1,877	31.3
4	Rs. 20000-50000	66	71	155	80	81	1	60	27	17	58	616	10.3
5	>Rs. 50000	3	5	11	11	11	2	2	7	0	1	53	0.9
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100

Source: Socio-economic Survey, 2018

5.3.3.4 Willingness to Pay

a) Monthly Water Tariff

203. The sampled survey was carried out to observe the response of the community towards the willingness to pay for monthly water tariff. As per the findings, out of total 300 sampled households, 36.00% (108) households prefer to pay monthly water tariff from Rs. 151 to 200 whereas about 17.00% (51) of sampled households prefer to pay tariff from Rs. 201-250. Similarly, 4.7% (14) of the sampled households are willing to pay between Rs. 250-301 per month. Likewise, the survey also shows that 20.30% (61) of the sampled HHs are willing to pay from Rs. 301 to Rs.350. Similarly, only 2.00% (6) and 3.0% (9) of the sampled HHs are willing to pay between Rs. 351 & Rs.400 and between Rs. 401 & Rs.450

respectively. The survey also shows that 6% (18) and 11.00% (33) of 300 sampled households are observed to be willing to pay between Rs. 451 & Rs.500 and more than Rs. 500 respectively. Details information about willingness to pay monthly water Tariff is presented in the table below.

Table 5-XIX:Willingness to pay for monthly tariff by Ward

S.N.	Tariff Range	Ward										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	>Rs. 500	1	0	10	0	2	0	12	1	0	7	33	11.0
2	Rs.451-500	1	1	10	0	4	0	1	0	0	1	18	6.0
3	Rs.401-450	0	2	2	0	5	0	0	0	0	0	9	3.0
4	Rs.351-400	0	0	2	0	1	0	0	0	2	1	6	2.0
5	Rs.301-350	0	6		1	1	0	49	0	0	4	61	20.3
6	Rs.251-300	0	0	2	1	3	0	6	0	0	2	14	4.7
7	Rs.201-250	0	0	2	0	3	2	3	2	1	38	51	17.0
8	Rs.151-200	14	34	5	1	2	2	5	2	18	25	108	36.0
	Grand Total	16	43	33	3	21	4	76	5	21	78	300	100.0

Source: Socio-economic Survey, 2018

b) Up-front Cash Contribution

204. The the detailed soioeconomic survey also assesses details on willingness to pay for upfront cash contribution. As per the survey, 98.95% (5935) of total 5998 HHs showed willingness to pay 5% up-front cash contribution for the proposed project. That means only 1.05% (63) of total 5998 HHs seemed reluctant for upfront cash contribution. It shows that majority of the HHs are ready to contribute required upfront cash so far. Similarly, most of the poor HHs has also shown interest towards this project and willingness for cash contribution even there is provision of free tap connection to poor households. This indicates the longing, the people of the project town have for this proposed project.

5.3.3.5 Affordability

205. The study has also assessed the affordability of community in terms of monthly income level for expense on water supply & sanitation service. Hence, while assessing the income level of households, it has been observed that only 11% (659) of 5998 households falls below poverty level as per the implementation guidelines (Income< 7500 per month).This means more than 85% of households can afford monthly water tariff and contribute for up front cash. Hence, affordability of the community has been obseved as encouraging and positive towards the program.

206. The WUSC can manage provision of subsidy to poor households for regular monthly tariff assessing the economic condition and affordability

5.3.5 Education & Skills

207. There are various educational institutions in the project town. According to the institutional data obtained from the survey, 31 educational institutions including higher secondary schools , secondary schools as well as primary schools in service area with 8,469 people including students (Total: 7,936, Male: 4,797, Female:3,139) , staffs (Total:55, Male: 32, Female:23) and teachers(Total:478, Male:186, Female:292). Almost of all educational institutions are relying on ground water, tap water and other sources. All of these educational institutions have water sealed latrines.

208. The socioeconomic survey also assessed on the education status of teach household head. The survey revealed that only 5.60 % (337) of total 5998 households project area are illiterate. Whereas, just literate ratio is 16.90% (1016) and more than SLC to above MA are 77.44% (4645). Details of education status of household head are presented in the table below:

Table 5-XX: Education Status of Household Head by Ward

S.N.	Education	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Illiterate	11	4	112	41	14	9		35	3	96	337	5.6
2	Literate	70	83	81	183	86	12	253	30	12	206	1,016	16.9
3	Up to Grade 5	283	234	258	142	206	15	276	83	71	435	2,003	33.4
4	Grade 5-10	33	41	66	115	79	23	106	17	31	372	883	14.7
5	SLC	34	57	97	80	39	8	76	8	17	126	542	9.0
6	IA	38	87	107	122	67	7	106	33	29	107	703	11.7
7	BA	20	54	50	59	21	10	15	13	25	34	301	5.0
8	MA	14	18	16	29	11		16	6	15	28	153	2.6
9	Above MA	8	18	3	13	5		9	1	1	2	60	1.0
	Grand Total	511	596	790	784	528	84	869	226	204	1406	5,998	100

Source: Socio-economic Survey, 2018

5.3.6 Health and sanitation

5.3.6.1 Health Posts/Hospitals

209. General medical facilities for diagnosis and treatments are available in the service area. There are various local hospitals and health centers in the project area that includes Sanjeevani Community Hospital, District Community Hospital, Panchkhal UN Training Institution Hospital, Panchkhal Primary Health Center and Baluwa Health Center. Similarly, some poly clinicss, pharmacy and medical shops are also available in Panchakhal Bazaar. For further medical services, most of the people prefer going to Dhulikhel Hospital which is just 17.8 km from the project town.

5.3.6.2 Incidence of Water-Borne Diseases and Infectious Diseases

210. The survey also collected cases of water borne diseases such as diarrhea, dysentery, stomach ache and skin disease etc. within the service area. It was found that cases of mortality by water related diseases are nil. The information related to water borne and communicable disease was crossed checked by visiting health institutions within the service area. According to the obtained information, about 3.60% (622) were observed to be suffered from diarrhea whereas 2.31% (684) were observed to be suffered from dysentery. Similarly, about 2.10%(77) were found to be suffered from other diseases such as skin, stomach pain, fever etc. In total, only 8.00 % (2372) of populations are known to be suffered from the water related diseases.

211. The main reason behind the incidence of water borne diseases can be the use of unprotected water source, consumption of raw drinking water and poor sanitation behaviour. This minimal number of incidence of diarrheal disease as well as other water borne diseases can be further reduced by the proposed project as this project ensures safety around the source & intake area, facilitate beneficiaries through provision of water treatment system and inculcate proper sanitation behaviour through the construction of public toilet. This can be

one of the beneficial impacts of the proposed project and can be augmented as well through certain measures. This has been integrated in environmental management plan (EMP) as the beneficial impact that improves the health & hygiene of the people of the project town through the effective implementation of the proposed project.

5.3.7 Community Infrastructure

5.3.7.1 Water Supply

i) Source to House Connections

212. There are several existing water supply systems in the new service area. Among them, the major systems are described briefly as follows:

Table 5-XXI:Details of Existing Water Supply Systems

S. No.	Name of the Water Supply System	Type of System	Number of Taps	Details of Tanks				Service Area	Tariff Collecting System	Average Supply Duration per day	Remarks
				RCC	Stone Masonry	Brick Masonry	Ferro Cement				
1	Amarkot Water Supply System	Deep Boring System	40-serving 700 HHs	1 no.-40m ³		-	2 nos.-20m ³	Ward no. 3	· Properly Well Maintained;	2 hours	
									· MinimumTariff per tap-NRs.1000		
2	Panhkhal Jal Water Supply System	Deep Boring System	650	1 no.-150m ³		1 no.-100m ³	1 no.-20m ³	Ward no. 3	· Properly Well Maintained;	2 and 1/2 hours	
									· MinimumTariff per tap-NRs.150 per 6000 liters; It increases @ NRs.25 per 1000 liter consumption		
									· Initial Charge for tap connection-NRs.6660		
3	Bhagwati Temple Water Supply System	Lifting System	350 while other 50 available taps arenot in operation	1 no.-50m ³			4nos-20m ³	Ward no. 9	· Properly Well Maintained;	Two times a day	
							2nos-10m ³		· Minimum Tariff for 10000 liters is NRs. 350. (It increases with increase in consumption)		
4	Dhungana Besi Water Supply System	Deep Boring System		1no.-100m ³				Not in operation			

S. No.	Name of the Water Supply System	Type of System	Number of Taps	Details of Tanks				Service Area	Tariff Collecting System	Average Supply Duration per day	Remarks
				RCC	Stone Masonry	Brick Masonry	Ferro Cement				
5	Mayagaun Water Supply System	-	15-serving 400 HHs	1 no.-10m ³	-	-	2nos-20m ³	-	· Properly Well Maintained;	-	Initially constructed by UNICEF & rehabilitated by FDB in 2044 B.S. & 2065 B.S. respectively.
									· Minimum Tariff for each tap is NRs. 3000 annually		
6	Bakhrel Di Water Supply System	-	160 taps				1 no.-20m ³		· Properly Well Maintained;	-	
							1 no.-20m ³ (under construction)		· Minimum Tariff for 6000 liters is NRs. 250 annually		
7	Satya Sai Water Supply System	Deep Boring System	118 taps				2nos-20m ³	Ward no. 12	· Properly Well Maintained;	-	
									· Minimum Tariff for 8000 liters is NRs. 300 annually		

Source: DEDR, Panchkhal, 2019

213. The survey revealed that largest numbers of household i.e., about 28.86% (1731) and 28.58%(1714) are fetching water from public taps and private taps by various water supply system respectively. Whereas, about 42.56%(2,553) households depend on well/spring/stream/Dhungedhara etc. The survey shows that they use same source of water for all purposes as drinking, cooking, bathing, washing clothes, watering in kitchen garden etc.

214. There is no provision of water treatment system in all above described existing system as water is directly distributed into small settlements throughout the town through small service reservoirs.

215. It is to be noted that none of these existing water supply systems are connected with the proposed water supply system. The proposed project is solely a new project. However, these existing systems will continue to provide service to the project town as earlier even after the construction of the proposed system.

ii) Consumption Level

216. People are using water from stream, kuwa and piped water. The water quality is not good except the piped water. The above-mentioned water supply system supplies water into small settlements and are not well managed. The survey team has collected information related to water consumption level during dry and wet season in the service area. Due to consumption of water from private/public tap & well, spring, and dhunge dhara (stone spouts), the consumption pattern and quantity do not vary between two seasons.

217. The survey revealed that water consumption level of each household is found to be 260.6 liters per day and the total time spent is about 49.6 minutes (per trip about 6.4 minutes) to fetch water. Similarly, the total trip to be carried out for fetching water is about 7.7 trips daily. The per capita per day consumption is about 52.43 liters per day.

iii) Operation Costs & Current Tariff

218. There are several existing piped water supply system. In addition, the communities depends upon stream and spring water. The communities are willing to pay handsome amount for the piped water supply service they may receive through the proposed project. They are also aware of the quality of supplied water. Hence, the community is ready to pay the water tariff that will be reasonably fixed by the concerned committee.

219. Now, they are fetching water through stream and kuwa, where the tapped aquifer is easily susceptible to pollution and contamination. As there is hardship of water during dry season and the quality of water is not good, they are ready to pay the tariff to any extent. Their main & only demand is to get water in sufficient quantity.

220. Different water tariffs are allocated in the existing systems. The minimum tariff is NRs.150 for per 6000 liters and it increases at the rate of NRs 25 per thousand liter consumption. The minimum tariff for 10000 liters is NRs.350. The minimum tariff for 6000 liters is NRs. 250 annually. The minimum tariff for 8000 liters is NRs. 300.

iv) Problems of the existing system

221. The problems of the existing water supply system in Panchkhal Municipality are as follows:

- The existing system is an old system, and the available water infrastructures are not sufficient to meet the current water demand.
- The water source is not sufficient to meet the present water demand of the service area. The water shortage is acuter during the dry season;
- There is only an intermittent supply of water. The present system capacity is not sufficient to meet the water demand of the population;
- The existing system supplies water without treatment. Therefore, the existing system has not been able to deliver water quality conforming to NDWQS standards especially turbidity during rainy season;
- WUSC has not been able to extend the distribution system to new areas where the demands of water exist.

5.3.7.2 Sanitation

a) Latrine Facilities

222. The survey shows that about 53.7% (3222) household have water sealed latrine where as 34.4% (2065) household have pit latrines. About 4.80% (287) have ventilated pit latrines whereas 0.90% (53) of total 5998 households are using cistern flush type of pit latrine. Similarly, 6.20% (371) of total households is recorded to be with No toilets. These details are based on the socioeconomic survey carried out in 2018 AD. However, presently, this condition has been changed and the sanitation coverage of all the households has already reached its target i.e., 100%. Because of this, the project district, Kavre has been declared ODF district in June, 2019 and it is 65th ODF district of Nepal. The table below gives the information regarding the availability of the latrine facility within the project area.

Table 5-XXII: Coverage of sanitary facilities

Type of Toilet	Ward #										Total	%
	2	3	4	6	7	8	9	10	11	12		
No Toilet	34	35	35	43	60	5	91	6	3	59	371	6.2
Pit Latrine	1	493	120	7	6	2	114	4	1	1317	2065	34.4
Ventilated Pit Latrine	5	14	1	38	2	10	158	38	2	19	287	4.8
Water Sealed	470	54	630	689	428	67	499	176	198	11	3222	53.7
Cistern Flush	1	0	4	7	32	0	7	2	0	0	53	0.9
Grand Total	511	596	790	784	528	84	869	226	204	1406	5998	100.0

Source: Socio-economic Survey, 2018

b) Drainage Facilities

223. The service area has roadside drains along Araniko highway but these drains are not maintained properly. Most of the parts of service area has not been facilitated with drainage facilities. It has been reported that major problem occurs during monsoon due to the insufficient capacity of surface drainage to drain out the run off water that comes from the upstream hill forest to the town. The Panchkhal bazaar gets flooded if the rainfall continues for more than 4-5 hours. This is due to the bed level of Jhigu khola and level of settlement areas. The roadside drains are situated along the blacktopped road. WUSC is much more enthusiastic for the construction of combined sewer and committed for necessary contribution.

c) Wastewater Management Practices

224. There is no sewerage system in the proposed service area. Almost all households in the urban areas have their own latrine with septic tanks. Similarly, private toilet with septic tank has been constructed in some households in rural area also. Such toilet with septic tank has been constructed in more than 61% HHs of service area. Hence, it is concluded that the people of the service area are much more aware in sanitation.

d) Solid Waste

225. The survey revealed that 83% of households are disposing domestic solid waste in the pit near to the house whereas 5.3% of household disposing their wastes by private collector. It was observed that the respondent have sufficient knowledge about the improperly managed solid waste that may affect the public health and surrounding environment. The detailed information are given in the table below:

Table 5-XXIII: Existing Solid Waste Management Practices

S.N.	Waste Management Practice	Ward										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Pit Near to House	15	36	10	1	14	4	68	5	18	78	249	83.0
2	Private Collector	1	1	7	0	0	0	7	0	0	0	16	5.3
3	Pit/Container managed by Municipality	0	4	14	1	5	0	1	0	1	0	26	8.7
4	Others	0	2	2	1	2	0	0	0	2	0	9	3.0
	Grand Total	16	43	33	3	21	4	76	5	21	78	300	100.0

Source: Socio-economic survey, 2018

5.3.7.3 Transportation

226. Panchakhal Bazaar is located about 45 km east of Kathmandu. Regular buses are available from New Buspark, Kotesore and Kalanki of Kathmandu which takes to Panchakhal after a bus ride of about 1.5 to 2 hours. The Kodari highway passes through the main bazaar area of Panchkhal. Hence, besides public buses, various modes of transportation are available in this project town.

5.3.7.4 Irrigation, Communication & Electricity

227. Irrigation facilities are also available in the project town. The study shows that there are various small irrigation systems like Jhiku Khola Irrigation System, Panchkhal Hokse Irrigation System etc.

228. The town is connected to national and international telecommunication network. All kinds of modern telecommunication services are available at the reasonable price. Major national daily newspapers as well as local newspapers are available within the project town.

229. The project area is well connected to the national electricity grid and hence, 24 hours supply of electricity is available in this project town.

5.3.8 Archeological Areas/Sites

230. The project town, Panchkhal is very famous for Palanchok Bhagwati temple, the temple where the Goddess, Palanchok Bhagwati is worshipped. This is said to be very famous religious site of Nepal. It is said that Palanchok Bhagwati is one of the most beautiful and most important Goddess images. The image of this Goddess is three feet tall, finely carved on black stone and decked with jewellery. Many pilgrims visit this temple especially

on Tuesday and Saturday. Similarly, animals are also sacrificed in this temple as offerings to the Goddess. During the Dasain festival, majority of people make a pilgrimage to this temple for worshipping the Goddess.

231. The district, Kavrepalanchowk is named after this Goddess. It is 58 km east of Kathmandu, a two hours hilly drive to reach on the hill top. This temple is located at the hilltop. It is believed that the Palanchowk Bhagawati, Naxal Bhagawati and Shobha Bhagawati (located in Kathmandu) are sisters and Palanchowk Bhagawati is the eldest among them. And, all the three idols were made by the same sculptor.

5.3.9 Local Institutions

5.3.9.1 Water Supply and Sanitation User's Association

232. The project has been conceptualized on community based and participatory approach. Almost one third of the project cost has to be mobilized and shared by the community. The community is responsible for operation and management of the system after handover the project. So, their active involvement in the decision-making regarding project preparation/ design, implementation, operation and maintenance has to be ensured. In this regard, they are represented in project related activities. The WUSC takes necessary decision on behalf of the consumer community, mobilizes necessary fund for project implementation as up-front cash and assists PMO/WSSDO/ICG Engineer for the project implementation. The WUSC makes necessary arrangement after completion of operation and maintenance period of the project.

233. The Panchkhal Water Supply and Sanitation Committee consist of eleven members representing from various clusters within the service area. The executive committee consists of 8 male and 3 in female members and one female member has been working as position of treasurer in key executive post of WUSC. According to the caste/ethnicity status of WUSC body, Brahman/Chhetri and Janajati groups occupy 4 and 7 respectively. The separate WUSCs are operating existing system, but some of them are in new WUSC. The Name list and position of the WUSCs are given in the table given below:

Table 5-XXIV: Members of Panchkhal WSSP

S.N.	Name	Position
1	Mr. Kumar Prasad Lamichane	Chairman
2	Mr. Rabindra Sipkhan	Vice Chairman
3	Mr. Chet Prasad Gautam	Secretary
4	Ms. Jhal Kumari Dulal	Treasurer
5	Ms. Laxmi Danuwar	Member
6	Mr. Rabindra Sithaula	Member
7	Mr. Bharat Shrestha	Member
8	Mr. Shiv Bahadur Sapkota	Member
9	Ms. Sarita Sahi Tamang	Member
10	Ms. Maili Danuwar	Member
11	Mr. Shyam B.K.	Member

Source: DEDR, 2019

234. The WUSC is registered as per water resource act 2049 and drinking water laws 2055. The number of members of WUSC is as per STWSSSP/PMO guideline.

235. It is intended that the WUSC will assist the PMO to implement the proposed project and it will operate and maintain Panchkhal Water Supply System to provide regular and quality drinking water to the consumers.

5.3.9.2 Governmental Organizations/NGOs/CBOs

236. There are 39 governmental organizations that includes Ilaka Forest Office, Ilaka Animal Husbandry Office, Panchkhal Ilaka Police Office, NEA Office, Nepal Telecom, Panchkhal Municipality Office etc. are available in the project town. Similarly, various non governmental organizations like Social Welfare Organization, Love Green Nepal etc. and financial institutions (Banks & Cooperatives) are existing in the area and providing services to the community. The existing financial institutions include NCC Bank, Prabhu Bank, Laxmi Bank, Nepal Bank, Sindhu Bikash Bank, Dev Development Bank etc. Similarly, some cooperatives are also actively involved in the project area.

5.3.10 Other Development Activities

237. There are various small scale as well as medium scale industries like Ply Industries, Rice Mills, Poultry Farming, Furniture Industries, Dairy Industries etc. in the project town. Similarly, the survey also shows that there are various hotels & lodges available within the project area that have been boosting the economic activities of the project town.

6 ANALYSIS OF ALTERNATIVES

6.1 With and Without Project Alternatives

238. Analysis of the alternatives of the proposed project is another important process of IEE study that will help to assess the feasibility of the project in regard to technical, environmental & social aspects. Primarily, this involves two alternatives that includes "Without Project" or "Do-nothing" Alternative and "With Project" Alternative.

6.1.1 Without Project Alternatives or Do-nothing alternatives

239. "Without Project" or "Do-nothing" Alternative conducted study on the existing water supply system to analyze the existing condition of the project town in the absence of the proposed project.

240. The study shows that the residents of the project area are consuming water from stream and kuwa where the tapped aquifer is easily susceptible to pollution and contamination. There is no treatment plant in existing systems. The water is directly distributed in the town through small service reservoirs. Though there are not any evidence of impacts of untreated water on the lives of local people at present situation, there is possibility of incidence of water-borne diseases in the future due to continuous consumption of unsafe and untreated water. This will result in the health hazards in the project area that will in turn expose the surroundings to environmental problems.

241. There are various but small existing water supply systems. The existing water supply systems within the project area is intermittent and is not able to meet the increasing demands of the increasing population of the project area. Insufficient water supply will compel them to control the use of water for various purposes even for sanitation practices. Lack of water in the sanitation practices like flushing of water after use of latrine, bathing, washing clothes etc. will demote the domestic hygiene of the project area. This may pose outbreak of diseases like Typhoid, Cholera, Dysentery etc. This may in turn result in various environmental problems.

242. 'Without Subproject' or 'Do-Nothing' alternative will toughen the chance of the occurrence of the abovementioned threats to the environment of the project area. Without subproject, people of the project area will continue to consume the partially treated or untreated water from the existing water supply system. This may increase the risk of bacterial infection resulting health issues that will obviously have impact on public health, animal health and the health of the ecosystems. Similarly, 'Do-Nothing' alternative will constrain the locals to be content with the intermittent water supply service.

243. This would further impede (i) further social and economic development of the municipality, (ii) fundamental right related to health as guaranteed in Constitution of Nepal (Article 35) that says that "Every citizen shall have the right of access to clean drinking water and sanitation", (iii) Goal of National Urban Water Supply & Sanitation Sector Policy, 2009 (Final Draft) to ensure the socio-economic development, improved health status and quality of life of urban populations, including the poor and marginalised, through the provision of sustainable water supply and sanitation services and protection of the environment and (iv) Nepal's delivery of its commitment to SDG 6th to increase the proportion of the population with sustainable access to safe drinking water and basic sanitation.

244. Beside this, 'Do-Nothing' alternative has one positive aspect as it may prevent the service area of the project town from the susceptibility towards the anticipated environmental impacts of this proposed project. However, for this only positive aspect, it will be irrational to ignore the hardship that locals of this project town are facing for safe, reliable and potable water. Hence, 'Do-Nothing' alternative will not be better alternative to be followed in order to get rid of the anticipated environmental impacts as these environmental impacts can either be avoided or minimized by suitable mitigation measures.

6.1.2 With Project Alternative

245. With Project Alternative was also analyzed by envisaging the likely benefits of the proposed project. The analysis shows that the proposed sub project will be the best alternative to overcome the aforementioned threats that is likely to occur in the absence of this subproject. With the Subproject 29,603 populations (2018) will be benefitted from adequate, safe, reliable and potable water supply & sanitation service. In overall, the 'with subproject alternative' will bring about the improved public health and living environment that will contribute to improved quality of life in the project municipality.

246. Hence, the 'with project' alternative will contribute to the realization of the Updated 15-Yr Development Plan for Small Towns Water Supply & Sanitation Sector, compliance with the fundamental right related to health as guaranteed in Constitution of Nepal (Article 35), fulfillment of Goal of National Urban Water Supply & Sanitation Sector Policy, 2009 (Final Draft) and the delivery of Nepal's commitment to SDG 6.

247. Along with this, the limitation of "Without Project" Alternatives continuous water supply system, treatment system and susceptibility to water borne diseases leads to opt for "With Project" Alternative. The proposed sub project will be the best alternative to overcome the aforementioned threats that is likely to occur in the absence of this subproject. This "With Project" Alternative also involves analysis of alternatives to assess the most cost-effective, reliable and efficient system that can serve the design population. The alternatives regarding "With Project" Alternative is described in detail in the following section.

6.1.2.1 Alternatives Relative to Planning and Design

248. As per Feasibility Study Report by PPTA team, the system design for the town has been done under two scenarios. The optimization of a proposed water supply system can be done regarding system layout, alternative technology, alternative materials and alternative source. In case of Panchkhal WSSP, the development of system alternatives has been done using alternate system layouts keeping other parameters constant.

i) Alternative Sources

249. There are no other alternative sources available in the nearby vicinity to meet the overall demand for this project. Both alternatives has proposed Sunkoshi River as the proposed source. There is no other reliable source nearby service area except Sunkoshi water source.

ii) Alternative Design

250. The environmental issues can be a deciding factor to choose the best alternative design among the list of alternatives. The design of both proposed alternatives is environmentally sound. In both alternatives, the structures from WTP to the distribution

network remain the same. The distribution network will be same for both alternatives. The main difference between the proposed alternatives is the design of transmission pipe line. Both alternatives are briefly discussed below:

a) Alternative I: Use of Required Flow from Sunkoshi River by Pumping with Double Pipes and Supply Water to Distribution System by Eleven RVTs

251. The system will be pumping system. First of all, water will be pumped from sumpwell (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head 210m to 220m at each stage to reach water at the treatment plant at an elevation 1337.50m.

252. After water reaching at Bhairab Mandir WTP/ ridge, a few quantity of water will be pumped towards Palanchowk Bhagwati RVT. Another major pipe line goes to the nine reservoirs by gravity system. Similarly, the third pipeline will pump water to Backwash RVT that has been proposed to backwash the proposed filter. This backwash RVT will also act as distributor that will supply water to RVT 11 at Kharelthok by gravity.

253. The team visited all locations and collected basic information of intake, WTP and reservoir locations and service area. The team has informed WUSC to take the ownership of land for the construction of structures, intake. Also informed to the WUSC to register the source as per government rules and regulations.

254. Hence, the total estimated transmission pipe line length ie sump well to WTP/ Bhairab Mandir is 9135.00 m. Two parallel pipes are used in main transmission.

b) Alternative II: Use of Required Flow from Sunkoshi River by Pumping with Single Pipes and Supply Water to Distribution System by Ten RVTs

255. The alternative I and alternative II are almost same but the main transmission for this alternative has only one pipe. This may be risky for the proposed water supply system. However, the alternative has been made for the study. The total estimated transmission pipe line length ie sump well to WTP/Bhairab Mandir is 6,784.00m.

iii) Selected Alternative Scheme

256. Environmentally, they are not much different and both of the alternatives have no such environmental issues too. Socially, both alternatives are on equal footing.

257. The financial indicator also indicates that the affordability percentage of the source in both alternatives I and II is almost same. The affordability is in between 3%-5% in alternatives I and II. Financially, alternative II is slightly more economical than alternative I. The increase in project cost in alternative I is due to design of two parallel pipes along the transmission main. These pipes are used in pumping stages and is the lifeline of the project which is essential for such type of project to minimize water interruption. If alternative II is selected for the proposed project, financially it may sound feasible but, technically the system may get failed as there is high possibility of interruption of the water supply service under the condition of pipe damage in the future if any. Hence, alternative I is recommended for further study though the cost is slightly higher than alternative II.

258. This indicates that the Alternative II is unfeasible option for the project town as per technical assessment. Hence, Alternative I has been selected as the best feasible alternative as this alternative is technically, environmentally and financially feasible.

7 ANTICIPATED ENVIRONMENTAL IMPACTS

259. The anticipated environmental impacts are mainly categorized into two viz., Beneficial Impacts and Adverse Impacts on the basis of its negative and positive significance. This is then further categorized into four impacts that includes i) Impact on Physical Environment, ii) Impact on Biological Environment, iii) Impact on Chemical Environment and iv) Impact on Socio-economic Environment, based upon the effects on the existing environment. These impacts are sub divided into three categories based upon the project phase that includes i) Design Phase, ii) Construction Phase and iii) Post Construction (Operation & Maintenance) Phase. These impacts are discussed below in detail .

7.1 Beneficial Impacts

260. The development of water and sanitation facilities will have numerous beneficial impacts on individuals as well as to the entire community. Availability of clean and adequate drinking water and sanitary facility are basic human needs. Also, any development efforts aimed at improving water and sanitation needs of an area will significantly contribute towards improving the quality of life of that area. Some of the major beneficial impacts of the project are categorized below:

7.1.1 Impact on Socio-economic Environment

7.1.1.1 Construction Phase

a) Employment Generation

261. The project will generate direct employment opportunities to the local people of the project area. The construction activities of the proposed project will offer the locals a grand opportunity to be engaged in the proposed project activities as either v skilled or non-skilled workers in terms of their proficiency. The main target group for this benefit is People relying on daily wages. The socioeconomic survey shows that 2.77% of total (5998) households have to rely on daily wages. Hence, this project will be beneficial to this 2.77% of total households. The amount of money earned by the local people will somehow increase the local economy thereby reducing the chances of seasonal migration of the local people depending upon daily wages works to survive

262. The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

b) Skill Enhancement

263. The construction of the project not only provides direct employment opportunities but also ensure the transfer of skills and technical proficiency to the local workforce. The project activities such as construction of intakes, treatment plant, valve chambers, buildings, public toilets etc. will provide transferable skills. In future, these skills can be a plus point for the locals in any relevant work as such. Hence, this benefit is targetted to the local people relying on daily wages and those to be involved in labor works of this proposed project.

264. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

c) Local trade and business opportunity

265. The proposed project will directly add in building business opportunity within the area. As construction work involves a lot of human resources, some grocery stores and,

agriculture and livestock product will gain a momentum in the vicinity of the construction site. This will boost the local trade and business sector. Similarly, procurement of locally available construction materials will also help to improve the local trade and business opportunity. The main target group for this beneficial impact is local people involved in local business sector. The socioeconomic survey shows that about 11.45% (687) and only 0.78% (47) of total 5998 HHs are involved in business and industry sector respectively. Though the target group quantity is not so significant, the enhancement of local trade & business opportunity will be fruitful to these people. This will further boost the local trade & economy.

266. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

7.1.1.2 Operation Phase

a) Improved health and hygiene

267. Deteriorating water quality and unsanitary conditions are often the causes of waterborne communicable diseases. The socioeconomic survey revealed that the cases of waterborne diseases such as diarrhoea, dysentery, stomach ache and skin disease etc. are found very few in numbers. Similarly, cases of mortality by water related diseases are nil. However, it is not certain that this condition will be well maintained in the future too. The provision of water treatment plant under the proposed project components will provide solution to this uncertainty. After the implementation of the project, easy access to safe & potable water will maintain the health & hygiene of the local people. This will also help to reduce the chance of occurrence of water-borne communicable diseases within the project area in the future. This will also help them in bringing a decrease in medical expenses that may require to be incurred if any incidence of water borne diseases is observed.

268. Similarly, the proposed project also ensures to promote the improved hygiene of people of the project area through the provision of one public toilet and one institutional toilet as these sanitation components inculcate good sanitation behaviour of people and contributes towards betterment of sanitation facilities.

269. As this proposed project aims to provide safe, reliable & potable drinking water supply services and sanitation services through provision of public & institutional toilets to the proposed service area of the project town, the main target group of this beneficial impact are the beneficiaries or people residing in the service area of this proposed project

270. The impact is direct in nature, local in extent, high in magnitude and long-term in duration.

b) Increased economic opportunity

271. Reliable Water Supply System is one of the most important infrastructures for the urban development. Hence, this proposed project increases rural-town migration due to availability of better infrastructures. This boost economic level of the town. The increased economic level increases the value of the land, thereby uplifting the economic status of the local people. The main target group for this beneficial impact are people of the service area involved in business & industry.

272. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

c) Impacts on Sustainability of the system

273. As per the project modality, the water tariff system for the proposed system is such that it should not be more than 5% of the monthly income of people. This water tariff system is actually a part of utility business plan. It determines the level of revenue that the service providers receive from the users for the operation of the whole system. It is an important economic instrument for improving water use efficiency and securing financial sustainability of water utilities & operation. The purpose of water tariffs is not just to receive the revenue to cover the operation & maintenance cost but also to control the water use and water pollution by imposing a price on the use of environment. It internalizes the negative externalities related to water use. Hence, this water tariffs helps to sustain and extend the system. More sustainable the system is, more will be the environmental sustainability. It is because the sustainable system indicates sustainable use of utilities i.e., water supply services. Sustainable use of water utilities means sustainable use of water resources. This indicates long term use of environmental resources and allows for long term environmental quality.

274. The impact is indirect in nature, local in extent, high in magnitude and long-term in duration.

d) Social Empowerment

275. Social Empowerment refers to the process of self empowerment enabling to overcome the sense of powerlessness in the society. This covers Gender Equity, Women's Participation and Social Inclusion. The proposed project will be able to enhance this social empowerment through various capacity building programs. Gender Inequality that is still prevailing within the project town is expected to be eliminated through the implementation of the proposed project.

276. The socioeconomic survey revealed that major household works such as cleaning of houses, washing clothes, child care, cooking, rearing animals, and fetching drinking water is considered as work of women. As per the sampled household survey carried out in 2018, 65% of female are observed to be involved in water fetching & storage and 35% of male are observed to be involved in this activity. This indicates that women are more responsible for fetching water in comparison to the men. As the proposed project aims to provide water supply service to each household through private connection, easy access to safe & potable water through the implementation of this proposed project will contribute towards their betterment. It is because the time that may be spent for fetching water will be saved and could be utilized in various other activities. The improved water supply system will contribute towards their better health and hygiene through the provision of safe & potable water. This will in turn ensure the maintenance of health & hygiene of other family members as the sampled survey also shows that 60% of female are involved in taking care of family members especially children and senior citizens.

277. The proposed project also encourages women participation in the project related activities by enforcing at least two women in water user's committee. As per the *Table 28* given above, three female members are appointed as members of Panchkhal Water Supply Users & Sanitation Committee among which three female members are appointed as General Members. Their involvement in WUSC will boost their confidence and decision making ability. Similarly, it will also provide them opportunity to actively participate in meetings, discussions and many other relevant programs.

278. The socioeconomic survey revealed that in comparison to men, women have much more work load regarding household activities as the gender inequality is still existing in emerging urban areas like Panchkhal Municipality. Hence, women of the project area are mostly entangled within the household activities. The involvement of women members in WUSC will be the exemplary effort to encourage other women to come out of the cocoon within which they have been entwined by household activities for decades and isolated from the society. The proposed project will also give emphasis on various activities like stakeholder consultations, meetings etc. to persuade women to actively participate in project related activities.

279. The proposed project also expects to enhance the condition of underprivileged people (Dalits & Poor People) by making them involved in various programs organized under the proposed project. Hence, this proposed project has also prioritized Social Inclusion.

280. The impact is indirect in nature, local in extent, low in magnitude and long-term in duration.

281. Overall, the Project will lead to enhanced public health and urban environment, significantly contributing to the improvement in the quality of life of Panchkhal town residents.

282. To sustain the positive outcomes, effective operation, and maintenance guided by an O&M manual that contains Water Safety Guide, among others, is essential. Continuing hands-on training of WUSC in EMP implementation particularly water quality monitoring is necessary. The summary of impact matrix of beneficial issues of the project is given in **Table 7-I**.

Table 7-I: Summary of Impact Matrix of Beneficial Issues of the project

Beneficial Impacts	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
Construction Phase					
Employment Generation	D	H (60)	L (20)	ST (5)	Very Significant (85)
Skill Enhancement	ID	M (20)	L (20)	LT (20)	Very Significant (80)
Local Trade and Business	D	M (20)	L (20)	LT (20)	Very Significant (80)
Operation Phase					
Improved Health and Hygiene	D	H (60)	L (20)	LT (20)	Very Significant (100)
Increase Economic Opportunity	ID	M (20)	L (20)	LT (20)	Very Significant (80)
Impacts on Sustainability of the system	ID	H (60)	L (20)	LT (20)	Very Significant (100)
Social Empowerment	ID	L (10)	L (20)	LT (20)	Significant (50)

Source: National EIA Guidelines, 1993 & IEE Field Study

Note: Scoring is done based on following;

Nature of Impact: D = Direct; IN = Indirect;

Magnitude, H = High (60); M = Medium/Moderate (20) ; and L = Low (10)

Extent, R = Regional (60), L = Local (20); and S = Site-specific (10)

Duration, LT = Long-term (20), MT = Medium-term (10); and ST = Short-term (5)

The points/scoring are taken from the National EIA Guidelines, 1993

Significance of Impact

Total Score: More than 75 : Very Significant

50-75 : Significant

Less than 50 : Insignificant

7.2 Adverse Impacts

7.2.1 Impact on Physical Environment

7.2.1.1 Design Phase

a) Soil Erosion & Slope Instability

283. During design phase, there is possibility of incorporation of sloped areas due to which construction activities in such area may result in soil erosion and slope instability.

284. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

7.2.1.2 Construction Phase

a) Soil Erosion & land surface disturbance

285. Excavation and digging of trenches during construction has the potential to cause erosion and cave in thereby causing soil erosion, silt runoff and unsettling of street surfaces as the bazaar area lies on the top of the hills. Unorganized disposal of the excavated earth can disturb the street surface and decrease the value of the area where it is disposed. The activity as such will be a discomfort to the road users and inhabitants.

286. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

b) Spoil Disposal & Gully Erosion

287. Inappropriate disposal of spoils from the construction activities may result in gullying and erosion of spoil tips especially when it is combined with unmanaged surface water runoff. This leads to destruction of vegetations, damage to agricultural lands and destruction to private property. This affects the people possessing those agricultural lands as well as the anticipated properties.

288. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

c) Loss of Fertile Top Soil

289. During pipeline excavation works, if soil materials are not deliberately handled, loss of fertile top soil can occur as while excavating, the fertile top soil may be removed. Top soil contains nutrients and organic matter which are significant to the vegetation growth. If the fertile top soil is lost during excavation, the ability of the soil to be reclaimed is affected because the physical characteristics and nutrient availability of the soil have been altered.

290. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

d) Air Pollution

291. There can be greater impact on air quality from the inadequately managed or haphazard project activities that includes: (i) earthworks such as clearing, grubbing, excavations, and drilling especially during dry seasons; (ii) demolition works; (iii) stockpiling of natural aggregates, excavated materials and spoils; (iii) transport, loading and unloading of natural aggregates; (iv) movement of construction-associated vehicles; (v) on-site concrete mixing; (vi) burning of firewoods for cooking & heating in work and labour camps; (vii) construction of sanitation components at core bazaar area (Tamaghat Bazaar Area) and (viii) open burning of solid waste by workers.

292. These activities may increase dust, carbon, monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons in the air. This affects the construction workers, people residing in this area and the passers by.

293. The impact is indirect, local to regional in extent, medium in magnitude and short-term in duration.

e) Noise Pollution

294. Noise-emitting construction activities include earthworks, concrete mixing, demolition works, movement and operation of construction vehicles and equipment, construction of sanitation components at market area and loading & unloading of coarse aggregates. The significance of noise impact is observed to be high in areas where noise-sensitive institutions such as healthcare and educational facilities are situated. This may affect the construction workers, people residing in this area and the passers by.

295. The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

f) Generation of solid waste & waste water from construction sites and worker's camp

296. During construction phase, generation of solid waste & waste water from the construction sites and workers camp are likely to create nuisance in the surroundings. Soil runoff from the construction site may lead to off-site contamination (particularly during rainy season). Similarly, Improper disposal of construction debris may lead to off-site contamination of water resources. Unmanaged solid waste & effluent from workers camp may contaminate the surroundings. This will affect the construction workers, people residing in this area and the passers by.

297. The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

g) Accidental Leakage or Spillage of Stored Fuel/Chemicals

298. During construction phase, there will be requirement of storage of fuel/chemicals. During the process of storage and handling process, there is possibility of accidental leakage or spillage of stored fuel/chemicals. If not removed quickly, the spilled chemicals/fuel may be absorbed by the floor. This may lead towards the contamination of soil & water. This will affect the community living around this area.

299. The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

h) Impact on Land Use Pattern

300. The construction of the proposed project components may occupy significant area of the land within the core area. This certainly affects the current land use pattern as the land to be used for the construction of these components could be used for other purposes like agricultural, residential etc. This effect is direct in nature.

301. As the construction works of the proposed project start, there is possibility of influx of people from the nearby areas of the project town to this project town. This in turn increase the population of the project area which lead towards the change in land use pattern within the core area in haphazard manner. Arable land may be converted to settlement areas. Unstable land may also be used for planned areas. Haphazard cutting of sloped areas may be done to increase settlement areas. The unmanageable land is the main reason behind the destruction of the environment. The effect is indirect in nature and affects the people residing within the core area of the project.

302. The impacts are both indirect & direct in nature, local in extent, medium in magnitude and long-term in duration.

i) Disruption to Natural Drainage

303. The pipe laying works along ROW of the public road within the service area of the proposed project may disrupt the existing natural drainage system as the natural drainage flow may be interfered by the construction activities that includes earthworks, backfilling, stockpiling etc. This can have significant consequences like Localised Flooding, Channel Erosion, Landslides etc affecting the residents of that area.

304. The impacts are direct in nature, local in extent, medium in magnitude and long-term in duration.

j) Haphazard Disposal of Dismantled Debris

305. The proposed project also involves dismantling activities for pipe laying works and other miscellaneous works. This will result in the generation of dismantled debris.

306. Similarly, after the completion of construction works, the temporary facilities like labour camps, stockpiling sites, temporary toilets etc. needs to be dismantled immediately. The dismantled properties in the form of debris if not properly and instantly disposed off, may create nuisance in the surroundings. This may degrade the environmental quality. This affect the people living nearby the haphazardly disposed places and even the construction workers also.

307. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

7.2.2 Impact on Biological Environment

7.2.2.1 Construction Phase

a) Impacts on Flora and Fauna

308. Major project components does not interfere any of the forest areas. Hence, there will be no such effect on the existing flora & fauna. However, there may be requirement of clearing of some bushes and shrubs along the proposed pipeline alignment i.e, from sump well to WTP sites as some portion of transmission mains pass through the Naule Community

Forest area. The study shows that there is no requirement of cutting trees. Similarly, during pipe laying works, some of the top soil may be lost. As some portion of transmission mains pass through vegetated areas, during pipe laying works, the noise of construction activities may affect the faunas living nearby these areas.

309. Haphazard site clearing, parking, and movement of construction vehicles and equipment, stockpiling will result in unnecessary loss of vegetation & fauna beyond Project footprints.

310. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

b) Impacts on Aquatic Life

311. During construction phase, the nearby water bodies may be used by the workers for their daily activities like waste disposal, sanitation activities which may pollute the river quality which in turn lead the habitat of aquatic life towards risk.

312. Similarly, the construction works for the proposed sump wells may also contaminate the quality of the existing & the proposed sources affecting the aquatic habitat.

313. There are 12 river crossings proposed for this project. Hence, during pipeline crossing construction, there is chance of release of sediments into the river that results in the suspension and subsequent deposition of sediments into the river. This may affect the aquatic life.

314. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

c) Forest Fire

315. As the study shows that some portion of main transmission pass through the community forest, during pipelaying works, there is greater possibility of accidental forest fire that can be due to either carelessness of workers or other sudden accidental causes. This forest fire in turn will result in various consequences that includes impact on flora & fauna, destroying of nutrients by the ashes, soil erosion etc.

316. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

d) Forest Encroachment

317. During pipe laying works, there will be regular inflow & outflow of the construction workers and other people related to the project construction to the forest area. This may result in possibility of encroachment of forest area. This will have direct impact on flora & fauna as their habitat will be disturbed by the forest encroachment. This will also discourage the ability of the forest vegetation to recover. Workers involved in the construction activities may use firewood of the forest areas which is illegal in actual.

318. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

7.2.2.2 Operation Phase

a) Impacts on Aquatic Life

319. The water discharged from the filter backwashing, if discharged directly into the nearby water bodies, may pollute the water bodies endangering the existence of aquatic lives .

320. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

7.2.3 Impact on Chemical Environment

7.2.3.1 Construction Phase

a) Impacts on Water Quality of the nearby rivers

321. During construction phase, there is high possibility of water resources like Jhiku Khola and Sunkoshi River to be polluted due to the chance of disposal of solid wastes by the workers and poor sanitation behavior of the workers. This will lower the water quality of these water bodies. Polluted water bodies will be detrimental to aquatic life as well as to the health of people relying mainly on the river and streams as sources of water for drinking and other domestic uses.

322. Similarly, some sections of the distribution pipeline will cross water bodies as there are total 12 river crossings proposed for this project, exposing these resources to risks of pollution caused by poorly managed construction sediments, wastes and hazardous substances.

323. The impact is direct in nature, local to regional in extent, medium in magnitude and short-term in duration.

7.2.3.2 Operation Phase

a) Impacts on Water Bodies

324. The sedimentation tank requires periodic cleaning through periodic removal of sediments settled down (Raw Sludge) at the bottom of the tank. The removed sediments or sludge from sedimentation tank needs to be properly disposed. But, there is high chance of disposal of sludge directly into the nearby water bodies. This will degrade the water quality of the river. This impact will be more troublesome during dry season when the flow will be less and self cleansing capacity of the river will be less.

325. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

7.2.4 Impact on Socio-economic Environment

7.2.4.1 Design Phase

a) Structural Instability

326. Panchkhal municipality belongs to hilly region hence, it is prone to seismic activity. As per report on Socio-Demographic Impact Study on Nepal Earthquake 2015 prepared by CDPS (TU), the project district, Kavre is highly affected by the massive earthquake that shook various parts of Nepal in April 25, 2015. If certain seismic activity again occurs in the future, this may result in cracking of structure leads to facility failure and public discomfort. Though this impact will be experienced during operation phase, this should be considered

during design phase so that such possibility of structural failure can be reduced to greater extent through safe design of earthquake resistant structures.

327. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

b) Health & Safety of Community & Workers

328. During design phase, if the project components are designed without focusing on the health & safety of community & workers, it will have greater impact on socio-economic environment.

329. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

c) Damage to the existing utilities

330. During construction phase, if the proposed pipelines interfere any of the existing utilities, there is greater possibility of those utilities getting damaged. This will create discomfort to the people getting facilities from those damaged utilities. Similarly, there is also possibility of some fraud people to take advantage of this impact and may make false claims for damaged utilities. Though this problem appears during construction phase, its mitigation measure should be considered during design phase. Hence, this impact is categorized for design phase.

331. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

7.2.4.2 Construction Phase

a) Community health and safety hazards

332. Overall, communities will be exposed to cross-cutting threats from construction's impacts on air and water quality, ambient noise level; mobility of people/goods/services; accesses to properties/economic activities/social services; service disruptions, etc. Communicable and transmittable diseases may potentially be brought into the community by construction workers.

333. The impact is indirect in nature, local in extent, medium in magnitude and short-term in duration.

b) Workers' Health and Safety Hazards

334. Workers will also be exposed to the cross-cutting threats of the impacts above during construction. Inadequate supply of safe/potable water and inadequate sanitation facilities; poor sanitation practices on site; poor housing conditions; the handling and operation of construction equipment; handling of hazardous substances; exposure to extreme weather and non-observance of health and safety measures, pose additional threats to the health and safety of construction workers. Construction workers may also be potentially exposed to communicable and transmittable diseases in the community and the workforce.

335. The impact is indirect in nature, local in extent, medium in magnitude and short-term in duration.

c) Traffic Congestion

336. The road from Dolalghat junction to Majhi Gaon may be susceptible to traffic congestion during transportation of construction materials as well as pipeline laying works as the pathway to the proposed sump well site falls within this roadways and this is a bit narrower that may provide discomfort to the passer-by & shopkeepers and may obstruct the daily activities of the people living in that area .

337. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

d) Public Protests

338. Due to the interruption of traffic flow, there is high chance of protests by the local people. This may interrupt the construction activities of the proposed project.

339. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

e) Disruption to Local Vendor's Business

340. The construction works during pipe laying activities may disrupt local vendor's business as the construction activities may obstruct their customers to have easy & direct access to their shops. This may hamper their daily business activities.

341. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

f) Mobilization of Child Labor

342. During construction period, there is possibility of mobilization of child labor by the contractors which is against the Child Labor Prohibition Act,2000 as child labor deprives children off their childhood and their right to education,health, safety and moral development.

343. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

g) Impacts on the Sustainability of Works

344. Nepal is a seismic prone country. It is the geographical location of Nepal that makes it extremely susceptible to seismic activity from the nearby Indian and Tibetan plates. Historically, Nepal has been prone to significant disasters resulting in mass destruction and claiming thousands of lives. Most recently, on 25 April 2015, a 7.8 magnitude earthquake struck in Gorkha district that resulted in the loss of life of thousands of people. As per *Nepal Disaster Management Reference Handbook (2017).Center for Excellence in Disaster Management and Humanitarian Assistance*, this devastating earthquake affected over 50 districts in Nepal. Kavre, the project district could not remain untouched from this disaster. Nepal is still experiencing repeated but random tremors of various magnitude. Hence, we cannot ignore the fact that there is high possibility of occurrence of such seismic events in the future that will be experienced in the project town also. If this occurs during the construction period of the proposed project, this may unsustain the project by causing damage to the unsettled/unfinished/uncured and/or completed structures affecting their structural integrity.

345. The impact is direct in nature, local in extent, high in magnitude and short-term in duration.

h) Damage to the existing utilities

346. During the construction phase, while excavating the earth, there is possibility of the existing water supply distribution pipelines getting damaged in a few places particularly in the market area. Similarly, the existing paved as well as unpaved road will also get damaged. This will obviously create discomfort to the people and people will be deprived of regular facilities they are getting from the existing utilities.

347. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

i) Impact on Downstream Users

348. The proposed water source is not used nearby the neighbouring settlements. During construction works at Intake/Sump Well site, there is chance of contamination of the source water due to carelessness in the sanitation behaviour of workers. The consumption of contaminated water may affect the health of the downstream users. However, this impact is not so significant as the socioeconomic study shows that no consumptive use of water has been noticed upto 4 km downstream of the proposed Sunkoshi River and the settlement area is observed to be situated at far downstream. This water quality if found altered due to project activities, this can be recovered after certain duration through self purification capacity of the rivers. Nevertheless, as a preventive measure, some mitigation measures can be adopted.

349. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration

7.2.4.3 OperationPhase

a) Occupational Health and Safety Hazards

350. Worker's exposure to, and/or mishandling of chemicals and other hazardous substances pose health and safety hazards.

351. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

b) Complications in water distribution system

352. There is chance of occurrence of complications in water distribution system due to any one or combinations of the following will have impact on public health: (i) accidental human error in chlorine dosing; (ii) accidental spill of hazardous substances; (iii) leaks in the system; (iv) lack of environmental quality monitoring; (v) inadequate maintenance and housekeeping; and (vi) deteriorating quality of water resource without parallel upgrading the water treatment process.

353. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

c) Impacts on Consumer's Health

354. Irregularity in the supervision of the operation of distribution system may lead to excessive algae growth in service reservoir which may produce toxins causing serious illness in humans consuming water. The algal growth may also impart earthy taste & odor which may create dismay to the consumers and this may result in customer complaints that may lead to protests also.

355. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration.

d) Impacts of Haphazard Disposal of Raw Sludge

356. During operation, while cleaning the sedimentation tank, there is chance of haphazard disposal of removed sediments/raw sludge either to the nearby water bodies or to the nearby land haphazardly. This type of act is not environment friendly at all. Though the raw sludge does not contain harmful constituents, aesthetically the haphazard disposal of the sludge seems unpleasant to the community.

357. The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

e) Non-sustainability of Services or Completed Works

358. As it has already been mentioned that the project town is prone to seismic events, if any seismic event occurs in the future, the sustainability of services or completed works may be at risk.

359. Similarly, the sustainability can be affected by the anticipated climate change effects. The critical impacts induced by climate change droughts are changes in temperature, precipitation, which has varying consequences not only on the ecosystem but on the availability of water supplies. Climate change alters the hydrological characteristics of surface water due to changes in seasonal rainfall pattern and surface run-off. This affects stream, river and reservoir yields and recharge of ground water aquifers making water resources difficult to manage and use. Good engineering design accommodates the climate change issues. This issue arises and results in disruption in smooth operation of water supply service with the Operator's disregard of these impacts. Along with this, the unsustainability of the completed works may result due to the issues that include; (i) Lack of Sense of ownership & Affordability; (ii) Lack of Institutional Capacity & Policy Compliance and (iii) Ineffectiveness in O & M.

360. The impact is indirect in nature, local in extent, medium in magnitude and long-term in duration.

361. The summary of impact matrix of adverse issues of the project is given in **Table 7-II**.

Table 7-II: Summary of Impact Matrix of Adverse Issues of the Proposed Project

Adverse Issues	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
A) Impacts on Physical Environment					
i) Design Phase					
Soil Erosion & Slope Instability	D	M (20)	L (20)	ST (5)	Insignificant (45)

Adverse Issues	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
ii) Construction Phase					
Soil Erosion & Land Surface Disturbances	D	M (20)	L (20)	ST (5)	Insignificant (45)
Spoil Disposal & Gully Erosion	D	M (20)	L (20)	ST (5)	Insignificant (45)
Loss of Fertile Top Soil	D	M (20)	L (20)	ST (5)	Insignificant (45)
Air Pollution	ID	M (20)	R (60)	ST (5)	Very Significant (85)
Noise Pollution	D	H (60)	L (20)	ST (5)	Very Significant (85)
Generation of Solid Waste & Wastewater from the construction site & worker's camp	D	M (20)	L (20)	LT (20)	Significant (60)
Accidental Leakage or Spillage of Stored Fuel/Chemicals	D	M (20)	L (20)	LT (20)	Significant (60)
Impact on Land Use Pattern	D & ID	M (20)	L (20)	LT (20)	Significant (60)
Disruption to Natural Drainage	D	M (20)	L (20)	LT (20)	Significant (60)
Haphazard Disposal of Dismantled Debris	D	M (20)	L (20)	LT (20)	Significant (60)
iii) Operation Phase					
Impact on the proposed source	D	M (20)	L (20)	LT (20)	Significant (60)
B) Impacts on Biological Environment					
i) Construction Phase					
Impacts on Flora and Fauna	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impacts on Aquatic Life	D	M (20)	L (20)	ST (5)	Insignificant (45)
Forest Fire	D	M (20)	L (20)	ST (5)	Insignificant (45)
Forest Encroachment	ID	M (20)	L (20)	LT (20)	Significant (60)
ii) Operation Phase					
Impacts on Aquatic Life	D	M (20)	L (20)	LT (20)	Significant (60)
C) Impacts on Chemical Environment					
i) Construction Phase					
Impacts on Water Quality of the nearby rivers	D	M (20)	R (60)	ST (5)	Very Significant (85)

Adverse Issues	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
ii) Operation Phase					
Impacts on Quality of Water Stored in Reservoir	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impact on Water Bodies	D	M (20)	L (20)	LT (20)	Significant (60)
D) Impacts on Socio-economic Environment					
i) Design Phase					
Structural Instability	ID	M (20)	L (20)	LT (20)	Significant (60)
Health & Safety of Community & Workers	ID	M (20)	L (20)	LT (20)	Significant (60)
Damage to the existing facilities	D	M (20)	L (20)	ST (5)	Insignificant (45)
ii) Construction Phase					
Community Health and Safety Hazards	ID	M (20)	L (20)	ST (5)	Insignificant (45)
Workers' Health and Safety Hazards	ID	M (20)	L (20)	ST (5)	Insignificant (45)
Traffic Congestion	D	M (20)	L (20)	ST (5)	Insignificant (45)
Public Protests	D	M (20)	L (20)	ST (5)	Insignificant (45)
Disruption to local vendor's business	D	M (20)	L (20)	ST (5)	Insignificant (45)
Mobilization of Child Labor	ID	M (20)	L (20)	LT (20)	Significant (60)
Impacts on the sustainability of works	D	H (60)	L (20)	ST (5)	Very significant (85)
Damage to the existing facilities	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impact on Downstream Users	D	M (20)	L (20)	ST (5)	Insignificant (45)
iii) Operation Phase					
Occupational Health & Safety Hazards	ID	M (20)	L (20)	LT (20)	Significant (60)
Complications in water distribution system	D	M (20)	L (20)	LT (20)	Significant (60)
Impact on Consumer's Health	D	M (20)	L (20)	ST (5)	Insignificant (45)
Impact on Haphazard Disposal of Raw Sludge	D	M (20)	L (20)	LT (20)	Significant (60)
Non-Sustainability of Services or Completed Works	ID	M (20)	L (20)	LT (20)	Significant (60)

Source: National EIA Guidelines, 1993 & IEE Study 2018/019

Note: Scoring is done based on following;

Nature of Impact: D = Direct; IN = Indirect;

Magnitude, H = High (60); M = Medium/Moderate (20) ; and L = Low (10)

Extent, R = Regional (60), L = Local (20); and S = Site-specific (10)

Duration, LT = Long-term (20), MT = Medium-term (10); and ST = Short-term (5)

The points/scoring are taken from the **National EIA Guidelines, 1993.**

Significance of Impact

Total Score: More than 75 : Very Significant

50-75 : Significant

Less than 50 : Insignificant

362. The above given table shows that *Air Pollution, Noise Pollution, Impacts on Water Quality of nearby rivers and Impact on Sustainability of works* are evaluated as “Very Significant”. However, if the mitigation measures as described above for these impacts are properly adopted, these impacts would not be problematic for the project implementation. Apart of this, the **Table 7-II** also shows that some impacts are insignificant & some are significant. The best way to mitigate these impacts is to follow the proposed mitigation measures and to implement them effectively.

7.3 Significance of Impact Rating

363. The significance of impact rating as shown in the above table is that it helps to determine the severity of each anticipated adverse impact. This helps to recommend suitable mitigation measures for each impact on the basis of its severity. This also helps to allocate the budget required for the implementation of the proposed mitigation measures. As per the severity, the impact rating act as a means of making policy and legislations more rational, predictable and scientific. This also helps to establish close and routine monitoring requirement or criteria for mitigating impacts. This also helps to recommend the needs of adopting special checklists, if required. Moreover, this assists to advance towards the environmental auditing during construction and operation phase, as one of the most important environmental management tools. This auditing enables to assess the actual environmental impacts, accuracy of prediction, effectiveness of environmental mitigation measures adopted and functioning of monitoring mechanism.

8 MITIGATION & AUGMENTATION MEASURES

364. The anticipated environmental impacts discussed in the earlier chapter are either adverse or beneficial. To sustain the project, it is necessary to deal with these impacts properly. Hence, the IEE study has proposed the effective measures to cope with these impacts. Here, the proposed measures include a) Mitigation Measures to reduce or eliminate or avoid the adverse impacts and b) Augmentation Measures to maximize the beneficial impacts. Both of these mitigation as well as augmentation measures are discussed below in detail.

8.1 Mitigation Measures

8.1.1 Impact on Physical Environment

8.1.1.1 Design Phase

a) Soil Erosion & Slope Instability

365. The mitigation measures will be as follows;

- Incorporate measures and sites for handling excessive spoil materials
- Incorporate drainage plan in final design

366. PMO, RPMO & DSMC are the main responsible bodies to carry out the above mentioned mitigation measures.

8.1.1.2 Construction Phase

a) Soil Erosion & Land Surface Disturbance

367. During construction, precautionary measures will be taken, proper backfilling trenches will be done, and the excavated soil will be protected against erosion. The key elements to proper backfilling shall include:

- Protecting the foundation from damage during backfilling
- Using the right backfill materials
- Compacting the backfill
- Final finishing the subgrade to ensure that water drains away from the foundation

368. This will also be mitigated through appropriate slope protection measures like Gabion Wall Construction, Retaining Wall Construction and Construction of Drainage Structures.

b) Spoil Disposal & Gully Erosion

369. Spoils will be safely disposed by adopting the following mitigation measures:

- Follow Spoil Management Plan as included in **Annex 2E**.
- Use of excess Spoil or Soil for filling depressed areas or borrow pits wherever possible.

- Appropriate disposal of Spoil at the designated places.
- Spoils should not be disposed on natural drainage paths, canals and other infrastructures.
- Provision of toe walls and retaining walls to protect the erosion of disposed spoils.
- Provision of proper drainage, vegetation and adequate protection against erosion at the Spoil Disposal Site.

c) Loss of Fertile Topsoil

370. The measures to mitigate this impact involves timely and careful removal of the top soil followed by proper temporary storage at suitable location. The top soil then will be reused in preparing green spaces under suitable condition.

d) Air Pollution

371. The measures to mitigate the impacts on air quality will include: (i) confining earthworks according to an Excavation Segmentation Plan that is a part of EMP; (ii) watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary; (iii) if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces; (iv) during demolition, watering of exterior surfaces, unpaved ground in the immediate vicinity and demolition debris; (v) signage at active work sites in populated areas; (vi) requiring trucks delivering aggregates and cement to have tarpaulin cover; (vii) limiting speed of construction vehicles in access roads and work sites to a maximum of 30 kph; (viii) Strict Prohibition of open burning of solid waste by the workers; (ix) Use of Vehicles complying with NVMES, 2069 B.S.; (x) Use of equipments/machinery that comply with National Ambient Air Quality Standards of GoN i.e., NAAQS, 2012; (xi) Use of Diesel Generators complying with National Diesel Generator Emission Standard, 2012; (xii) Conduct Air Quality Test for dust nuisance (PM 10 and PM 2.5) at key settlement and market areas, school, hospital at least once in a month during dry working season (Jan-June), and (xiii) Supply of clean cooking fuel to workers instead of allowing them to use firewood for cooking by the concerned contractor.

e) Noise Pollution

372. The measures to mitigate the noise pollution will include: (i) using equipment that emits the least noise, well-maintained and with efficient mufflers; (ii) restricting noisy activities to daytime and overtime work to avoid using noisy equipment; (iii) Prohibit the use of pressure horn by transportation vehicles; (iv) Conduct noise level test once a year during peak construction stage at location near school, hospital and settlements; (v) limit engine idling to a maximum of 5 minutes; (vi) spread out the schedule of material, spoil and waste transport; (vii) minimizing drop heights when loading and unloading coarse aggregates; (viii) Avoid noise generating activities like excavation works, dismantling for excavation works, loading & unloading of construction materials, noise of material transportation vehicles etc. during school time and at hospital area if any; (ix) Regular inspection & maintenance of construction/transportation vehicles to ensure the use of Vehicles complying with NVMES, 2069 B.S.; (x) Regular inspection & maintenance to ensure the use of equipments/machinery that comply with ambient noise levels standards i.e., National Noise Standard Guidelines, 2012 of GoN and (xi) Regular inspection & maintenance to ensure the

use of Diesel Generators complying with National Diesel Generator Emission Standard, 2012.

f) Generation of solid waste & waste water from construction sites and worker's camp

373. The mitigation measures for this impact is briefly described below:

Construction Wastes:

- Adopt 3R (Reduce, Reuse & Recycle) concept
- Ensure storage areas are secure, safe and weatherproof.
- Management of Reusable Wastes
- Sale of Recyclable wastes to Scrap Dealer
- Final Disposal of Bio degradable solid wastes
- Avoid over ordering of construction materials to the extent possible. This will be challenging as it requires strong coordination with the concerned contractors as it cannot be made mandatory. However, it is not impossible too to coordinate with the contractors in this regard.
- Use standard size & quantity of construction materials.
- Construct earthen drains to reduce the runoff from the stockpiles.

Solid Wastes & Effluent from Worker's Camp:

- Adopt Segregation of Solid Waste (3R Concept) on the basis of being biodegradable or non-biodegradable. It is because non-biodegradable wastes cannot be broken down by decomposers and their disposal poses a big problem.
- Management of biodegradable wastes that includes food waste, paper waste, biodegradable plastic, etc. by any suitable processes that include Composting. If these two processes are not possible then, the wastes shall be either managed by handing over these wastes to the municipality waste collectors who will finally dispose those wastes to the landfill sites of the project town or by disposing those wastes to the burial pits at suitable place.
- Non biodegradable wastes like glass, plastics & metals shall be managed by reusing them for site use or selling them to scrap dealers instead of disposing them.
- Strict Prohibition on open incineration of solid wastes & Strict Prohibition on use of plastic materials to minimize the quantity of plastic wastes as much as possible.
- Construct the temporary latrines with temporary soak pits & septic tanks within the camp site for proper disposal of sewage.
- Provide temporary but proper drainage system for proper outlet of waste water generated from cooking practices adopted by the workers.
- Employ local people from nearby villages to maximum extent possible. It will minimize the number of workers residing at worker's camp. Lesser

the number of people, lesser will be the solid waste & effluent generated. However, it cannot be made mandatory because availability of local people with required skills will not be ensured at the time of construction.

g) Accidental Leakage or Spillage of Stored Fuel/Chemicals

374. The mitigation measures for this impact is briefly described below:

- Provision of well managed storage site with well-sealed surface provided with catch drain as far as possible.
- Organize awareness programs for the workers responsible for handling fuel/chemicals prior to the construction works.
- Supervise workers to handle fuel/chemicals properly during transportation as well as storage.
- Use of spill kit materials to block flow and prevent discharge to nearby water bodies
- Scatter the Sawdust, sand or dry soil over the area of spill and leave for few minutes to soak up the fuel/chemical. So, availability of saw dust, sand or dry soil should be ensured in the store.
- Regular Inspection Visit to the storage site to inspect the leakage of the stored container of fuel/chemical.

h) Impact on Land Use Pattern

375. The mitigation measures for this impact are as follows:

- Selection of barren and public land only for the construction of project components can be the best mitigation measure for the impact resulting from the construction of the proposed project components. However, this has to be considered during the design of the project and has to be followed accordingly during construction phase. Otherwise, this impact remains unavoidable and irreversible.
- Monitoring on the haphazard land use & planning by the concerned authority.

i) Disruption to Natural Drainage

376. The mitigation measures for this impact are as follows:

- Avoid the natural drainage pathways for pipe laying works.
- Stockpile the excavated materials at safe but nearby place.
- Restore natural drainage system if the drainage system during construction is blocked.

j) Haphazard Disposal of Dismantled Debris

377. The mitigation measures for this impact are as follows:

- Immediate Response on handling of dismantled debris.
- Segregation of Dismantled Debris

- Adopt 3R (Reduce, Reuse & Recycle) concept to minimize the quantity of dismantled debris.
- Sale of Recyclable Wastes to Scrap Dealer

8.1.2 Impact on Biological Environment

8.1.2.1 Construction Phase

a) Impacts on Flora & Fauna

378. The mitigation measures for this impact include:

- Replace the excavated top soil to its original position after the completion of pipe laying works
- Re-vegetating disturbed slopes and grounds, as applicable
- Awareness programs regarding the policy related to the conservation of existing flora & fauna, to the workers prior to the construction and the community during various meetings and discussion programs;
- Adopt the suitable mitigation measures proposed to minimize noise pollution as mentioned above in 8.1.1 d).
- Regular Monitoring by DSMC & PMO

b) Impacts on Aquatic Life

379. The mitigation measures for this impact include:

- Strict Monitoring on the daily activities of workers ;
- Provision of temporary but well equipped toilets
- Restriction to workers from fishing;
- Adopt measures mentioned for the solid waste management
- Careful monitoring during pipelaying works along the river crossings to minimize the release of the sediments as far as possible. However, this impact is short term and can be recovered soon.

c) Forest Fire

380. The mitigation measures for this impact include:

- Prohibition on burning dry grass or debris;
- Prohibition on camp fires & smoking within the forest area to the workers;
- Keeping fire fighting equipment stand by within the construction sites;
- Provision of safety trainings regarding forest fire to the construction workers prior to construction.

d) Forest Encroachment

381. The mitigation measures for this impact include:

- Strict & Regular Monitoring during the entry of workers for the construction workers,
- Mobilization of the concerned community forest groups,
- Legal Provision along with imposing fines as punishment for those responsible for forest encroachment ;and,

- Provision of trainings to the construction workers to provide support in controlling encroachment.

8.1.2.2 Operation Phase

a) Impacts on Aquatic Life

382. The outlet of the water treatment plant is connected to the nearby natural drainage through the wash out pipe. Hence, the backwashed water is discharged to the natural drainage. Similarly, there are no water bodies nearby the WTP area as well as there are no settlements either. Hence, there will be no such significant environmental impact from the filter backwashing process on the aquatic lives. However, as precaution, the following mitigation measure for this impact can be adopted:

- Preparation and Implementation of Sanitation Safety Plan providing guidance for the sanitation activities that also includes safe release of water discharged from the filter backwashing process besides other sanitation activities. This Sanitation Safety Plan is not mandatory in the project design as like Water Safety Plan however, this can be prepared during operation phase as the initiative to mitigate the impacts related to sanitation activities caused by the construction of the project.

8.1.3 Impact on Chemical Environment

8.1.3.1 Construction Phase

a) Impacts on Water Quality of the nearby rivers

383. Mitigation measures will be implemented before the construction stage to prevent the contamination of drinking water source and other environmental receptors from worker camps and construction site toilets septage. The mitigation measures includes;

- Appropriate design of septage disposal will minimize the risks to public health. The appropriate design of toilets includes septic tanks that are designed as per national standards and codes to allow for maximum retention of septage. This includes ensuring septic tanks are sealed and watertight. Septage disposal pit will be designed and constructed in accordance with international best practice and acceptable standards. This will include, locating disposal pits at least 300 m away from the nearest dwelling and 30 m downstream of the drinking water source, The pits will be installed on relatively flat land with no more than 8 % slope and sites selected for locating of pits will not be where food crops are grown. The sanitation condition will be maintained to deter flies, mosquito breeding, free from odor. The septage disposal site will ensure no disturbances to nearby community forests.
- The exact location of the final disposal site has not been designated as it does not fall under the project scope. It is the task of contractor to manage the disposal site. It should be confirmed during construction phase by the contractor through consultation with WUSC under the ideal condition.

384. In addition to this, other mitigation measures include

- Disposing of spoils or excess soils as free filling materials as soon as possible;

- Locating temporary storage areas on flat grounds and away from main surface drainage routes;
- Shielding temporary storage areas with sandbags
- Implementing eco-friendly solid and hazardous waste management, disposing them promptly;
- Providing adequate water supply and sanitation facilities at work sites.
- Adopt measures mentioned above for the solid waste management
- Strict supervision on the behaviour of workers for the waste management as well as sanitation behaviour and monitoring the workers to manage the wastes properly.
- Strict & Regular Monitoring during pipe laying works

8.1.3.2 Operation Phase

a) Impact on Water Bodies

385. The mitigation measures for this impact will include as follows:

- Disposal of raw sludge into the borrow pits near the construction sites.
- Avoid direct discharge of the raw sludge to the water bodies through strict monitoring to the operators involved.
- Proper Implementation of Water Safety Plan (WSP).

8.1.4 Impact on Socio-economic Environment

8.1.4.1 Design Phase

a) Structural Instability

386. This impact will be mitigated through proper design of earthquake resistant structures as per standard and code of practice.

387. PMO, RPMO & DSMC are the main responsible bodies for the adalternative of this mitigation measure.

b) Health & Safety of Community & Workers

388. The mitigation measure for this impact will include;

- Training on Community Health & Safety Hazards by DSMC by disseminating information in regard to this through training manuals, photographs & documents related to safety.
- PMO, RPMO & DSMC are the main responsible bodies to carry out the above mentioned mitigation measures.

c) Damage to the existing facilities

389. The mitigation measures for this impact will include;

- Coordinate with the concerned agencies to finalize the pipe network layout to avoid damage to the existing utilities.
- Design & Locate pipelines away from existing utilities during design as far as possible.

- Provide budget for restoration/replacement of damaged utilities.
- Photographs of construction sites before and after the construction to avoid the false claims.
- Prompt Reinstatement of paved as well as unpaved roads after completion of excavation works for pipe laying.

390. PMO, RPMO & DSMC/Contractor are the main responsible bodies to carry out the above mentioned mitigation measures.

8.1.4.2 Construction Phase

a) Community Health & Safety Hazards

391. The mitigation measures for this impact will include:

- Contractor's implementation of EMP;
- Adequate lighting, temporary fence, reflecting barriers and signage at active work sites;
- Contractor's preparedness in emergency response;
- Adequate dissemination of GRM and Contractor's observance/implementation of GRM.

b) Worker's Health & Safety Hazards

392. The mitigation measures for this impact will include:

- Submission of Simple OHS plan for employer's approval that involves appropriate health & safety arrangement that includes minimum requirements for various activities like Excavation works, Works within the confined spaces, Use of warning signs, boards & signage, Use of PPE, Accident & Emergency Response and Monitoring & Reporting.
- Comply Labor Act (1992) of GoN
- Train all site personnel regarding environmental health and safety as like in design phase by DSMC & Contractors
- Provide Personal Protective Equipment (PPEs) to workers that includes protective clothing, helmets, goggles and other equipment designed to protect the wearer's body from injury or infection and ensure their effective usage
- Require workers to wear high visibility clothes
- Exclude public from worksites
- Maintain accident reports and records.
- Make first aid kits readily available
- Provision of well equipped worker's camp and Maintain hygienic accommodation
- Ensure uncontaminated water for drinking, cooking, and washing,
- Assure clean eating areas
- Make sure sanitation facilities are readily available
- Provide adequate space and light to the camp site
- Adequate supply of potable water to the camps and good sanitation within camps
- Provide medical insurance coverage for workers
- Provide orientation for guest visitors
- Ensure that visitors do not enter hazard areas unescorted;

- Ensure moving equipment is outfitted with audible backup alarms;
- Hearing protection equipment enforced in noisy environment
- Chemical and Material storage areas need to be marked clearly
- Implementation of Emergency Preparedness Response Plan to mitigate the impacts of flooding problems that includes i) Reporting of Incidents; ii) Investigation of incidents and iii) Prepared for availability of Stretchers, Life buoys, first aiders, first aid kits etc.

c) Traffic Congestion

393. This impact cannot be avoided because the structure of the bazaar area is very congested. However, this impact will be mitigated as follows;

- The trench for pipeline should not be abandoned and the contractor should be recommended to backfill the trench immediately followed by compaction right after completion of pipe laying works.
- Installation of signage at appropriate locations indicating available alternate access routes to minimize traffic disruptions.
- Provision of access to shops and residences using simple wooden walkways.
- Provision of alternative way for vehicular movement and pedestrians if possible
- Follow the Traffic Management Plan especially at Bazaar Areas like Hokse Bazaar, Panchkhal Bazaar area and Palanchowk Bhagwati Area, the sample of which has been attached in **Annex 2D**.

394. The contractor and DSMC are the main responsible bodies to mitigate this impact.

d) Public Protests

395. The mitigation measures for this impact will include:

- Public Consultation should be carried out at various stages & locations as per requirement.
- Implement Grievance Redress Mechanism
- Pre-notify the public regarding the construction works that may hinder their daily activities and Coordinate with them properly

e) Disruption to Local Vendor's Business

396. The mitigation measures for this impact includes;

- Avoid delay in construction works and Prompt Backfilling accompanied by compaction right after completion of pipe laying works without delay.
- Provision of temporary access to the shops through provision of planks.
- Pre-notify the vendors regarding the construction works that may hinder their daily activities and Coordinate with them properly.

f) Mobilization of Child Labor

397. The mitigation measures for this impact includes;

- As the Child Labor Prohibition Act, 2000 states that “No Child having not attained the age of 14 years shall be engaged in works as a laborer” during mobilization, provision for the requirement of submission of the citizenship certificate of each labor, should be made.
- During contract agreement, the agreement by the contractor to follow Child Labor Prohibition Act, 2000 and Child Labour Prohibition Rules & Regulations, 2006, should be made.

g) Impacts on Sustainability of Works

398. The mitigation measures for this impact includes;

- After every seismic event, the contractor must conduct engineering investigation of built structures and implement the necessary corrective actions immediately as a mitigation measure for this impact.
- Prepare & Follow Emergency Preparedness and Response Plan

h) Damage to the existing facilities

399. If during construction phase, the problem regarding damage to the existing facilities arises, then it will be the fault of the people involved in construction works as this problem will be considered during design phase. This problem will arise only if no carefulness is adopted by the workers and if the pipeline layout drawings prepared during design phase is not strictly followed. Hence, the mitigation measure for this impact is to monitor construction workers to adopt carefulness and to strictly follow the layout drawings.

400. Similarly, during excavation works, damage to the existing paved as well as unpaved roads can be mitigated through reinstatement works. The proposed project has provision for this reinstatement works and the cost estimate has been included in the the detailed design cost estimate of this proposed project.

i) Impact on Downstream Users

401. The mitigation measures for this impact include:

- Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly.
- Provision of temporary latrines with basic facilities

8.1.4.3 Operation Phase

a) Occupational Health and Safety Hazards

402. The mitigation measures for this impact include;

- Installation of clear, visible signage in premises on safety measures; and
- Setting up a mechanism for the quick response to spills of chemical and hazardous substances.

b) Complications in Water Distribution System

403. The mitigation measures for this impact include;
- Ensuring the regular operation of water treatment plant to meet satisfactory water quality;
 - Providing safe storage for chemicals;
 - Ventilation of Housed dosing unit for chlorine and
 - Train operators for handling chlorine for which Chlorine Use Guidelines as included in **Annex 5** will be followed.

c) Impacts on Consumer's Health

404. The mitigation measures for this impact are as follows:
- Regular Monitoring by the WUSC
 - Removing of Algae grown within the reservoir at regular intervals by the operating team deployed by the WUSC.
 - Monitoring & Proper Implementation of WSP.

d) Impacts of Haphazard Disposal of Raw Sludge

405. Reuse & Recycling is the best suitable option to mitigate this impact. This raw sludge can be reused in various ways. This reuse is based on the type of constituent of the sludge. Like if the raw sludge constitutes major portion of soil particles, then it can be reused for the brick making process. If the raw sludge constitutes major portion of sand particles, it can be used in ceramic makings, manufacture of cement and other cementitious materials and also as a substitute to building materials.

e) Non-sustainability of Services or Completed Works

406. The following mitigation measures to avoid non-sustainability of services or completed works are as follows:
- Monitoring of source yield closely by WUSC especially in the dry season and during a climate-change-induced drought.
 - After every seismic event, execution of engineering investigations of completed works and implementation of the necessary corrective actions without delay by WUSC. This involves preparation of Emergency Preparedness & Response Plan and Immediate Implementation of this plan after any seismic event.
 - Strengthening Institutional Capacity and Policy Compliance through various project related capacity building programs
 - Carrying out regular O & M with effectiveness through proper management of WUSC

8.2 Augmentation Measures

8.2.1 Impact on Socio-economic Environment

8.2.1.1 Construction Phase

a) Employment Generation

407. The augmentation measures for this beneficial impact will be as follows:

- Recommend contractor to employ local people by giving high priority to women and under privileged group as far as possible.
- Ensure equity in provision of wages to both male as well as female labors.

b) Skill Enhancement

408. The augmentation measures for this beneficial impact will be as follows:

- Making a proper work plan and code of conduct during the construction period.
- Provision of regular hands on training to the workers during the project construction period

c) Local trade and business opportunity.

409. The augmentation measures for this beneficial impact will be as follows:

- Recommend contractor to give priority to the local products during procurement of construction of materials.
- Priority also will be given to local services like grocery stores, tea shops, hotel & restaurants etc. during the entire construction period.
- Provision of regular hands on training to the workers during the project construction period

8.2.1.2 Operation Phase

a) Improved health and hygiene

410. The augmentation measures for this beneficial impact will be as follows:

- Regular maintenance of the water supply components should be done so that the project operates smoothly and the benefits are intact.

b) Increased economic opportunity

411. The augmentation measures for this beneficial impact will be as follows:

- Ensuring regular maintenance of the water supply components
- Promoting land development activities in the area.

c) Sustainability of the system

412. The augmentation measures for this beneficial impact will be as follows:

- Preparation & Implementation of proper Utilities Business Plan in regard to the water tariffs to systematize the water tariff system of the proposed system.
- Regular Collection of Water Tariffs as per plan prepared.

c) Social Empowerment

413. The augmentation measures for this beneficial impact will be as follows:

- Priority will also be given to vulnerable groups in WUSC along with female groups.
- Involving underprivileged group of people especially women and poor people in various capacity building programs and project related community

9 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

9.1 Stakeholder Consultation & Participation

414. Stakeholder consultation and participation is an essential process in project preparation. It is also a part of information disclosure. It will disseminate as well as collect information regarding the proposed project by involving various stakeholders that includes Key Informant Interviews, Stakeholders Meetings, Focus Group Discussions (FGD), On-site discussions with WUSC and Random Field Interviews. The checklists & findings of FGD has been included in **Annex 4** and the minutes of various meetings undertaken during field visits are also included in **Annex 3**.

415. This stakeholder consultation requires the analysis of stakeholders through the identification of the potential participants and the methods of their involvement. The table given below illustrates the concerned stakeholders of the proposed project that will have either primary or secondary.

Table 9-I:Stakeholder Analysis & Mapping

S.N.	Stakeholders	Primary ⁴	Secondary ⁵	Stakeholders 'Role or Interest	Level of Influence
1.	Government of Nepal		✓	It is the executive and central body.	High
2.	Ministry of Water Supply (MoWS)		✓	It is the lead executive agency and is responsible for policy coordination, guidance, review of programs, ensuring that all aspects relevant to achieve the objective of the project and for sustaining the improved services to the required level.	High
3.	ADB		✓	It supports government of Nepal in improving and enhancing the existing water supply service.	Medium
4.	Department of Water Supply and Sewerage Management		✓	It is the lead-implementing agency and works under MoWS with the responsibility of planning, implementation, operation, repair & maintenance of the proposed project.	High
5.	DWASH-CC		✓	It provides coordination in the preparation of local WASH plans with inputs from WASH sector actors and in the effective implementation of the local plans related to this project.	High

⁴ Primary Stakeholders: people, groups and institutions affected positively (beneficiaries) or negatively (involuntarily resettled) by the proposed program

⁵ Secondary Stakeholders: people, groups and institutions that are important intermediaries in the program delivery process

S.N.	Stakeholders	Primary ⁴	Secondary ⁵	Stakeholders 'Role or Interest	Level of Influence
5.	UWSSP, PMO, RPMO & DRTAC		✓	It is responsible in successfully implementing the proposed project activities, establishing coordination with ADB & GoN and managing day to day activities at municipality levels.	High
6.	Town Development Fund (TDF)		✓	TDF will assist the project municipality conducting financial appraisal of the proposed project and advice DWSSM on its outcomes prior to the start of detailed design process.	High
7.	Local Bodies (DCC, Municipality & Ward Offices)		✓	It is responsible for establishing coordination with the implementing agency. Here, the municipality will be also responsible for policy compliance as well as for addressing public protests if any.	High
8.	Community Forest User's Group		✓	It is responsible for establishing coordination with the contractor during construction works within the community forest area.	High
9.	Forest Security Personnel		✓	It is responsible for establishing coordination with the contractor during construction works and for establishing harmony between locals and construction workers within the community forest area.	High
10.	DSMC		✓	It will assist PMO & RPMO in the overall planning, implementation and monitoring of the project activities regarding environmental & social safeguards requirements.	High
11.	WUSC		✓	It is responsible for O & M of the proposed project. It will also facilitate the concerned authorities during planning as well as construction phase.	High
12.	Households (Families & Individuals)	✓		They are the main beneficiaries and are benefitted by the provision of adequate, safe, reliable & potable drinking water.	Low
13.	Contractors, Petty Contractors		✓	It is responsible for bidding for works and involved in the construction of the proposed project.	Low

S.N.	Stakeholders	Primary ⁴	Secondary ⁵	Stakeholders 'Role or Interest	Level of Influence
14.	Local Technicians/Plumbers	✓		This group will be benefitted through the increased work opportunities related to construction works of the proposed project.	Low
15.	Unemployed Locals	✓		This group will be benefitted through the increased work opportunities related to construction works of the proposed project.	Low
16.	Local Vendors	✓		This group will be affected by the pipe laying works at core bazaar areas interfering the access to their shops.	Low
17.	Schools & Hospitals	✓		This group will be benefitted by the provision of enhanced and improved continuous water supply service.	Low
18.	Commercial Establishments (Private Enterprises)	✓		This group is benefitted by enhancing their business by supplying items to the construction employees regarding their basic needs.	Low
19.	Scrap Vendors	✓		This group will be benefitted by purchasing the recyclable wastes generated from the construction activities as well as from workers camp.	Low
20.	Local Leaders		✓	This group will facilitate to establish strong coordination between the local people and the project authority.	High

Source: IEE Field Study 2018 and DEDR & DDR, 2019

416. The consultations were carried out on various dates at various locations within the project town for the discussion of the anticipated environmental impacts that may result from the construction of the proposed project. The consultations were undertaken with key stakeholders that includes Local Bodies, Beneficiaries Households, TDF, PMO, RPMO & DRTAC in line with ADB's requirements pertaining to environment and social considerations. The key concerns of the people related to the project that includes Implementation of the safeguard policy framework in field level, Delivering the information regarding safeguard activities to local level, Willingness to pay, 5% Upfront cash collection and People's participation in project implementation were discussed.

9.2 Major issues raised by the stakeholders

417. The major issues raised by the key stakeholders during stakeholder consultation are as follows:

- i. The project town is in need of safe, reliable and potable water.

- ii. Water shortage problem is acute in the project town during dry season.
- iii. People of the project town are relying on untreated water as the water through the existing water supply system is directly distributed in the town through small service reservoirs.
- iv. The operating system of the existing water supply system is good but the supply system is intermittent and there is no proper design of distribution system.
- v. The project should give priority to local people while hiring for the construction activities.
- vi. The project must consider solid waste management issues during construction period.
- vii. The proposed project must address the socioeconomic problems that may be observed during the construction period at Ilam Bazaar area like Traffic Congestion, Disruption to Local Vendors, Discomfort to the passerby, Noise Pollution, Air Pollution, Damage to the existing facilities etc.
- viii. The construction works within the community forest areas should not involve cutting trees as well as destruction of any kind of forest resources.

418. The assurance made by the study team regarding the issues raised by the stakeholders are as follows:

- i. The proposed project will address the water shortage problem faced by Panchkhal Municipality.
- ii. The proposed project has provision of water treatment system. This will resolve the problems of consumption of untreated water.
- iii. The proposed project has provision of continuous water supply system. This will end the irregular water supply service.
- iv. The proposed project with water treatment facility and continuous water supply provision if effectively implemented will address the needs of Panchkhal municipality residents regarding safe, reliable and potable water supply service.
- v. The socioeconomic problems raised by the stakeholders have been considered in IEE study and this IEE study has proposed mitigation measures for these issues. Accordingly, for ensuring the effective implementation of the proposed mitigation measures, EMP will be prepared and the contractor will be enforced to consider, follow and implement the EMP during construction.
- vi. The solid waste management plan will be prepared, followed and implemented during the construction phase of the project that includes Spoil Management & Disposal, Disposal of Dismantled Debris and Management of Construction Wastes & Solid Wastes.
- vii. Local workers of Panchkhal Municipality will be given priority for employment to the extent possible however; it requires strong coordination with the concerned contractor.

419. The project envisages that stakeholder consultations will continue during the project period and concerned stakeholders will be invited and encouraged to participate. The PMO and ICG will maintain rapport with WUSC and the municipality. PMO, ICG, Contractors, and WUSC will be open to the public to discuss concerning the progress of the subprojects, adverse impacts, mitigation measures and environmental monitoring and grievances. The stakeholder consultations in future will be as follows.

- i. During construction, if change in design, alignment, and location, the PMO and ICG will hold at least one public consultation to solicit perceived impacts, issues, concerns and recommendations from affected communities;
- ii. Before construction, the PMO and ICG will conduct an information, education and communication (IEC) campaign among the affected communities about the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the PMO and ICG, and status of compliance with the Government's environmental safeguard requirements. Billboards about the subproject, implementation schedule and contact details of the executing agency, PMO-ES, ICG-ESA and Contractors will be set up at strategic locations. The grievance redresses procedure and details will be posted at the offices of the ICG, WUSC and municipality;
- iii. During construction, regular random interviews will be conducted by the ICG-ESA every month to monitor environmental concerns of subproject communities;
- iv. During operation, periodic random interviews will be conducted by the ICG and WUSC to monitor the environmental concerns of subproject communities;
- v. The public consultations and information disclosure will be continuous throughout the project cycle. PMO and ICG will be responsible for designing and implementing such aspects on the ground.

420. The GoN-approved IEE Report (in English), will be available at the offices of PMO, ICG, and WUSC for the perusal of interested parties. Copies may be made available upon formal request. IEE and environmental monitoring reports will be disclosed on the ADB's and UWSSSP website. This will be also as a part of Information Disclosure.

10 GRIEVANCE REDRESS MECHANISM

10.1 Purpose of the Grievance Redress Mechanism

421. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate resolution of affected persons' concerns, complaints, and grievances related to social, environmental and other concerns on the project. The GRM will aim to provide a time-bound and transparent mechanism to resolve such concerns. The mechanism, developed in consultation with key stakeholders, will ensure that: (i) the basic rights and interests of every person adversely affected by the social and environmental performance of a Project are protected; and (ii) their concerns are effectively and timely addressed.

422. A common GRM will be in place for social, environmental or any other grievances related to the project. The GRM will provide an accessible forum for receiving and facilitating resolution of affected persons' grievances related to the project. Project will publish the sample grievance registration form on its website, and publish it in local language, at the hoarding board of each of the participating WUA or municipalities' office. Every grievance shall be registered with careful documentation of process adopted for each of the grievance handled, as explained below. The environmental and social safeguards officer (ESO/SSO) at the project management office (PMO) will have the overall responsibility for timely grievance redress on environmental and social safeguards issues. The Social Safeguards Officer at the Regional Project Management Office (RPMO) will be the focal person for facilitating the grievance redress at the local level.

423. A municipal-level public awareness campaign will be conducted on a regular basis as shown in the Communication & Public Participation Plan (CAPP) of the project to ensure awareness on the project and its GRM. The social and environmental safeguards experts of the PMQAC and RDSMCs will support the WUA or municipalities in conducting municipality-wide awareness campaigns, which will ensure that all stakeholders including poor and vulnerable are aware of the GRM and project's entitlements.

10.2 Proposed Set-Up

424. A Grievance Redress Committee (GRC) will be formed at the Municipality level, comprising the Mayor as Chairperson of GRC, and Regional Project Manager RPMO as Secretary. The GRC members will comprise of (1) WUSC Secretary; (2) RPMO Engineer; (3) RPMO social /environmental (as relevant) officer, (4) representative of affected persons, (5) RDSMC's safeguards specialist (social/environment as relevant), (6) a representative of reputable and relevant CBO/SHG/organization working in the project area as invitee⁶, and (7) contractor's representative. The secretary of the GRC will be responsible for convening timely meetings and maintaining minutes of meetings. The concerned social safeguards expert of RDSMC will support the RPMO safeguard's officer and Project Manager of RPMO to ensure that grievances, including those of the poor and vulnerable are addressed. All GRCs shall have at least two women committee members. Along with representatives of the APs, civil society and eminent citizens can be invited as observers in GRC meetings.

⁶ If the complaints are related with IP/Dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities shall be involved.

425. The functions of the local GRC are as follows: (i) provide support to affected persons on problems arising from environmental or social disruption; asset acquisition (if necessary); and eligibility for entitlements, compensation and assistance; (ii) record grievances of APs, categorize and prioritize them and provide solutions within 15 days of receipt of complaint by WUA or local bodies; and (iii) ensure feedback to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

426. The GRM procedure is depicted in **Figure 10-I**, and is outlined below in detail, with each step having time-bound schedules and responsible persons to address grievances and indicating appropriate persons whose advice is to be sought at each stage, as required:

- (i) First Level of GRM (WUA level): The first-level, which is also the most accessible and immediate venue for quick resolution of grievances will be the contractors, RDSMC field engineers and RPMO supervision personnel, who will immediately inform the WUA. Any person with a grievance related to the project works can contact UWSSP to file a complaint. The municipal-level field office of the RPMO, in WUA's building, will document the complaint within 24 hours of receipt of complaint in the field, and WUA or local bodies will immediately address and resolve the issue at field-level with the contractor, supervision personnel of RPMO and RDSMC field engineers within 5 days of receipt of a complaint/grievance. The assigned RDSMC's Social Mobilizer will be responsible to fully document: (i) name of the person, (ii) date of complaint received, (iii) nature of complaint, (iv) location and (v) how the complaint was resolved. If the complaint remains unresolved at the local level within 5 days, the WUA will forward the complaint to the municipality level GRM.
- (ii) Second Level of GRM (Municipality level): The complainant will be notified by the WUA that the grievance is forwarded to the Municipality-level GRC. The M level GRC will be called for a meeting, called and chaired by the Mayor. The GRC will recommend corrective measures at the field level and assign clear responsibilities for implementing its decision within 10 days of receipt of complaint by WUA. If the grievance remains unresolved within 10 days of receipt of complaint by WUA, the matter will be referred to the third level. The RPMO Engineer will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings, providing feedback to complainants and taking follow up actions so that formal orders are issued and decisions are carried out.
- (iii) Third Level of GRM (PMO Level): Any unresolved or major issues at Municipality level will be referred to the PMO for final solution. The PMO's Project Director (PD) will have special meeting to find solutions. Decision has to be made within 15 days of receipt of complaint by WUA. The PD will sign off on all grievances received by the PMO. The concerned Deputy Project Director (DPD) and environmental and social safeguards officers (ESO & SSO) of PMO will be involved with support from the PMQAC's social/environment safeguards experts. The SSO will be responsible to convey the final decision to the complainant.

427. The complainant will have to fill up Grievance Redress Form as shown in **Annex 2C** to file the complaint. All paperwork (details of grievances) needs to be completed by the

WUA member secretary assisted by RDSMC and circulated to the WUA Chairperson and members. At Municipality level, the RPMO Engineer will be responsible for circulation of grievances to the Regional Project Manager, DWSS, Mayor and other GRC members, prior to the scheduled meetings. The RPMO's Engineer will be responsible for follow-through of all escalated grievances. All decisions taken by the GRC will be communicated to the APs by the RPMO's SSO.

428. Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

429. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use ADB's Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB Nepal Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries (DMCs). The ADB's AM information will be included in UWSSP Information Datasheet (PID), to be published in web and distributed to the affected communities, as part of the project GRM.

430. This GRM procedure is briefly depicted in **Figure 10-I** given below:

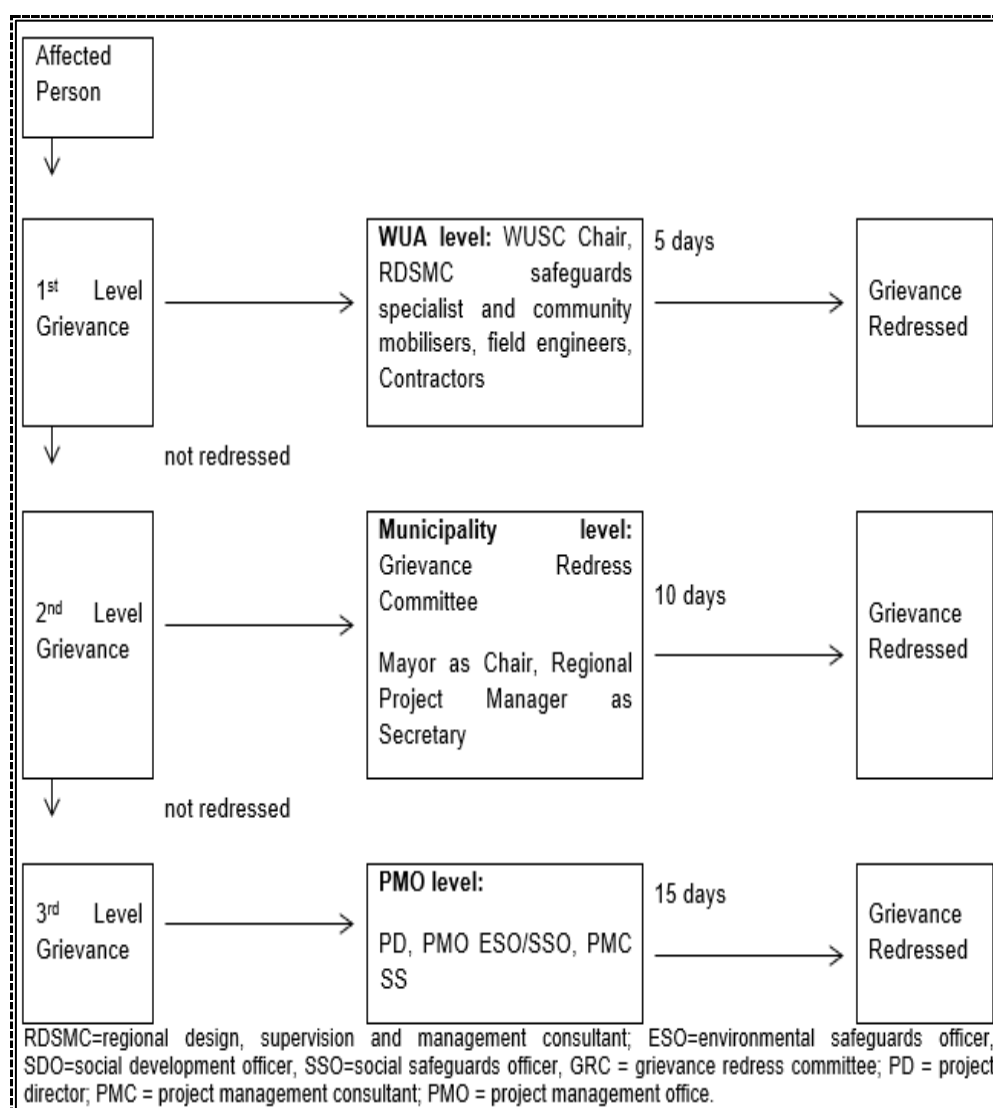


Figure 10-I: Grievance Redress Mechanism (Formal Approach)

11 ENVIRONMENTAL MANAGEMENT PLAN

11.1 Introduction

431. The purpose of the environmental management plan (EMP): is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assignment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impacts of the project and in enhancing beneficial impacts; and (iv) ensuring that safety recommendations are complied with.

432. A copy of EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

11.2 Institutional Arrangement

11.2.1 Executing and implementing agencies

433. The Ministry of Water Supply (MoWS) will be the executing agency with the responsibility of project execution delegated to the Department of Water Supply and Sewerage Management (DWSSM). Water User's and Sanitation Committees of the proposed towns are the implementing agencies.

434. The key responsibilities of the executing and implementing agencies are as follows:

a) *Prior to construction:*

- MoWS will deputize a qualified staff to act as the Environmental Safeguard Officer of the Project management office (PMO).
- MoWS will establish the grievance redress mechanism, including setting up the Grievance Redress Committee.
- The Water Supply and Environmental Division of the MoWS will be responsible for reviewing and approval of the IEE Report.
- DWSSM will review the IEE Report prepared by the Design, Supervision and Management Consultant Team's Environmental Safeguard Expert (DSMC-ESE) before forwarding this to MoWS.
- DWSSM will prepare the ToRs for the Environmental Safeguard Specialist that will engage to support PMO and for the Environmental Safeguard Specialists of the two Design, Supervision and Management Consultants that will be appointed to prepare the projects.

11.2.2 Safeguard Implementation Arrangement

435. **Project Management Office (PMO):** A project officer (Environment) will be engaged in PMO to ensure implementation of environmental safeguards. He/ she will be provided with necessary consultant support, and capacity development and training. The responsibilities of the Environment Officer are:

- (i) review and confirm existing IEEs and EMPs are updated based on detailed designs, that new IEEs/EMPs prepared by DSMCs comply to exclusion criteria and project selection guidelines as stipulated in the EARF and government rules; and recommend for approval to PMO;
- (ii) approve subproject environmental category;
- (iii) ensure that EMPs are included in bidding documents and civil works contracts;
- (iv) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by RPMOs and contractors;
- (v) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;
- (vi) facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant;
- (vii) supervise and provide guidance to the RPMOs to properly carry out the environmental monitoring and assessments as per the EARF;
- (viii) review, monitor and evaluate effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken;
- (ix) consolidate monthly environmental monitoring reports from RPMOs and submit semi-annual monitoring reports to ADB;
- (x) ensure timely disclosure of final IEEs/EMPs in project locations and in a form accessible to the public;
- (xi) address any grievances brought about through the Grievance Redress Mechanism (GRM) in a timely manner as per the IEEs;
- (xii) undertake regular review of safeguards-related loan covenants, and the compliance during program implementation; and
- (xiii) organize periodic capacity building and training programs on safeguards for project stakeholders, PMO, RPMOs, and WUAs.

436. **Regional Project Management Offices (Eastern and Western RPMOs):**The environmental officer assigned by DWSSM to the RPMOs will receive support from (i) the PMO environmental officer, (ii) environmental specialist from PMQAC; and (iii) the environmental specialist and EMP monitors of the regional DSMCs to carry out the following:

- (i) prepare new IEEs and EMPs in accordance with the EARF and government rules;
- (ii) include EMPs in bidding documents and civil works contracts;
- (iii) comply with all government rules and regulations;
- (iv) take necessary action for obtaining rights of way;
- (v) oversee implementation of EMPs including environmental monitoring by contractors;
- (vi) take corrective actions when necessary to ensure no environmental impacts;
- (vii) submit monthly environmental monitoring reports to PMO; and
- (viii) address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

437. **PMQAC:** The Project Management and Quality Assurance Consultants (PMQAC) will provide support to the PMO in the following areas:

- (i) ensure that the quality of the designs and construction of all water supply and sanitation components implemented under the project are to the required standards; and
- (ii) assist the PMO with the overall planning, implementation and monitoring of the project during all stages of implementation including adherence to all environmental and social safeguards' requirements.

438. **Regional DSMCs:** The RDSMCs will provide support to the RPMOs in the following areas:

- (i) prepare quality feasibility studies, detailed engineering designs, safeguards documents and bid documents
- (ii) provide effective construction supervision and contract management of all water supply and sanitation components implemented under the project in its region
- (iii) assist the RPMOs with the overall planning, implementation and monitoring of each subproject during all stages of implementation including adherence to all environmental and social safeguards requirements
- (iv) work closely with the Water User and Sanitation Committees (WUSCs), respective project municipalities and communities to ensure that the citizens are aware of project benefits and their responsibilities
- (v) ensure that poor and vulnerable groups will benefit equally from the project.

439. **Civil Works Contracts and Contractors:** The contractor will be required to designate an Environment, Health and Safety (EHS) supervisor to ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract. The contractor will be required to submit to RPMO, for review and approval, a site-specific environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per EMP; and (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP. The contractor will be required to undertake day to day monitoring and report to the respective RPMO and DSMC.

440. A copy of the EMP or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP or SEMP constitutes a failure in compliance and will require corrective actions. The EARF and IEEs specify responsibilities in EMP implementation during design, construction and O&M phases.

441. The PMO and RPMOs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the subproject sites."

442. **Capacity Building:** The PMQAC safeguards experts (environmental and social) will be responsible for training the (i) PMO's safeguards officers (environmental and social); (ii) RPMOs' engineers and social development officers. Training modules will need to cover

safeguards awareness and management in accordance with both ADB and government requirements as specified below:

- (i) Environmental Safeguards
 - (a) sensitization on ADB's policies and guidelines on environment;
 - (b) introduction to environment and environmental considerations in water supply and wastewater projects;
 - (c) review of IEEs and integration into the project detailed design;
 - (d) improved coordination within nodal departments; and
 - (e) monitoring and reporting system. The contractors will be required to conduct environmental awareness programs and orientation to the workers prior to deployment to work sites.
- (ii) Social Safeguards
 - (a) sensitization on ADB's policies on Involuntary Resettlement and Indigenous People;
 - (b) introduction to social safeguards assessment and document requirements;
 - (c) Consultation and participations requirements;
 - (d) Project GRM and ADB's Accountability Mechanism (AM); and
 - (e) monitoring and reporting system.

443. **Water Users and Sanitation Committees (WUSCs):** WUSCs are the eventual operators of the completed projects. The key tasks and responsibilities of the WUSCs are, but not limited to:

Before construction

- Facilitate public consultation and participation, information dissemination and social preparation.
- Provide available data to DSMC-ESS during the conduct of IEE
- Assist in securing the tree-cutting permit and/or registration of water source.
- Participate in the capacity development program.

During construction

- Assist in the observance of the grievance redress mechanism.
- Actively participate in the monitoring of Contractor's compliance with IEE and its EMP and the conditions set out with Government's approval of the IEE Reports.
- Facilitate public consultations, as necessary.

During operation

- Implement EMP and the Water Safety Plan.
- If applicable, actively work with the engaged licensed and accredited laboratory in water quality monitoring.
- Prepare the environmental monitoring report as per IEE.
- Ensure observance of the grievance redress mechanism.

444. **Licensed and accredited laboratory:** It is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring in the first few years of operation and to train the WUSC on the same. The laboratory will ensure that while carrying

out the water quality monitoring as prescribed in the National Drinking Water Quality Standard and its Directives, 'hands-on' training is provided to the WUSC.

11.3 Environmental Management Plan (EMP) Matrix

445. The table given below gives brief details on the Environmental Management plan (EMP) matrix that is to be implemented for the project implementation.

Table 11-I: Environmental Management Plan Matrix

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
A. Beneficial Impacts					
1. Impact on Socioeconomic Environment					
a) Construction Phase					
Income	Employment Generation	- Recommend contractor to employ local people by giving high priority to women and under privileged group as far as possible. - Ensure equity in provision of wages to both male as well as female labors.	DSMC, Contractor & WUSC	- Contractors' Workers Log Book - Number of local labors employed in project - Consultant Monitoring Report	During Construction Project
Personal Skills	Skill Enhancement	- Making a proper work plan and code of conduct during the construction period. - Provision of regular hands on training to the workers during the project construction period	DSMC, Contractor & WUSC	- Contractors Work Schedule - Hands on training Photographs - WUSC monitoring report	During Construction Project
Local trade & business opportunity	Enhanced Local trade & business opportunity	- Recommend contractor to give priority to the local products during procurement of construction of materials. - Priority also will be given to local services like grocery stores, tea shops, hotel & restaurants etc. during the entire construction period.	DSMC, Contractor & WUSC	- Contractors' Materials Log Book - WUSC monitoring report	During Construction Project
b) Operation Phase					
Health & Hygiene	Improved health & hygiene	Regular maintenance of the water supply components should be done so that the project operates smoothly and the benefits are intact	WUSC	- Number of Site Inspection Visits - Photographs of Inspection Visits - WUSC monitoring report	During O & M

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Economy	Increase Economic Opportunity	- Ensuring regular maintenance of the water supply components - Promoting urbanization through proper land development activities in the area	- WUSC - Local Authority	- Number of Site Inspection Visits - State of properly & legally planned land use	During O & M
Sustainability	Impacts on Sustainability of the system	- Preparation & Implementation of proper Utilities Business Plan in regard to the water tariffs to systematize the water tariff system of the proposed system. - Regular Collection of Water Tariffs as per plan prepared.	WUSC	- Utilities Business Plan - Records of Water Tariff Collection	During O & M
Social Status	Social Empowerment	- Prioritize the vulnerable groups in WUSC along with female groups. - Involving underprivileged group of people especially women and poor people in various capacity building programs and project related community meetings	WUSC	- Number of members of WUSC - Photographs of capacity building programs - Minutes of meetings	O & M phase
B. Adverse Impacts					
1. Impacts on Physical Environment					
a) Design Phase					
Topography/Geology	Soil Erosion & Slope Instability	- Incorporate measures and sites for handling excessive spoil materials - Incorporate drainage plan in final design	PMO, RPMO, & DSMC	- Spoil Management Plan - Final Design Documents	Before award of contract, During Detailed Design Phase
b) Construction Phase					
Topography/Geology	Erosion & Land Surface Disturbance	- Protecting the foundation from damage during backfilling - Using the right backfill materials - Compacting the backfills - Final finishing the subgrade to ensure that water drains away from the foundation	Contractor	- Contractor's Work Log Book - Field Photographs	Weekly Basis During Construction Phase
Spoil Management	Inappropriate disposal of spoils from the	- Follow Spoil Management Plan as included in Annex 2E. - Use of excess Spoil or Soil for filling depressed	Contractor	- Spoil Management Plan - Photographs - Location of Spoil	During Construction Phase

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	construction activities may result in gulying and erosion of spoil tips especially when it is combined with unmanaged surface water runoff.	areas or borrow pits wherever possible. • Appropriate disposal of Spoil at the designated places. • Spoils should not be disposed on natural drainage paths, canals and other infrastructures. • Provision of toe walls and retaining walls to protect the erosion of disposed spoils. • Provision of proper drainage, vegetation and adequate protection against erosion at the Spoil Disposal Site.		Disposal Site • Photographs	
Soil Fertility	Loss of Top Soil	• The measures to mitigate this impact can be adopted through timely and careful removal of the top soil followed by proper temporary storage at suitable location. The top soil then is reused in either preparing green spaces or others under suitable condition.	Contractor	• Field Photographs • Contractor's Work Log Book	Weekly Basis During Construction Phase
Air Quality	Air Pollution	• Strict Prohibition of open burning of solid waste	Contractor	Written Notice/Code of Conduct	During award of contract
				Visible Emission	Weekly Basis During Construction
		• Watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary;	Contractor	Number of complaints from sensitive receptors	
				Number of water Tank/s	Weekly Basis During Construction
				Capacity of Water Tank/s	
				Daily/Weekly Frequency/Timing of water spraying	
		• if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces;	Contractor	Locations of water spraying	
				Contractors' Materials Log Book of Materials to ensure the use of crushed gravel	Weekly Basis During Construction
		• Conduct Air Quality Test for dust nuisance (PM 10 and PM 2.5) at key settlement and market area, school, hospital at least once in a month during dry working season (Jan-June).	Contractor	• Air Quality Test Reports • Photographs	Monthly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Air Quality	Air Pollution	Use of Construction/ Transportation Vehicles complying with NVMES,2069	Contractor	Number and Types of vehicles in use Certified documents for each vehicle used	Weekly Basis During Construction
		Regular inspection & maintenance of construction/transportation vehicles	Consultant & Contractor	Contractor's/Consultant's log book of vehicle inspection & maintenance	Daily Basis/During Construction
		Supply of clean cooking fuel to workers instead of allowing them to use firewood for cooking.	Contractor	Written Notice/Code of Conduct	Prior to construction
				Type of fuel supplied to camps	Weekly Basis during construction
				Quantity of fuel supplied to camps	Weekly Basis during construction
Acoustic Environment	Noise Pollution	Restricting noisy activities to daytime and overtime work to avoid using noisy equipment;	Contractor	Written Notice	Prior to construction
		Prohibit the use of pressure horn by transportation vehicles	Contractor	Written Notice/Code of Conduct Number of vehicles fitted with pressure horns Maximum Sound Level of Pressure Horn	Daily Basis
		Conduct noise level test once a year during peak construction stage at location near school, hospital and settlements.	Contractor	- Noise Level Test Reports - Photographs	Yearly Basis
		Avoid noise generating activities like excavation works, dismantling for excavation works, loading & unloading of construction materials, noise of material transportation vehicles etc. during school time and at hospital area if any.	Contractor	- Number of complaints from the sensitive receptors - Contractor's Work Schedule	Monthly Basis
		Regular inspection & maintenance of construction/transportation vehicles to ensure the use of Vehicles complying with NVMES,2069 B.S.	Contractor	Contractor's/Consultant's log book of vehicle inspection & maintenance	Daily Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Regular inspection & maintenance to ensure the use of equipment/machinery that comply with applicable emission standards of GoN i.e., National Noise Standard Guidelines, 2012	Contractor	Contractor's/Consultant's log book of equipment/machinery inspection & maintenance	Daily Basis
		Regular inspection & maintenance to ensure the use of Diesel Generators complying with National Diesel Generator Emission Standard,2012	Contractor	Contractor's/Consultant's log book of equipment/machinery inspection & maintenance	Daily basis
Solid Waste	Haphazard Disposal of Wastes	a) Construction Wastes			
		Adopt 3R (Reduce,Reuse & Recycle) concept	Contractor	Daily/Weekly quantity/volume of reusable/recyclable SW collected	Daily basis
		Ensure storage areas are secure, safe & weatherproof.	Contractor	Locations of stockpiling sites	Daily basis
		Management of reusable wastes	Contractor	Number of cases of on-site reuses	Daily basis
		Sale of Recyclable wastes to scrap dealer	Contractor	- Daily/Weekly quantity/volume of such wastes sold to or given to scrap vendors - Frequency of sale to scrap vendors	Daily basis
		Final Disposal of Bio degradable solid wastes	Contractor	- Number/size of burial pits for final disposal of bio-degradable solid waste - Location of burial sites - Frequency of burials	Daily basis
		- Avoid over ordering of construction materials to the extent possible. This will be challenging, as it requires strong coordination with the concerned contractors, as it cannot be made mandatory. However, it is not impossible too to coordinate with the contractors in this regard. - Use standard size & quantity of construction materials.	Contractor	Contractor's log book of construction materials	Daily basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Construct garland drains to reduce the runoff from the stockpiles.	Contractor	- Location of construction sites - Photographs	Daily basis
Solid Waste	Haphazard Disposal of Wastes	b) Solid Wastes, Wastewater and Sewage from labour camp			
		Adopt Segregation of Solid Waste (3R Concept) based on being biodegradable or non-biodegradable. It is because decomposers cannot break down non-biodegradable wastes and their disposal poses a big problem.	Contractor	Number of Colored Bins to segregate wastes into biodegradable & non-biodegradable wastes	Daily basis during construction
		Manage biodegradable wastes that include food waste, paper waste, biodegradable plastic, etc. by any suitable processes that include Composting. If these two processes are not possible then, the wastes shall be managed either by handing over these wastes to the municipality waste collectors who will finally dispose those wastes to the landfill sites of the project town or by disposing those wastes to the burial pits at suitable place.	Contractor	- Daily/Weekly quantity/Volume of Biodegradable solid waste collected - Site Photographs - Contractor' Work Log Book	Daily basis during construction
		Non-biodegradable wastes like glass, plastics & metals shall be managed by reusing them for site use or selling them to scrap dealers instead of disposing them	Contractor	- Daily/Weekly quantity/volume of such wastes sold to or given to scrap vendors - Frequency of sale to scrap vendors/dealers	Daily basis during construction
		Strict Prohibition on open incineration of solid wastes & use of plastic materials to minimize the quantity of plastic wastes	Contractor	Written Notice	Prior to Construction & During Construction
		Construction of the temporary latrines with temporary soak pits & septic tanks within the campsite for proper disposal of sewage	Contractor	- Field Photographs - Contractor's Monthly Progress Report	Daily basis
		Provide temporary but proper drainage system for proper outlet of waste water generated from cooking practices adopted by the workers	Contractor	- Field Photographs - Contractor's Monthly Progress Report	Daily basis
		Employ local people from nearby villages to maximum extent possible. It will minimize the	Contractor	Contractor's Workers Log Book	Prior to the construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		number of workers residing at worker's camp. Lesser the number of people, lesser will be the solid waste & effluent generated. However, it cannot be made mandatory because availability of local people with required skills will not be ensured at the time of construction.			
Handling of Fuels/Chemicals	Accidental Leakage or Spillage of Stored Fuel/Chemicals	Provision of well managed storage site	Contractor	Location of storage site	Weekly Basis during construction
		Organize awareness programs for the workers responsible for handling fuel/chemicals	DSMC & Contractor	Records of awareness programs in the form of minutes, photographs	Prior to the construction
		Supervise workers to handle fuel/chemicals properly	DSMC & Supervisor of Contractor	Records of any accidental spillage/leakage	Daily Basis During Construction
		Use of spill kit materials to block flow and prevent discharge to nearby water bodies	Contractor	Contractor's log book of materials procured for construction	Weekly Basis During Construction
		Scatter the Sawdust, sand or dry soil over the area of spill and leave for few minutes to soak up the fuel/chemical. So, availability of saw dust, sand or dry soil should be ensured in the store	Contractor	Frequency of use of saw dust, sand or dry soil	Weekly Basis During Construction
		Regular Inspection Visit to the storage site to inspect the leakage of the stored container of fuel/chemical	DSMC & Contractor	- Number of Site Visits - Complaints of Leakage	Weekly Basis During Construction
Land Use Pattern	Change in land use pattern in haphazard manner	- Selection of barren and public land only for the construction of project components - Avoid the acquisition of private and agricultural land for the construction of project components. - Monitoring on the haphazard land use & planning by the concerned authority.	PMO & DSMC	- Details of land ownership - Monitoring Reports on Haphazard Land Use	During Detailed Design Phase
Drainage	Disruption to Natural Drainage	Avoid the natural drainage pathways for pipe laying works.	DSMC & Contractor	Pipe Layout plan	During Construction
		Stockpile the excavated materials at safe but nearby place.	DSMC & Contractor	Location of Spoil Disposal Sites	Daily Basis During Construction
		Restore natural drainage system if the drainage system during construction is blocked.	Contractor	Photographs of before and after restoration	Daily Basis During Construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Dismantled Debris	Haphazard Disposal of Dismantled Debris	• Immediate Response on handling of dismantled debris	Contractor	Number of complaints from the sensitive receptors	Daily Basis After Construction and Prior to Operation
		• Segregation of Dismantled Debris • Adopt 3R (Reduce, Reuse& Recycle) concept	Contractor	• Number of Colored Bins • Contractor's Work Log Book	Daily Basis
		• Sale of Recyclable Wastes to Scrap Vendors/Dealers	Contractor	• Quantity/Volume of such wastes sold to or given away to scrap vendors • Frequency of sale to scrap vendors	Daily Basis
c) Operation Phase					
Source Yield	Deficiency of water at the proposed source	• The impact comes out to be insignificant however, regular source yield monitoring is recommended.	WUSC	• Monitoring Report	Monthly Basis
2. Impacts on Biological Environment					
a) Construction Phase					
Flora & Fauna	Loss of vegetation, Loss of habitat of faunas	• Replace the excavated top soil to its original position after the completion of pipe laying work	Contractor	• Photographs of before and after the replacement of top soil • Contractor's Work Log Book	Daily Basis During Construction
		• Re-vegetating disturbed slopes and grounds, as applicable;	Contractor	• Photographs of revegetation of disturbed slopes and grounds • Contractor's Work Log Book	Weekly Basis During Construction
Flora & Fauna	Loss of vegetation, Loss of habitat of faunas	• Awareness programs regarding policy related to the conservation of existing flora & fauna, to the workers prior to the construction and the community during various meetings and discussion programs	PMO, DSMC & Contractor	Minutes & Photographs of Awareness Programs	Prior to Construction
		• Adopt the suitable mitigation measures proposed to minimize noise pollution as mentioned earlier	Contractor	• Written Notice • Contractor's Work Schedule	As mentioned earlier

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Regular Monitoring	DSMC & RPMO	- Contractor's Log Book - Number of Monitoring Visits	Daily Basis During Construction
Aquatic Life	Loss of habitat of aquatic life	Strict Monitoring on the daily activities of workers and Prohibition on disposal of wastes to the water bodies during construction works at source area.	Contractor & DSMC	- Location of Labor Camp Site - Photographs - Number of Complaints from the sensitive receptors - Number of Monitoring Visits - Monitoring Reports - Written Notice to prohibit disposal of wastes	Weekly Basis
		Provision of temporary but well-equipped toilets	Contractor & DSMC	- Location of these temporary facilities - Photographs of toilets constructed	Weekly Basis
		Restriction to workers from fishing	Contractor & DSMC	- Written Notice - Number of complaints from the sensitive receptor	Daily Basis During Construction
		Adopt measures mentioned above for the solid waste management	Contractor & DSMC	- Number of Colored Bins to segregate wastes Daily/Weekly - Quantity/Volume of Biodegradable solid waste collected	Daily Basis During Construction
Forest Fire	Impact on Flora & Fauna, Destruction of nutrients by the ashes, soil erosion	- Prohibition on burning dry grass or debris - Prohibition on camp fires & smoking within the forest area to the workers - Keeping firefighting equipment stand by within the construction sites; - Provision of safety trainings regarding forest fire to the construction workers prior to construction	Contractor & DSMC	- Written Notice right before the construction - Contractor's Log Book - Photographs of Safety Trainings	Daily Basis During Construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Forest Encroachment	Impact on Flora & Fauna	• Strict & Regular Monitoring during the entry of workers for the construction workers, • Mobilization of the concerned community forest groups, • Legal Provision along with imposing fines as punishment for those responsible for forest encroachment & • Provision of trainings to the construction workers to provide support in controlling encroachment	Contractor & DSMC	• Written Notice right before the construction • Contractor's Workers and Visitor's Log Book • Training Photographs	Daily Basis During Construction
b) Operation Phase					
Aquatic Life	Pollution of water bodies endangering aquatic lives	• Direct discharge of the raw sludge to the water bodies will be discouraged through strict monitoring to the operators involved.	WUSC	Number of complaints from the sensitive receptors	Weekly Basis
		• Proper Implementation of Water Safety Plan (WSP)	WUSC, DSMC & PMO	• WUSC Monitoring Reports • Water Safety Plan	Monthly Basis
3. Impacts on Chemical Environment					
a) Construction Stage					
Water Quality	Pollution on surface water sources by crossing of pipelines over water bodies, poorly managed construction sediments and other wastes, poor sanitation practices by workers	• Provision of Septage Disposal through construction of toilets with septic tanks	Contractor, DSMC	• Semi Annual Environmental Monitoring Report • Photographs of toilets constructed	Prior to Construction as well as During Construction
		• Disposing of spoils or excess soils as free filling materials as soon as possible	Contractor	• Spoil Management Plan • Location of Spoil Disposal Site	During Construction
		• Locating temporary storage areas on flat grounds and away from main surface drainage routes; • Shielding temporary storage areas with sandbags	Contractor	• Photographs of temporary storage areas	Monthly Basis
		• Adopt measures mentioned above for the solid waste management	Contractor	• Number of Colored Bins to segregate wastes	Daily Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
				• Daily/Weekly quantity/Volume of Biodegradable solid waste collected	
		• Provision of adequate water supply and sanitation facilities at work sites	Contractor	• Number of Complaints received from the workers • Number of Water Supplies to the workers	Weekly Basis
		• Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly.		• Number of supervisions • Reports on Supervision	Weekly Basis
b) Operation Stage					
Water Quality	Impact on Water Bodies	• Disposal of raw sludge to the appropriate landfill or burial sites of the proposed project town	WUSC O & M Team	• Frequency of Burials • Location of Burial Sites	During Cleaning of sedimentation tank
		• Use of raw sludge as compost for agricultural land	WUSC O & M Team	• Quantity/Volume of Raw Sludge Scraped from sedimentation tank	During Cleaning of sedimentation tank
		• Avoid direct discharge of the raw sludge to the water bodies through strict monitoring to the operators involved	WUSC O & M Team	• Written Notice	During Cleaning of sedimentation tank
		• Proper Implementation of Water Safety Plan (WSP)	WUSC O & M Team	WUSC Monitoring Reports	During entire operation phase, Monthly Basis
4.Impact on Socio-economic Environment					
a) Design Phase					
Structural Instability	Cracking of structure leads to facility failure and public discomfort due to construction of water supply components in high earthquake zones	• Proper Design of each & every component as per standard and code of practice.	PMO, RPMO & DSMC	Detailed Design Documents	During detailed design phase

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Health & Safety of Community & Workers	Lack of provision will have impact during construction	Training on Community Health & Safety Hazards by DSMC by disseminating information in regard to this through training manuals, photographs & documents related to safety.	PMO, RPMO & DSMC	Photographs & Minutes	During detailed design phase and Prior to Construction
Existing facilities	Disruption of services & False Claims by the People	- Coordinate with the concerned agencies to finalize the pipe network layout to avoid damage to the existing utilities. - Design & Locate pipelines away from existing utilities during design as far as possible. - Provide budget for restoration/replacement of damaged utilities. - Photographs of construction sites before and after the construction to avoid the false claims. - Prompt Reinstatement of paved as well as unpaved roads after completion of excavation works for pipe laying	DSMC, RPMO, PMO, Contractor	- List of affected utilities and operators; - Pipeline Layout Plan - Bid document - Photographs before and after the construction sites - Contractor's Work Log Book	During detailed design phase
b) Construction Phase					
Community Health & Safety	- Cross-cutting threats from construction's impacts on air and water quality, ambient noise level; mobility of people/goods/services; accesses to properties/economic activities/social services; service disruptions, etc. - Communicable and transmittable diseases may potentially be brought into the community by	Contractor's implementation of EMP	Contractor, RPMO, DSMC	EMP	During Construction Phase, Weekly Basis
		Adequate lighting, temporary fence, reflecting barriers and signage at active work sites;	Contractor	- Photographs depicting lighting, temporary fencing, reflecting barriers and signage facilities. - Quantity of lighting, temporary fence, reflecting barriers and signage	During Construction Phase, Monthly Basis
		Contractor's preparedness in emergency response;	Contractor	Emergency Response Plan	During Construction, Weekly Basis
		Adequate dissemination of GRM and Contractor's observance/implementation of GRM	Contractor	- Monthly Reports of GRC - Number of Grievance Redress Form received	During Construction, Monthly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	construction workers				
Workers Health & Safety	Risk to worker's health & safety	Submission of Simple OHS plan for employer's approval that involves appropriate health & safety arrangement that includes minimum requirements for various activities like Excavation works, Works within the confined spaces, Use of warning signs, boards & signage, Use of PPE, Accident & Emergency Response and Monitoring & Reporting.	Contractor	OHS Plan Submitted	Prior to the start of the construction
		- Comply Labor Act (1992) of GoN - Train all site personnel regarding environmental health and safety as like in design phase by DSMC & Contractors - Provide Personal Protective Equipment (PPEs) to workers that includes protective clothing, helmets, goggles and other equipments designed to protect the wearer's body from injury or infection and ensure their effective usage - Require workers to wear high visibility clothes	Contractor	- Site –Specific H&S plan - Record of H&S orientation training like Photographs & Minutes - Availability of personal protective equipment at construction site - Environmental Site Inspection Report	Visual inspection by RPMO (monthly) and DSMC-ESS on a weekly basis. Frequency and sampling sites to be finalized during detailed design and final location of project components
		Exclude public from worksites	Contractor	Contractor's Visitors' Log Book	Weekly Basis during construction
		Maintain accident reports and records.	Contractor	Number of accidents as per site records	Weekly Basis during construction
		Make first aid kits readily available	Contractor	Contractor's Health & Safety Log Book	Weekly Basis during construction
		- Provision of well equipped worker's camp and Maintain hygienic accommodation - Ensure uncontaminated water for drinking, cooking, and washing, - Assure clean eating areas - Make sure sanitation facilities are readily available - Provide adequate space and light to the camp site	Contractor	- Location of Worker's Camp Site - Number of Monitoring Visits - Number of Complaints from the workers	Monthly Basis during construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	Workers need to be mindful of the occupational hazards, which can arise from working at height and excavation works.	Adequate supply of potable water to the camps and good sanitation within camps	Contractor	- Number of water supplies - Number of complaints from the workers	Weekly Basis during construction
		Provide medical insurance coverage for workers	Contractor	Medical Insurance Documents	Prior to the construction
		- Provide orientation for guest visitors - Ensure that visitors do not enter hazard areas unescorted;	Contractor	- Record of Orientation training (Photographs & Minutes) - Contractor's Visitor's Log Book	Monthly Basis during construction
		- Ensure moving equipment is outfitted with audible backup alarms; - Hearing protection equipment enforced in noisy environment	Contractor	Contractor's Log Book of Machinery & Equipment	Weekly Basis during construction
		Chemical and Material storage areas need to be marked clearly	Contractor	Signage Board to make aware regarding Chemical Storage and Material Storage Area	Monthly Basis during construction
		Implementation of Emergency Preparedness Response Plan to mitigate the impacts of flooding problems that includes i) Reporting of Incidents; ii) Investigation of incidents and iii) Prepared for availability of Stretchers, Life buoys, first aiders, first aid kits etc.	Contractor	- Investigation Reports - Emergency Preparedness Response Plan - Contractor's Materials Log Book	Monthly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Traffic Congestion	Interference in the daily activities of people	- The trench for pipeline should not be abandoned and the contractor should be recommended to backfill the trench immediately. - The contractor will be accountable to provide signage at appropriate locations indicating available alternate access routes to minimize traffic disruptions. - The contractor will have to ensure access to shops and residences using simple wooden walkways. - Provision of alternative way for vehicular movement and pedestrians if possible - The contractor shall follow the Traffic Management Plan especially at Bazaar Areas especially Tamaghat Bazaar Area.	Contractor	- Number of Site Visit and Photographs of Sites - Traffic Management Plan	Daily Basis
Public Protests	Interruption in the construction activities	- Public Consultation should be carried out at various stages & locations as per requirement. - Implement Grievance Redress Mechanism - Pre-notify the public regarding the construction works that may hinder their daily activities and Coordinate with them properly	Contractor & DSMC	- Photographs - Minutes of Consultation Programs - Grievance Redress Mechanism Status - Written Notice or Miking	Prior to the construction
Local Vendor's Business	Discomfort to the customers to get access to the shops hampering the daily business activities	Adopt "zero soil" approach thorough prompt backfilling right after completion of drain construction. In general, execution of excavation works is such that excavation will be done in a few meters length i.e., 50m at a time followed by pipe laying, backfilling over the pipe and removal of all surplus material from the site.	Contractor	- Field Visits - Contractor's Work Schedule	Weekly Basis
		Provision of temporary access to the shops through provision of planks	Contractor	Photographs	Weekly Basis
		Pre-notify the vendors regarding the construction works that may hinder their daily activities and Coordinate with them properly	Contractor	Written Notice or Miking (Verbal Notice)	Prior to the construction
Deployment of	Deprivation of	As the Child Labor Prohibition Act, 2000 states that	Contractor &	Citizenship Certificate of	Prior to Construction

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Child Labor	Children's right to education, health, safety and moral development is deprived	"No Child having not attained the age of 14 years shall be engaged in works as a laborer" during mobilization, provision for the requirement of submission of the citizenship certificate of each labor, should be made.	PMO	the workers	
		During contract agreement, the agreement by the contractor to follow Child Labor Prohibition Act, 2000 and Child Labour Prohibition Rules & Regulations, 2006, should be made.	Contractor & PMO	Contract Document	During award of contract
Sustainability of Works	Damage to unsettled/unfinished /uncured and/or completed structures and affecting their structural integrity by seismic event if any	- After every seismic event, the contractor must conduct engineering investigation of built structures and implement the necessary corrective actions immediately - Avoid construction works during monsoons - Prepare & Follow Emergency Preparedness and Response Plan	Contractor	- Monthly Progress Report - Contractor's Log Book	Construction Phase
Existing Facilities	Damage to the existing utilities creating discomfort to the people	- Monitor construction workers to adopt carefulness and to strictly follow the layout drawings. - Reinstatement Works	Contractor, RPMO, DSMC	- Number of Complaints received at GRC - Pipeline Layout Plan - Contractor's Bill of Quantities - Photographs	During Construction Phase on Daily Basis
Health of Downstream Users	Health Hazards due to intake of contaminated water	- Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly. - Provision of temporary latrines with basic facilities	Contractor	- Photographs - Number of Complaints received from the downstream user's group	During Construction Phase on Daily Basis
c) Operation Phase					
Occupational Health & Safety	Worker's exposure to, and/or mishandling of chemicals and other hazardous substances	Installation of clear, visible signage in premises on safety measures	WUSC	- Number of Site Visits - Site Visit Reports - Photographs of location where signage are installed	Weekly Basis

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	es pose health and safety hazards.	Setting up a mechanism for the quick response to spills of chemical and hazardous substances.	WUSC	- Frequency of use of chemical & hazardous substances - Quantity of chemical/hazardous substances used for the proposed project	Monthly Basis
Drinking water supply	- Extraction of unsatisfactory raw water quality - Delivery of unsafe water to the distribution system - Inadequate protection of intake - Health Hazards arising from inadequate design of facilities for receiving, storing and handling of Cl & other chemicals	Ensure the correct operation of water treatment plant to meet satisfactory water quality	PMO & RPMO	WUSC Monitoring Reports	Monthly Basis during operation
		Provide Safe Storage for chemicals	Contractor	Location of Chemical Storage	Monthly Basis during operation
		Ventilation of "Housed" dosing unit for chlorine	Contractor, PMO & DSMC	- Detailed Design Drawings - Contractor' Working drawings & Photographs of Dosing Unit Constructed	During Construction
		Train operators for handling chlorine	RPMO, PMO & WUSC	Minutes & Photographs of Training	Prior to operation right after completion of construction
		Removal of Algae grown within the reservoir at regular intervals by the operating team deployed by the WUSC.	WUSC	Frequency of Algae Removal	Monthly Basis
		Monitoring & Proper Implementation of WSP.	WUSC	WUSC Monitoring Reports	Monthly Basis
Water Scarcity	Impacts on Downstream Users	The impact is found to be insignificant,however, regular source yield monitoring is recommended.	WUSC	Monthly Reports	Monthly Basis
Aesthetic appearance	Impact of Haphazard Disposal of Raw Sludge	Reuse & Recycling is the best suitable option to mitigate this impact. This raw sludge can be reused in various ways. This reuse is based on the type of constituent of the sludge. Like if the raw sludge constitutes major portion of soil particles, then it can be reused for the brick making process. If the raw sludge constitutes major portion of sand particles, it can be used in ceramic makings, manufacture of cement and	WUSC	WUSC Monitoring Reports	At each time of cleaning

Field	Impacts	Mitigations /Enhancement Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		other cementitious materials and also as a substitute to building materials.			
Non-Sustainability of Services or Completed Works	Disruption in water supply service by sudden seismic events or climate change droughts	WUSC should monitor yield closely especially in the dry season and during a climate-change-induced drought.	WUSC & the local body	- Number of Human Resources Mobilized for monitoring - Yield Monitoring Reports	During Dry Season and Immediate action during climate-change-induced drought.
		After every seismic event, WUSC should conduct engineering investigations of completed works and implement the necessary corrective actions without delay. This shall involve preparation of Emergency Preparedness & Response Plan and Immediate Implementation of this plan after any seismic event.	WUSC	WUSC Monitoring Reports	Immediate after any seismic event
		Strengthening Institutional Capacity and Policy Compliance through various project related capacity building programs	WUSC	- Photographs of capacity building programs - Minutes of such programs - WUSC Monitoring Report	During project construction and During initial stage of operation phase
		Carrying out regular O & M with effectiveness through proper management of WUSC.	WUSC	WUSC Monitoring Report	Right after the completion of project construction period

Source: IEE Field Study, 2018

11.4 Environmental Monitoring Program

446. Environmental monitoring will be done during construction at three levels:

- (i) Monitoring development of project performance indicators by the PMO-ESS;
- (ii) Monitoring implementation of mitigation measures by the Contractor; and
- (iii) Overall regulatory monitoring of environmental issues by PMO.

447. In addition to regular monitoring onsite (at town level) by the ICG and DSMC-ESS on the EMP implementation of the mitigation measures, monitoring of key environmental parameters is proposed. **Table 11-II** presents the indicative environmental monitoring plan for the project which includes relevant environmental parameters, with a description of the sampling stations, the frequency of monitoring, applicable standards, and responsible agencies.

Table 11-II: Environmental Monitoring Program

	Field	Stage	Parameters	• Location	Frequency	Standards	Responsibility
1.	Air quality	• Before construction to establish baseline • Construction phase	PM10 SO2 NOx	• Worksite locations • Along water transmission main 1-km interval from PTWs • Construction campsite locations	• 24-hour monitoring once in a season (except monsoons) for the construction period	• National Ambient Air Quality Standards, 2003	Contractor
2.	Noise and vibration levels	• Prior to construction to establish baseline • Construction phase	Equivalent day and night time noise levels	• PTWs location • Along water transmission main 1-km interval from PTWs • Construction campsite locations	• Once in a season (except monsoons) for the construction period	• National Noise Standard Guidelines, 2012	Contractor
3.	Water quality	• Prior to construction to establish baseline • Construction phase	TDS, TSS, pH, hardness, BOD, fecal coliform, total nitrogen, total phosphorus, heavy metals, temperature, DO, hydrocarbons, mineral oils, phenols, cyanide, temperature	• Adjacent to construction sites (to be identified by the (DRTAC or DSMC))	• Twice a year (pre-monsoon and post-monsoon) for the entire period of construction	• National Drinking Water Quality Standards, 2006	Contractor
4.	Survival rate of landsca	• O&M phase	Survival rate	• In the areas where re-plantation/	• Twice a year for 2 years	• None	WUSC

	Field	Stage	Parameters	• Location	Frequency	Standards	Responsibility
	ping, tree plantation			landscaping proposed			

Source: IEE Study 2018,019

11.5 Institutional Capacity Development Program

448. Considering the limited capability of the Project's key players in environmental management, technical assistance from environmental specialists and capacity development during loan implementation will be needed. Capacity development will consist of hands-on training in implementing the responsibilities in EMP (as well as in EARF) implementation, complemented with a short-term series of lectures/seminars on relevant topics.

449. WUSC cannot monitor the quality of supplied water as prescribed in NDWQS and its Directives. Although monitoring kits and laboratory rooms will be provided, this would not guarantee WUSC can handle monitoring appropriately. DWSSM has five regional laboratories; however, some are not functioning fully due to lack of human resources. Considering that public health is a critical concern associated with water supply, it is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring for at least the first 2-3 years of operation with WUSC actively participating in developing its capacity. Water quality monitoring should be carried out in such a way that WUSC will be "learning by doing." After the engagement period, there should be continuing periodic training of new persons to ensure that the capacity of WUSC is sustained. The cost for monitoring during operation is based on the assumption that a licensed laboratory will be engaged in both the monitoring requirements and to train WUSCs. A Water Safety Plan is included in the project design and will oblige the operator to carry out water quality monitoring accordingly. The amount of NPR 500,000 will be provided annually to implement the Plan. There will be sufficient fund to include training by the licensed and accredited laboratory while monitoring water quality.

450. The contractors will be required to conduct environmental awareness programs and orientation to the workers before deployment to the work site. The proposed training project along with the frequency of sessions is presented in Table 49. The Environmental Safeguard specialist & EMP Field Monitoring Staff are responsible for organizing different training programs for Environmental Management.

Table 11-III: Training Program for Environmental Management

Items	Pre-construction/prior to construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staff	Experiences and best practices sharing
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and GON and how the project will meet these requirements	To build the capacity of the staff for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and GON	To share the experiences and best practices aimed at learning

Items	Pre-construction/prior to construction	Construction	
			lessons and improving implementation of EMP
Contents	Module 1: Orientation • ADB Safeguards Policy Statement • Government of Nepal Environmental Laws and Regulations Module 2: Environmental Assessment Process • ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements • Review of environmental assessment report to comply with ADB requirements • Incorporation of EMP into the project design and contracts	• Roles and responsibilities of officials/contractors/consultants towards protection of the environment • Environmental issues during construction • Implementation of EMP • Monitoring of EMP implementation • Reporting requirements	Experiences on EMP implementation – issues and challenges Best practices followed
Duration	1 day	1 day	1 day on a regular period to be determined by PMO, ICGs, and (provide if DRTAC or DSMC)
Participants	Executing and implementing agencies, PMO, and PMO staff (technical and environmental) involved in the project implementation	PMO ICGs Contractors	PMO ICGs Contractors

Source: IEE Study, 2018

11.6 Staffing Requirement and Budget

451. Staffing requirement will include the: (i) deputizing a DWSSM or PMO staff as the PMO environmental safeguards officer; (ii) deputizing WSSDO staff as RPMOS environmental engineers in each subproject town; (iii) engagement of a PMO-environmental safeguards specialist to provide technical assistance and guidance to the PMO and partly to the RPMOS and capacity development/training; and (iv) a DSC environmental safeguards specialist to conduct the IEEs and prepare the IEE reports according to the provisions of this EARF.

452. The Costs required for implementing the EMP will cover the following activities:

- (i) Updating IEE, preparing and submitting reports and public consultation and disclosure;

- (ii) Application for environmental clearances; and
- (iii) Implementation of EMP, environmental monitoring program, and long-term surveys.

453. Environmental monitoring during construction will also be straightforward and will involve periodic site observations and interviews with workers and others, plus checks of reports and other documents. This will be conducted by PMO-ESS assisted by the PMO environmental safeguard officer. Therefore, no separate budget is required for PMO-ESS.

454. The cost of mitigation measures and surveys during the construction stage will be incorporated into the contractor's costs, which will be binding on him for implementation. The contractors will conduct the surveys.

455. The operation phase for mitigation measures are good operating practices to mitigate the environmental impacts of this phase & the responsibility remains to WUSC. WUSC will conduct all monitoring during the operation and maintenance phase. To ensure the delivery of safe drinking water from its catchment to the consumers, there is provision of Water Safety Plan (WSP) for the proposed project. If a licensed laboratory is engaged for the first 2-3 years of operation for training purposes, the cost can be accommodated under the Water Safety Plan. The cost of awareness program & WSP during the contract period is NRs. 500,000.00 under provisional sum.

456. The indicative costs of EMP implementation are shown in **Tables 11-IV**.

Table 11-IV: Indicative Cost of EMP Implementation

S. No.	Local Level Monitoring & Mitigation Measures	Mitigation & Monitoring Costs
A.	Local Level Monitoring Measures	
a)	Air quality Monitoring	200,000.00
b)	Noise levels Monitoring	50,000.00
c)	Water Quality Monitoring	50,000.00
B.	Mitigation Measures	
a)	Impacts on Physical Environment	
I.	During Construction Phase	
i.	Soil Erosion and Land Surface Disturbance	
	Proper Backfilling	No additional cost required, separately included under Miscellaneous Items
	Slope Protection Measures (Gabion Wall Construction, Retaining Wall etc.)	No additional cost required, separately included in Detailed Cost Estimate
ii.	Spoil Disposal	200,000.00
iii.	Loss of top Fertile Soil	No additional cost required
iv.	Air Pollution	
	Excavation Segmentation Plan	No additional cost required
	Watering of dry exposed surfaces and stockpiles of aggregates at least twice daily	
	Other mitigation measures as mentioned	No additional cost required
v.	Noise Pollution	No additional cost required
vi.	Generation of Construction Wastes & Solid Wastes	
	Waste Management	250,000.00
vii.	Accidental Leakage or Spillage of Stored Fuel/Chemicals	No additional cost required
viii.	Impact on Land Use Pattern	No additional cost required
ix.	Disruption to Natural Drainage	No additional cost required
x.	Haphazard Disposal of Dismantled Debris	
	Segregation, 3R Concept, Sale to Scrap Dealers	No additional cost required as it has already

S. No.	Local Level Monitoring & Mitigation Measures	Mitigation & Monitoring Costs
		been mentioned in v
xi.	Regular Source Yield Monitoring	No additional cost required; it is borne by WUSC itself
b)	Impacts on Biological Environment	
I.	Construction Phase	
i.	Impacts on Flora & Fauna	
	Awareness programs to the construction workers	No additional cost required
	Revegetating disturbed slopes & grounds	150,000.00
	Others as mentioned in Sub Section 8.1.2.1 a)	No additional cost required
ii.	Impacts on Aquatic Life	
	Strict Monitoring on the daily activities of workers	No additional cost required
	Provision of temporary but well-equipped toilets at worker's camp	350,000.00
	Solid Waste Management	No additional cost required as it has already been mentioned above in v.
II.	Operation Phase	
i.	Impacts on Aquatic Life	
	Proper Implementation of Sanitation Safety Plan	No additional cost required; it will be borne by WUSC
c)	Impacts on Chemical Environment	
I.	Construction Phase	
i.	Impacts on Water Quality of nearby rivers	
	Appropriate design of Septage Disposal with well-equipped temporary toilets	No Additional Cost Required as it has already been mentioned in
	Disposing of spoils or excess soils as free filling materials as soon as possible	No Additional Cost Required
	Locating temporary storage areas on flat grounds and away from main surface drainage routes	250,000.00
	Shielding temporary storage areas with sandbags	No Additional Cost Required
	Implementing eco-friendly solid and hazardous waste management, disposing them promptly	No Additional Cost Required as it has already been mentioned above in v.
	Providing adequate water supply and sanitation facilities at work sites.	No Additional Cost Required. It has to be managed by the contractor itself.
	Strict supervision on the behavior of workers for the waste management as well as sanitation behavior and monitoring the workers to manage the wastes properly	No Additional Cost Required
	Strict & Regular Monitoring during pipe laying works	No Additional Cost Required
d)	Impacts on Socioeconomic Environment	
I.	Design Phase	
i.	Structural Instability	No additional cost required
ii.	Health & Safety of Community & Workers	
	Training on Community Health & Safety Hazards by DSMC by disseminating information in regard to this through training manuals, photographs & documents related to safety	No additional cost required
ii.	Damage to the existing facilities	No additional cost required
II.	Construction Phase	
i.	Community Health & Safety Hazards	
	Contractor's implementation of EMP	No additional cost required
	Adequate lighting, temporary fence, reflecting barriers and signage at active work sites	300,000.00
	Contractor's preparedness in emergency response	300,000.00
	Adequate dissemination of GRM and Contractor's observance/implementation of GRM	No additional cost required
ii.	Worker's Health & Safety Hazards	
	Provision of PPE to workers	300,000.00
	Provision of Worker's Camp	350,000.00
	Other Mitigation measures	No Additional Cost Required

S. No.	Local Level Monitoring & Mitigation Measures	Mitigation & Monitoring Costs
iii.	Traffic Congestion	No Additional Cost Required
iv.	Public Protests	No Additional Cost Required
v.	Disruption to Local Vendor's Business	
	Prompt Backfilling	No Additional Cost Required
	Provision of Planks to provide access to shops & homes	50,000.00
vi.	Mobilization of Child Labor	No Additional Cost Required
vii.	Impact on Sustainability of Works	
	Engineering Investigations after any seismic event, if any	100,000.00
	Emergency Preparedness Response	No additional cost required as it has already been mentioned above in xii)
viii.	Damage to the existing facilities	
	Monitor construction workers to adopt carefulness and to strictly follow the layout drawings.	No Additional Cost Required
	Reinstatement Works of the damaged existing paved roads if any	No Additional Cost Required. Its cost is separately included in Cost Estimate.
III.	Operation Phase	
i.	Occupational Health & Safety Hazards	
	Installation of clear, visible signage	No additional cost required; it will be managed by WUSC itself
	Setting up of mechanism for quick response to spills of chemical and hazardous substances.	No additional cost required; it will be managed by WUSC itself
ii.	Complications in Water Distribution System	No additional cost required; it will be managed by WUSC itself
iii.	Impact on Consumer's Health	No additional cost required; it will be managed by WUSC itself
iv.	Impact on Downstream Users	No additional cost required; it will be managed by WUSC itself
v.	Non-sustainability of Services or Completed works	
	Source Yield Monitoring	No additional cost required; it will be managed by WUSC itself
	Engineering Investigations after every seismic event if any	No additional cost required; it will be managed by WUSC itself
	Preparation of Emergency Response Plan and Immediate implementation of this plan after any seismic event	100,000.00
	Strengthening Institutional Capacity and Policy Compliance through various project related capacity building programs	No additional cost required; it will be managed by WUSC itself
	Carrying out regular O & M with effectiveness through proper management of WUSC.	No additional cost required; it will be managed by WUSC itself
Total Cost of Local Level Monitoring & Mitigation Measures		3,000,000.00

Source: IEE Study 2018/019

457. Note: The breakdown cost is based on past similar project experience however independent cost may alter without altering the total cost.

458. The above given table shows that the total estimated cost for Local level Monitoring and Mitigation Measures i.e., the indicative cost for EMP implementation is 3,000,000.00. This has been included under provisional sum in General Works in BoQ that includes necessary environmental mitigation measures for the anticipated impacts during the entire construction period.

459. The environmental management will be implemented during the detailed design phase that will continue through the procurement, construction, and operation phases. **Table**

11-V & 11-VI presents the indicative timeframe of key EMP activities about project implementation schedule & the proposed topics for Capacity Building/Training respectively.

Table 11-V: Environmental Management Implementation Schedule

Activity		Indicative Time Frame
PROJECT IMPLEMENTATION		
	Detailed Design & Bidding Documents	Q2 Y0
	Procurement	Q3 Y0
	Construction	Q4 Y0 – Q4 Y2
	Contractor Operating Period	Q3 Y2 – Q4 Y3
	Handover to WUSC for Operation	Q3 Y3 – Q1 Y4
	Defects Liability Period	Q3 Y2 – Q4 Y4
ENVIRONMENTAL MANAGEMENT		
Overall		
1.	Design Review and Technical Audit Consultant (DRTAC)-Engagement of Environmental Specialist	Starting Q4 Y0 (5 yrs of intermittent inputs)
2.	PMO's submission of Environmental Monitoring Report (EMR)	
	- Monthly EMR for project's Monthly Progress Report	- 8 th day after effective month
	- Semi-Annual EMR during construction for submission to ADB	- 8 th day after effective 6-mo. period
	- Annual EMR for submission to ADB	- 8 th day after an effective year
Before Construction Mobilization		
1.	Finalization of EMP, (if applicable) revision of IEE	Q2 Y0
2.	ADB review & approval of revised IEE & EMP.	Q 2 Y0
3.	Obtaining Government's approval of IEE Report	Q2 Y0 – Q3 Y0
4.	Community preparation (including disclosure of Final IEE & its EMP)	Q4 Y0
5.	Establishment of baseline data (as set out in the EMP)	Q4 Y0 (shall have been done before award of contract)
6.	Preparation of C-EMP by selected Contractor, review of C-EMP	Q4 Y0, before Notice to Proceed is
	Against SPS-compliant EMP.	given
Construction Period		
Mobilization to Demobilization		
1.	Implementation of mitigation measures and conduct of environmental effects monitoring following the C-EMP.	Q4 Y0 – Q4 Y2
2.	Submission of Environmental Monitoring Report (EMR)	Q4 Y0 – Q4 Y2
	- Monthly, by Contractor	5 th day of the month following the effective month
	- Quarterly, by Contractor or by Licensed Laboratory	3 rd day of the month following the effective quarter
Operation Period (potentially could start even before DLP is over)		
1.	Implementation of mitigation measures & monitoring activities as specified in the EMP	Starting anytime between Q3 Y3 & Q1 Y4
2.	Submission of EMR	anytime between Q3 Y3 & Q1 Y4
	- Monthly, by Operator	5 th day of the month following

Activity			Indicative Time Frame
			the effective month
		Quarterly, by Operator or (if applicable) by Licensed Laboratory	3 rd day of the month following the effective quarter

Source: IEE Study 2018/019

Table 11-VI: Proposed Topics for Capacity Building/Training

Topic			Target Participants	Timing
1. By Environmental Specialists				
1.1	Legal Framework		DWSSM, PMO,	Early stage
	▪	Relevant national laws, regulations & standards on EA& management	WSSDO, ICG,	of Output 2
	▪	ADB SPS 2009	RMSO, WUSC (15-18)	
	▪	EA& review procedure under the Project		
1.2	Environmental Assessment			
	▪	Rapid environmental assessment		
	▪	Initial environmental examination		
1.3	Some Aspects of EA Process & Environmental Management			
	▪	Meaningful consultation & info disclosure		
	▪	Grievance redress mechanism		
	▪	Environmentally responsible procurement		
	▪	Occupational & community health and safety		
1.4	EMP Implementation, part 1		DWSSM, PMO,	Early stage
	▪	Institution arrangements & responsibilities	WSSDO, ICG,	of Output 2
	▪	Environmental quality monitoring	RMSO, WUSC,	
	▪	Emergency response	(15-18)	
1.5	EMP Implementation, part 2			
	▪	Performance monitoring & indicators		
	▪	Environmental monitoring report		
2. By External Experts				
2.1	Other relevant topics, such as:		MoWS, DWSSM,	During
A	Good engineering and construction practices as mitigation measures		PMO, ICG,	Project's
B	Climate change adaptation (applicable to eligible activities/works under the Project)		WSSDO, RMSO, DSMC(30)	CapacityDevt. Program
	B.1 Climate change impacts on infrastructure			
	B.2 Climate-proofing of infrastructure			
C	Strategic environmental assessment of WSS sector policy, development plans, and programs			
D	Other relevant topics that may be suggested by MoWS, DWSSM, PMO, ICG& WSSDO			

Source: IEE Study 2018/019

12. MONITORING AND REPORTING

460. RPMO is the main monitoring agency of the proposed project that will monitor and measure the progress of EMP implementation with assistance from DMSC. The monitoring activities will correspond with the project's risks and impacts, and will be identified in the IEEs for the subprojects. In addition to recording information on the work and deviation of work components from original scope, PMO, RPMOs & DSMC will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome. Along with this, Ministry of Water Supply (MoWS) as well as Ministry of Forests & Environment (MoFS) under Government of Nepal will also undertake monitoring process through random field visits to review the project performance.

461. RPMOs will submit monthly monitoring and implementation reports to PMO, who will take follow-up actions, if necessary. PMO will submit semi-annual monitoring reports to ADB. This report will be based on the Sample Semi-Annual Monitoring Report Template given in **Annex 2F** and Sample Environmental Site Inspection Report given in **Annex 2G**. The subproject budgets will reflect the costs of monitoring and reporting requirements.

462. For subprojects likely to have significant adverse environmental impacts, PMO will retain qualified and experienced external experts to verify its monitoring information. PMO environmental safeguard specialist will document monitoring results, identify the necessary corrective actions, reflect them in a corrective action plan, and for each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the PMO.

463. ADB will review project performance against the MoWS commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

- (i) conduct periodic site visits for projects with adverse environmental or social impacts;
- (ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
- (iii) review the periodic monitoring reports submitted by PMO to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
- (iv) work with PMO to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
- (v) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

13. CONCLUSION

464. The IEE study indicates that:

- The proposed project, its components, are not within or adjacent to environmentally sensitive areas.
- The proposed project will fulfill the increasing water demand of the project town regarding the reliable water supply system. It will definitely address the issues raised by the hardship that people of the project town are facing for safe, reliable & potable water for years.
- The proposed project will bring about: (i) the benefits of access to reliable supply of safe and potable water; (ii) promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts; and (iii) enhanced community health, improved quality of life and safe communities as outcomes.
- Along with positive outcomes, the proposed project will also have negative impacts as discussed above in Chapter VI. As per our IEE study, four of the adverse impacts that includes *Air Pollution, Noise Pollution, Impacts on Water Quality of nearby rivers and Impact on Sustainability of Works* are evaluated as “Very Significant”. However, these impacts would not be problematic for the project implementation if the activities that stimulate this impact to occur are properly controlled through the proposed mitigation measures.
- Some of the adverse impacts are also evaluated as *Significant*. However, these will not be sufficient to threaten or weaken the surrounding resources. Mitigation measures, integral to socially and environmentally responsible construction practices, will be commonly used at construction sites and the contractors will be aware about it. Hence, mitigation measures would not be difficult to implement.
- Similarly, Insignificant impacts can either be avoided or simply mitigated through the proposed mitigation measures.
- The environmental management plan (EMP) as mentioned above in *Chapter 11*, if duly considered, followed and implemented during project construction activities, then the environmental issues will not be issues to be worried about.
- If the responsible body mentioned in the EMP matrix shown in the **Table 11-1** properly takes up the responsibility for the implementation of mitigation measures for the likely impacts resulting from the various activities of the project, then, the environment of the project area will be safe and less affected from the project activities.
- Regular monitoring with good operation & maintenance service including prompt action on leaks and complying of the water supplied as prescribed in the National Drinking Water Quality Standards Directives will lessen the risks of the ineffective implementation of the proposed project and will sustain the system.
- Construction of public toilets within the project town will improve the public behaviour regarding safe & civilized sanitation practices. It aids in maintaining ODF status of the project town.

- None of the anticipated environmental impacts of the proposed project is significant enough to go for either detailed EIA study or further especial study.
- As per ADB Categorization, the proposed project falls under “Category B”. As per EPR 1997 (Latest Amendments 2017) Schedule H, this IEE study fulfills the requirements of IEE criteria. This IEE thus fulfills the policy requirements of both the ADB and the GoN. This indicates that IEE study is sufficient for the effective implementation of Panchkhal Water Supply & Sanitation Project.
- The IEE study shows that project benefits outweigh the risks and these potential risks can be overcome through proper planning and management.

465. Based on the above findings, the classification of the Panchkhal Water Supply and Sanitation Project as "Category B" is confirmed, no further special study or detailed EIA needs to be undertaken and people of Panchkhal Municipality will get rid of the hardship of safe, reliable & potable water they have been experiencing for decades.

14. LITERATURE REVIEWED

ADB, 2003. *Environmental Assessment Guidelines*.

ADB, 2009. *Safeguard Policy Statement*

Aquatic Animal Protection Act, 1961 with amendments. www.lawcommission.gov.np

ADB, 2010. *Handbook of Style and Usage*.

Constitution of Nepal (2015). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

District Health Profile, Kavre 2075/76

Environmental, Health and Safety (EHS) Guidelines (2007). International Finance Corporation, World Bank Group

Environment Protection Act, (1997). Ministry of Science, Technology and Environment Kathmandu

Environment Protection Rules, (1997), Ministry of Science, Technology, and Environment, Kathmandu

Environmental Standards and Collection of Concerned Informations, (2018). Ministry of Forests & Environment, Government of Nepal, Singhadurbar, Kathmandu

Environment Statistics of Nepal, CBS, 2011

Environmental Impact Assessment Guidelines, (1993). National Conservation Strategy Implementation Project, National Planning Commission, His Majesty's Government, Nepal

Final Feasibility Study of Panchkhal Water Supply and Sanitation Project, 2018

Detailed Engineering Design Report of Panchkhal Water Supply & Sanitation Project, 2019

Due Diligence Report of Panchkhal Water Supply & Sanitation Project, 2019

Environmental Assessment and Review Framework, (2017). Regional Urban Development Project (RUDP), Ministry of Urban Development (MoUD), Government of Nepal for ADB

Environmental Assessment and Review Framework, (2018). Urban Water Supply & Sanitation (Sector) Project, Ministry of Water Supply, Government of Nepal for ADB

Final Socio-Economic Profile of Panchkhal Water Supply & Sanitation Project, 2018

Forest Act, (1993). www.lawcommission.gov.np

Labor Act (1991), Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

Land Acquisition Act, 1977 and latest amendments. www.lawcommission.gov.np

Local Government Operation Act, (2017). www.lawcommission.gov.np

National Drinking Water Quality Standards and Implementation Directives for National Drinking Water Quality Standards (2005), Ministry of Physical Planning and Works, Government of Nepal

National Forest Policy, (2015). dof.gov.np

National Urban Policy (2007). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

National Urban Water Supply & Sanitation Sector Policy, Final Draft (2009). Ministry of Physical Planning & Works, Government of Nepal, Kathmandu

National Water Supply & Sanitation Policy (Draft) (2014). Ministry of Urban Development, Government of Nepal, Kathmandu

Nepal Disaster Management Reference Handbook (2017). Center for Excellence in Disaster Management and Humanitarian Assistance, <http://www.cfe-dmha.org>

Proximity Report Generated by the Integrated Biodiversity Assessment Tool (Panchkhal Town), (2018), ADB

Rural Water Supply and Sanitation National Policy, (2005) and Rural Water Supply and Sanitation National Strategy, (2005). Ministry of Physical Planning and Works, His Majesty's Government, Singhadurbar, Kathmandu, Nepal

Shrestha K 1998. Dictionary of Nepalese Plant names. Mandala Book Point, Kathmandu, Nepal.

Solid Waste Management Act (2011). Ministry of Science and Technology and Environment, Kathmandu

STATE of Nepal's FORESTS (2015). Ministry of Forests & Soil Conservation, Government of Nepal

The Updated Fifteen-Year Development Plan for Small Towns' Water Supply and Sanitation Sector, 2009

Town Development Act (1998), www.lawcommission.gov.np

Upreti, B.K (2003). Safeguard the Resources, Environmental Impact Assessment Process and Practice, Kathmandu

Urban Water Supply & Sanitation Policy (2009)

Water Resource Act (1992). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

<https://cites.org/eng/disc/what.php>

<https://www.cbd.int/>

www.mofald.gov.np

ANNEXES

ANNEX 1
APPROVED TERMS OF REFERENCE (ToR)



पत्र संख्या:- ०६६/६०
चलानी नं:- १९६

खानेपानी मन्त्रालय
सिंहदरबार, काठमाडौं



फोन नं.: ४२११६९३
फ्याक्स : ९७७-१-४२११४३३
सिंहदरबार,
काठमाडौं, नेपाल ।
मिति: २०७६।०७/२४

श्री खानेपानी तथा ढल व्यवस्थापन विभाग,
पानीपोखरी, काठमाडौं ।

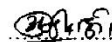
विषय: प्रारम्भिक वातावरणीय परीक्षण (IEE) को कार्यसूची (TOR) स्विकृति सम्बन्धमा ।

प्रस्तुत विषयमा तहां विभागबाट स्वीकृतीको लागि पेश भै आएको देहायको आयोजनाको प्रारम्भिक वातावरणीय परीक्षण (IEE) को कार्यसूची नेपाल सरकार (सचिबस्तर) को मिति २०७६/०७/१८ को निर्णयानुसार प्राप्त कार्य सूचीमा उल्लेख गरिएका Issue/Impact का अलावा प्रतिवेदन तयारीका समयमा अन्य Issue/Impact देखा परेमा सो पनि समावेश गर्नुपर्ने शर्तमा प्राप्त कार्यसूची वातावरण संरक्षण नियमावली २०५४ को नियम ५ बमोजिम स्वीकृत भएको व्यहोरा आदेशानुसार अनुरोध छ ।

आयोजनाहरू:

१. पाँचखाल सहरी खानेपानी तथा सरसफाइ आयोजना, काभ्रेपलाञ्चोक ।

(स्वीकृत प्रारम्भिक वातावरणीय परीक्षणको कार्यसूची प्रतिवेदन १ प्रति यसै साथ संलग्न छ ।)


अन्जना महर्जन
ईन्जिनियर

बोधार्थ :

✓ श्री सहरी खानेपानी तथा सरसफाइ (क्षेत्रगत) आयोजना, पानीपोखरी ।

Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage Management
Urban Water Supply and Sanitation (Sector) Project
PROJECT MANAGEMENT OFFICE
Panipokhari, Kathmandu

TERMS OF REFERENCE (ToR)
for
INITIAL ENVIRONMENTAL EXAMINATION
of
PANCHKHAL WATER SUPPLY AND SANITATION PROJECT
KAVREPALANCHOWK DISTRICT

Submitted To:	Submitted By:
Ministry of Water Supply, Singhadurbar, Kathmandu	Project Management Office, Urban Water Supply and Sanitation (Sector) Project, Department of Water Supply and Sewerage Management, Panipokhari, Kathmandu
Prepared by: TAEC Consult P. Ltd. – Integrated Consultants Nepal (P) Ltd. JV	

SEPTEMBER, 2019



[Handwritten signature]
[Faint text below signature]

ToR for IEE of Sunkoshi Panchkhal WSSP

List of Abbreviations

A.D.	Anno Domini
ADB	Asian Development Bank
B.S.	Bikram Sambat
BPT	Break Pressure Tank
CBD	Convention on Biological Diversity
CBS	Central Bureau of Statistics
c/c	Center to Center
CITES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
DC	Direct Current
DCC	District Coordination Committee
DEDR	Detailed Engineering Design Report
DHM	Department of Hydrology & Meteorology
DI	Ductile Iron
DL	Distribution Line
DMA	District Metered Area
DRTAC	Design Review & Technical Audit Consultant
DSMC	Design Supervision and Management Consultant
DWSSM	Department of Water Supply & Sewerage Management
EA	Executing Agency
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Act
EPR	Environmental Protection Rules
ESA	Environmental Safeguards Assistant
ESE	Environmental Safeguards Expert
FDB	Fund Development Board
FGD	Focus Group Discussion
GI	Galvanized Iron
GoN	Government of Nepal
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HHs	Households
HP	Horse Power
IA	Implementing Agency
IBAT	Integrated Biodiversity Assessment Tool
IC	Interruption Chamber
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICG	Implementation Core Group
IEE	Initial Environmental Examination
IO	International Organization
IUCN	International Union for Conservation of Nature
LC	Least Concern
MoWS	Ministry of Water Supply
NDWQS	National Drinking Water Quality Standard

ToR for IEE of Sunkoshi Panchkhal WSSP

NEA	Nepal Electricity Authority
NGO	Non-Governmental Organization
NRs.	Nepalese Rupees
O&M	Operation & Maintenance
OBA	Output-Based Aid
ODF	Open Defecation Free
PE	Polyethylene
PID	Proportional Integral Derivative
PLC	Programmable Logic Controller
PMO	Project Management Office
PN	Pressure Number
PPHA	Persons Per Hectare
QOL	Quality of Life
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RPMO	Regional Project Management Office
RVT	Reservoir Tank
SCADA	Supervisory Control and Data Acquisition
SPS	Safeguard Policy Statement
SSTWSSSP	Second Small Towns Water Supply and Sanitation Sector Project
STWSSSP	Small Towns' Water Supply & Sanitation Sector Project
TDF	Town Development Fund
TL	Transmission Line
ToR	Terms of Reference
UNICEF	United Nations International Children's Emergency Fund
UWSSSP	Urban Towns' Water Supply & Sanitation (Sector) Project
VDC	Village Development Committee
VU	Vulnerable
WSSDO	Water Supply and Sanitation Division
WSSP	Water Supply & Sanitation Project
WTP	Water Treatment Plant
WUA	Water Users' Association
WUSC	Water Users' & Sanitation Committee



ToR for IEE of Sunkoshi Panchkhal WSSP

WEIGHTS AND MEASURES

°C	Degree Celsius/Centigrade
%	Percentage
m ³	Cubic Meter
dia.	Diameter
HP	Horse Power
Kg/day	Kilogram per day
Kg/sq cm	Kilogram per square centimeter
km	Kilometer
kVA	Kilo Volt Ampere
lps	Liter per second
m	meter
mm	millimeter
nos	numbers
PPHA	Person per hectare
sq km.	Square Kilometer

ToR for IEE of Sunkoshi Panchkhal WSSP

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Name and Address of the Proponent.....	1
1.2 Consultant Preparing the Report.....	1
2 BACKGROUND AND DESCRIPTION OF THE PROJECT.....	2
2.1 Project Background.....	2
2.2 Relevancy of the Project.....	2
2.3 Objective of TOR.....	3
2.4 Objective of the IEE study.....	4
2.5 Description of the Project.....	4
2.5.1 Location and Accessibility of the Project Area.....	4
2.5.2 Water Supply Components.....	11
2.5.3 Sanitation Components.....	21
2.6 Proposed Service Area.....	22
2.7 Population and Demographic Characteristics.....	24
2.8 Settlement pattern.....	25
2.9 Ethnicity and caste.....	25
2.10 Education and Health.....	25
2.11 Waterborne and Communicable Diseases.....	26
2.12 Economic Activities.....	26
2.13 Income Level and Poverty Conditions.....	26
2.14 Existing Water Supply & Sanitation Situation.....	27
2.14.1 Existing Water Supply.....	27
2.14.2 Existing Sanitation Situation.....	29
2.15 Project Rationale.....	30
2.16 Willingness and Affordability to Pay.....	30
2.17 Water Tariff.....	30
2.18 Poverty Alleviation Aspects.....	31
2.19 Description of the Environment.....	31
2.20 Resettlement, Relocation and Compensation Issues.....	37
2.21 Project Impact Area.....	37
3 PROCEDURES TO BE ADOPTED FOR THE STUDY.....	38
3.1 Literature Review/Desk Study.....	38
3.2 Impact Area Delineation.....	38
3.3 Field Study.....	38
3.3.1 Physico-Chemical Environment.....	39
3.3.2 Biological Environment.....	39
3.3.3 Socio-Economic & Cultural Environment.....	39
3.4 Public Notice.....	40

ToR for IEE of Sunkoshi Panchkhal WSSP

3.5	Public Consultation	40
3.6	Collection of Muchulkas (Deed of Inquiry) and Recommendation Letters	40
3.7	Impact Identification, Prediction & Evaluation Methods	40
3.8	Report Preparation	41
4	POLICIES, LAWS, RULES, DIRECTIVES, AND GUIDELINES	42
5	REQUIRED TIME, ESTIMATED BUDGET AND SPECIALISTS REQUIRED FOR PREPARING THE REPORT ...	44
5.1	Time Schedule	44
5.2	Estimated Budget	44
5.3	Human Resources Required	44
6	ANTICIPATED IMPACTS OF THE PROPOSED PROJECT ON ENVIRONMENT	45
6.1	Beneficial Impacts	45
6.1.1	Impact on Socioeconomic Environment	45
6.2	Adverse Impacts	45
6.2.1	Impact on Physical Environment	45
6.2.2	Impact on Biological Environment	45
6.2.3	Impact on Chemical Environment	46
6.2.4	Impact on Socio-economic Environment	46
7	MATTERS CONCERNING THE PREVENTION & AUGMENTATION OF THE IMPACTS OF THE IMPLEMENTATION OF THE PROPOSAL ON THE ENVIRONMENT	47
8	ALTERNATIVE ANALYSIS	48
8.1	Alternative System Analysis	48
8.2	Alternative Assessment	48
8.2.1	System Alternative I	48
8.2.2	System Alternative II	49
8.2.3	Selected/Proposed Sub Project	49
9	MATTERS TO BE MONITORED WHILE IMPLEMENTING THE PROPOSAL	50
9.1	Environmental Management Plan	50
9.2	Environmental Monitoring Plan	50
9.3	Information Disclosure, Public Consultation, and Participation	51
9.4	Grievance Redress Mechanism	51
10	REPORT	53
11	OTHER NECESSARY MATTERS	57
12	LITERATURE REVIEWED	58

List of Annexes

- Annex I: ADB's REA Checklist, Environmental Checklists & Socioeconomic Questionnaires for IEE Study
- Annex II: Checklists for Baseline Information Collection & Sample Questionnaire for Socio-economic survey
- Annex III: Sample of EMP Matrix
- Annex IV: Photographs

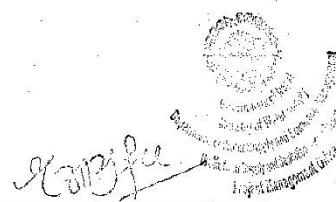
ToR for IEE of Sunkoshi Panchkhal WSSP

List of Tables

Table 1 : Criteria for requirement of IEE for Drinking water supply Projects	3
Table 2: Panchkhal Municipality Ward Profile	6
Table 3 : Salient Features of the Project	7
Table 4: Capacity and Number of Pump	13
Table 5: Transformer and Diesel Generator	14
Table 6: Population and Growth Rate	24
Table 7: Details of Newly Formed Panchkhal Municipality	24
Table 8: Distribution of Households and Population by Ethnic Composition	25
Table 9: Income Level of Households by Ward	26
Table 10: Coverage of sanitary facilities	29
Table 11: Existing solid waste management practices	30
Table 12: Tariff Band for Different Alternatives	31
Table 13: Monthly Tariff Structure	31
Table 14: Average Monthly Rainfall at Panchkhal (Station no. 1036)	32
Table 15: Average Monthly Temperature at Panchkhal (°C)	32
Table 16 : Major Plant Life Forms of the Project Area	32
Table 17: List of Mammals in the project area	33
Table 18: Bird Species in the project area	34
Table 19: List of Herpito-Fauna in the Project Area	35
Table 20: List of Fishes in the Project Area	36
Table 21: Scoring of Impacts	41
Table 22: Significance of Impacts	41
Table 23: Proposed Work Schedule	44

List of Figures

Figure 1: Location Map of the Project Area	5
Figure 2: District Metering Area (DMA) of the Proposed System	18
Figure 3: Proposed Service Area	23



ToR for IEE of Sunkoshi Panchkhal WSSP

1. INTRODUCTION

1.1 NAME AND ADDRESS OF THE PROPONENT

This Terms of Reference (TOR) has been prepared with reference to the Feasibility Study Report & Final Detailed Engineering Design Report to carry out the Initial Environmental Examination (IEE) of Sunkoshi Panchkhal Water Supply & Sanitation Project in Kavrepalanchowk District. TOR for this IEE study of this project is needed as a reference to EPR 1997 (amendments 2007 & 2017). Urban Water Supply and Sanitation (Sector) Project (UWSSSP) of the Government of Nepal, The Department of Water Supply and Sewerage Management (DWSSM) is the project proponent. The Ministry of Water Supply (MoWS) is the approval agency.

Name of the Proponent:

Project Management Office
Urban Water Supply and Sanitation (Sector) Project
Department of Water Supply and Sewerage Management

Address of the Proponent:

Panipokhari, Kathmandu
Tel: 977 1 442388, 977 1 4412348
Fax: 977 1 4413280
E-mail: info@uwsssp.gov.np
Website: www.uwsssp.gov.np

Name of the Approval Agency:

Ministry of Water Supply
Government of Nepal

1.2 CONSULTANT PREPARING THE REPORT

TAEC Consult P. Ltd. Joint Venture with Integrated Consultants Nepal Pvt. Ltd. is responsible for preparing this IEE report.

Address of the Consultant:

Shankhamul, Kathmandu
Tel: 977 1 5242846
Fax: 977 1 5242553
E-mail: taec@mos.com.np
Website: www.taecconsult.com.np



2 BACKGROUND AND DESCRIPTION OF THE PROJECT

2.1 Project Background

Prior to three projects (STWSSSP), (SSTWSSSP) & TSTWSSSP, currently, ADB and GoN are working together to provide water supply and sanitation services to selected urban municipalities of Nepal through Urban Water Supply Sanitation (Sector) Project (UWSSSP) in accordance with the updated 15-year Development Plan for Small Towns and the National Urban Development Strategy. The Project will support Nepal in expanding access to community managed water supply & sanitation in 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by ADB. UWSSSP will be implemented over a five-year period (indicative implementation period is 2018 to 2023) and will be supported through ADB financing using a sector lending approach. This project has the following outputs: i) Improved Water Supply and Sanitation Infrastructure in Project Municipalities and ii) Strengthened Institutional and Community Capacities.

Department of Water Supply and Sewerage Management (DWSSM) is the implementing agency whereas the Ministry of Water Supply is the executing agency. The project will assist in implementing a part of the 15-year Development Plan for Small Towns Water Supply and Sanitation Development in the country and about 20 Small Towns will be covered by this project.

In this context, the Eastern Regional Design Supervision and Management Consultants (ERDSMC), joint venture of TAEC Consultants P. Ltd. and Integrated Consultants Nepal (P.) Ltd. has been assigned to provide services on detailed design of seven towns namely, Birendranagar (Chitwan), Kathariya (Rauthat), Lalbandi (Sarlahi), Katari (Udaipur), Diktel (Khotang), Bhojpur Bazaar (Bhojpur) and Charikot (Dolakha) Town Projects. In addition, Ilam (Ilam), Brihat Bhanu (Tanahun), Sunkoshi Panchkhal (Kavre), Kanchanrup (Saptari), Rampurta (Okhaldhunga) and Deurali Hopse (Nawalpur) are assigned for the preparation of DEDR report.

The project has many stakeholders such as the WUSC, Project Management Office/ DWSSM, DRTAC, Town Development Fund (TDF), and Regional Design Supervision and Management Consultants (RDSMCs), RPMO. There is a need for effective co-ordination among the various stakeholders. In this context, the consulting team especially the major members of the Consultants' Team including the Team Leader, socio-economist and design engineer responsible for detailed design has been responsible for maintaining co-ordination with all the stakeholders involved in the project.

Both the GoN and ADB policies require that the environmental implications of individual developments needs to be taken into account in the planning and decision-making process, and that action is taken to reduce the adverse impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and Project development and implementation.

2.2 Relevancy of the Project

As per TOR issued to DSMC, it is stated that the Project needs to be studied from the environmental point of view as per EPA 1997 and EPR 1997 (Amendments 1999, 2007 & 2017). The proposed water supply and sanitation project is intended to serve the water demand of partial wards of 2, 3, 4, 6, 7, 8, 9, 10, 11 & 12 Panchkhal Municipality, Kavrepalanchowk District. It is expected that after the implementation of this project, the users of the area will be able to avail adequate amount of safe drinking water.

ToR for IEE of Sunkoshi Panchkhal WSSP

The project needs to go through the IEE process as stipulated in EPR 1997 (Amendments 1999, 2007 & 2017). The proposed project shall be using surface water sources. The Project does not involve the construction of any tunnels; relocation of people or households & there is no need to settle any households. The project is expected to benefit a design population of about 45,768 (2040).

As the proposed project falls within the definitions provided in the EPR 1997 (Amendments 1999, 2007 & 2017) Schedule 1 (Pertaining to Rule 3) (Clause H) for drinking water projects; only an IEE shall be necessary. The regulation stated in Schedule 1 (Clause H) shall only be applicable if the proposal does not fall under the category "A" through (Clause H) of Schedule 2. The following given table gives the brief details on fulfillment of the criteria for the requirement of IEE as per Schedule 1 (Pertaining to Rule 3) (Clause H) and Schedule 2 (Pertaining to Rule 3) (Clause H) of Environmental Protection Regulations 1997 with amendments 2017 by the proposed project.

Table 1 : Criteria for requirement of IEE for Drinking water supply Projects

Condition described in the Act and Regulations	Status for the proposed town project
Surface water sources with safe yield up to 1 cusec and utilizing up to 50% of the available quantity.	Not Applicable
Treatment process of water at the rate more than 25 liters per second.	The proposed project requires 103lps discharge for the treatment process.
Supply of drinking water to a population ranging between 10,000 and 100,000 upon connecting new sources.	Within the limit as the present population is 29,603 and the targeted population is 45,768 up to design year 2040.
Operation of a drinking water supply system with inclusion of sewage disposal system with sewage treatment system	Not Applicable. This will be covered in the sanitation master plan for the proposed town.
Operation of water supply project included in a multipurpose project utilizing a source of 25 liter per sec water.	Not Applicable as this is not a multipurpose project and is solely for water supply & sanitation.

2.3 Objective of TOR

The main objective of the TOR is to guide the subsequent IEE study and to produce a comprehensive and coherent IEE Report. It also ensures that the resulting IEE study will fulfill the environmental assessment requirements of the project. It means that ToR shall ensure that IEE is sufficient for the proposed project.

The specific objectives of ToR include;

- Delineates the scope of IEE study
- Serves as a standard document against which the subject matter covered by the IEE report will be evaluated.
- Describes the existing environment of the proposed project town
- Delineates the specific project activities to be undertaken

ToR for IEE of Sunkoshi Panchkhal WSSP

- Identifies the existing policies, plans, strategy, rules, acts and various legal frameworks related to the proposed project
- Sets out time frame, with the required human resources to carry out IEE study along with the required estimated budget
- Identifies and List out the anticipated environmental impacts that can be either adverse or beneficial
- Emphasizes the most significant aspects of the study

2.4 Objective of the IEE study

The main objectives of the TOR is to guide the subsequent IEE study, to produce a comprehensive and coherent IEE Report as per the Environmental Protection Act, 1997 and Environmental Protection Rules, 1997 (with amendments 2007 & 2017). The specific objectives of the proposed IEE study include:

- Identify the major issues that may arise as a result of proposed works on biophysical, socio-economic and cultural environment of the project area,
- Recommend practical and site-specific environmental mitigation and enhancement measures, prepare and implement environmental monitoring plan for the project,
- Provide information on the general environmental setting of the Panchkhal Town area as baseline data. Make sure that IEE is sufficient for the proposed water supply project.

2.5 Description of the Project

2.5.1 Location and Accessibility of the Project Area

The Project area of Sunkoshi Panchkhal Water Supply and Sanitation Project lies in Panchkhal Municipality, Kavrepalanchowk District, a hilly district in the Province 3 of Nepal. The municipality lies between 27° 39' 0" Latitude and 85° 37' 0" Longitude. The project town lies in the west from the proposed water source Sunkoshi river.

ToR for IEE of Sunkoshi Panchkhal WSSP

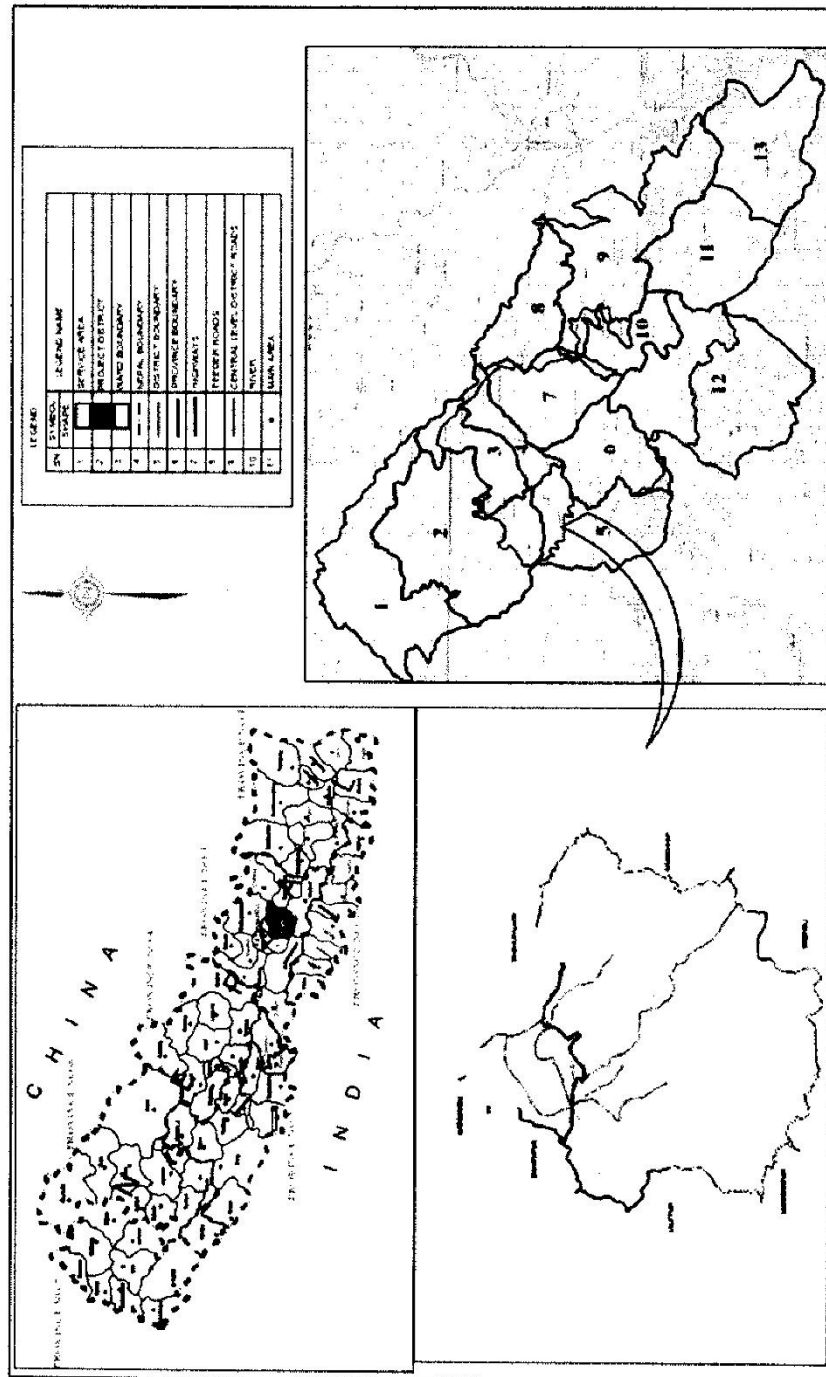


Figure 1: Location Map of the Project Area

TAEC-ICON JV

ToR for IEE of Sunkoshi Panchkhal WSSP

This **figure 1** given above shows that the project area belongs to Panchkhal Municipality of Kavrepalanchowk District of Province 3 of Nepal. The project town is bounded by Mandandeupur Municipality in the north, Bhumlu Rural Municipality in the east, Temal Rural Municipality in the south east, Namobuddha Municipality in the south and Dhulikhel Municipality in the west. The project area lies in the west from the proposed water source Sunkoshi River. Out of 13 wards of the project town, the proposed project area covers partial areas of wards 2,3,4,6,7,8,9,10,11 & 12.

The project town was declared as Municipality by the Government of Nepal, Ministry of Federal Affairs and Local Development from Council of Ministers on May 8, 2014. The Panchkhal Valley, intermontane basin developed in the southeast of the Kathmandu Valley is located within the eastern flank of a synclinalorium in Kavre District. At the time of the 2011 Nepal census, it had a population of 40061 & 8948 houses combining of the then VDC that were merged. The then VDC which were merged are Anaekot, Hokse Bazaar, Kharelthok, Koshidekha, Deubhumi Baluwa, Sathighar Bhagawati & Panchkhal forming agriculturally rich Panchkhal Municipality. Later, again this newly formed municipality is merged with other two VDCs namely Kharelthok VDC & Koshidekha VDC to form a new Panchkhal Municipality with total of 13 wards covering area of 103 sq. km. According to 2011 Nepal census, the total population of this Panchkhal municipality is 37,997. The following table gives brief details on the ward profile of Panchkhal Municipality:

Table 2: Panchkhal Municipality Ward Profile

Present Municipality	Ward	Former VDC/Municipality	Former Ward No.
	1	Panchkhal Municipality	WN 12 & 13
	2	Panchkhal Municipality	WN 14 & 15
	3	Panchkhal Municipality	WN 2
	4	Panchkhal Municipality	WN 3
	5	Panchkhal Municipality	WN 1
	6	Panchkhal Municipality	WN 4 & 5
	7	Panchkhal Municipality	WN 6
	8	Panchkhal Municipality	WN 7 & 8
	9	Panchkhal Municipality	WN 16 & 17
	10	Panchkhal Municipality	WN 11
	11	Kharelthok VDC	WN 1 to 9
	12	Panchkhal Municipality	WN 9 & 10
	13	Koshidekha VDC	WN 1-9

Source: Final District 1-75Corrected Last for Rajpatra (www.mofald.gov.np)

The **Table 2** shows that the reformed Panchkhal municipality has been divided into 13 wards. The current wards (1-10) of Panchkhal Municipality belong to wards (1-8) & (12-15) of former Panchkhal municipality. Similarly, the current ward 11 belong to ward 1 to 9 of former Kharelthok VDC, ward 12 belong to wards 9 & 10 of the former Panchkhal Municipality and ward 13 belong to wards 1 to 9 of former Koshidekha VDC.

The town is about 45km away towards east from capital city, Kathmandu. Panchkhal Bazaar, the project site is linked at Dhulikhel with Barhabise and Kathmandu along Arniko Highway.

ToR for IEE of Sunkoshi Panchkhal WSSP

The project has all-weather black topped road passes from the middle of the service. The internal road in the service are mostly gravel and earthen. A few kilometer road ie zero kilo to Palanchowk Bhagwati road has been black topped.

The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The mean monthly temperature is 24.9°C. The temperature ranges from 11.66°C to 24.9°C. The average mean annual rainfall is 1020 mm, which is slightly less than 1400 mm, the average precipitation of Nepal.

Hokse Bazaar, Zero Km, Anaekot, Deubhumi Baluwa, Sathighar Bhagwati are the local market centers in this area. This project town is famous for vegetables. The main cash crop of Panchkhal is Potato, Tomato, Chilly, Beans, Cauliflower, Paddy and other seasonal vegetables and food crops are Maize, Wheat etc.

The salient features of the project area is briefly included in the table given below.

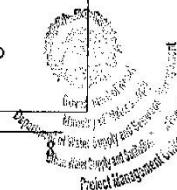
Table 3 : Salient Features of the Project

SN.	Items	Description
1	Name of Project	Panchkhal Water Supply and Sanitation Project
2	Type	- Pumping System: Stage 1(Sump Well) to WTP site, WTP site to RVT 10 and to Backwash RVT - Gravity System: From WTP site to RVT 1 to RVT 9 and Distribution System - Gravity System: From Backwash RVT to RVT 11 Kharelthok RVT
3	Study Level	Final Detailed Engineering Design
4	Location Area	
	Province	3
	District	Kavrepalanchowk
	Rural Municipality/Municipality	Panchkhal Municipality
	Service Area Ward and settlement	Panchkhal Municipality: Ward no 2: Tinkune, Bagaladihi, Dwardihi, Majhdihi, Takedihi, Ratopahiro Ward no 3: Lamidihi, Jantadihi, Kaplidihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok Ward no 4: Zero Kilo, Lamidanda, Panchkhal, Purano Bazaar, Tamaghat Ward no 6: Dulalthok, Bakhreldihi, Tinpipe Bazar, Ekatabasti, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi Ward no 7: Sigrampati, Shikharpur, Jorpiple Ward no 8: Khattar, Padalla, Simradi, Kharani (Madi Gau) Ward no 9: Bhimsenthan, Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun

ToR for IEE of Sunkoshi Panchkhal WSSP

SN.	Items	Description
		Ward no 10: Nayagau, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar Ward no 11: Luitelgaun, Devbhumi, Ojhatar, Karketar, Kharelthok, Jaretar, Bakultar, Ranipani, Serabesi, Ward no 12: Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote, Tinghare, Nagbeli, Aapghari.
5	Available Facilities	
	Road	Arniko Highway (Dhulikhel – Panchkhal- Dolaighat-Barahabise)
	Water Supply System	WUSCs
	Electricity	Available
	Communication	Available
	Health Services	Available
	Banking Facilities	Available
6	Social Status	
	Present HHs Numbers (2018)	5,998
	Present Population (2018)	29,603
	Base Year Population (2021)	31,415
	Design Year Population (2040)	45,768
	Average HHS size	4.94
	Population Growth Rate % (PGR)	2.00
	Projected HHs in Design Year (based on GR)	9,273
7	Water Demand (MLD)	
	Base Year (2021)	3.97 (3, 973,998 ltr per day)
	Design Year (2040)	5.79 (5,789,652 ltr per day)
8	Source Characteristics	
	Source Name	Sunkoshi River (Seepage Water after Infiltration Gallery)
	Source Type	Snow fed Perennial River (Seepage Water)
	Source Location	WN - 10 of Bhumlu Rural Municipality (At boundary of Panchkhal Municipality, Bimire Dobhan about 2.5km downstream of Dolaighat Bazaar (i.e., 2km downstream from the confluence of Indrawati and Sunkoshi river))
	Discharge to be tapped (lps)	84.00 (including filter backwash and 20 hr pumping daily)
8	Type of Structures	
	Proposed intakes	1 set (2 sump well/ intakes with 4 collectors) at Sunkoshi river right bank (WN - 10 of Bhumlu Rural Municipality)
	Water treatment plant	Rapid mixture followed by flocculator followed by sedimentation tank followed by rapid sand filter then disinfection. Total Capacity for 84 lps, at WTP location beside transformer about 200m downstream of Bhimsenthan.
	Pumping Details	All pumps run at a time: Stage 1/ Sumpwell: 4 nos-85HP, Transformer 500KVA, Generator 2 nos. 160 kVA (for arty two pumps)-WN 10 of Bhumi Rural Municipality Stage 2: 4 nos. 85HP, Transformer 500 kVA,

TAEC-ICON JV



ToR for IEE of Sunkoshi Panchkhal WSSP

SN.	Items	Description
		Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 3: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 10 of Bhumlu Rural Municipality Stage 4: 4 nos. 85 HP, Transformer 500 kVA, Generator 2 nos. 160 kVA (for any two pumps)-WN 9 of Panchkhal Municipality Stage 5 (WTP site): 2no each 20HP (only one run at a time) for RVT-10 and 2 no each 5HP (only one run at a time) for backwash cum Kharelthok (RVT-11) supply-WN 9 of Panchkhal Municipality
	Ground Reservoir (No and Capacity in CUM)	From Sump Well to WTP site: • 1No-150m³ at each 2nd, 3rd & 4th stage of pumping; • 1no @400 m³ at WTP site • Location: WN 10 of Bhumlu Rural Municipality from Stage 1 to 3 and WN 9 of Panchkhal Municipality for Stage 4 & WTP Site Service Reservoir RVT 1: 150 m³ capacity (WN-3 of Panchkhal Municipality, Thumka Upstream) RVT 2: 150 m³ capacity (WN-2 of Panchkhal Municipality, Anekot) RVT 3: 150 m³ capacity (WN-5 of Panchkhal Municipality, Sashastra) RVT 4: 150 m³ capacity (WN-6 of Panchkhal Municipality, Bakhreldihi) RVT 5: 100 m³ capacity (WN-12 of Panchkhal Municipality, Radhakrishna School) RVT 6: 100 m³ capacity (WN-12 of Panchkhal Municipality, Nayagaun) RVT 7: 150 m³ capacity (WN-10 of Panchkhal Municipality, Jaretar) RVT 8: 150 m³ capacity (WN-7 of Panchkhal Municipality, Shikharpur) RVT 9: 50 m³ capacity (WN-9 of Panchkhal Municipality, Bhetwalthok-9N-29) RVT 10: 100 m³ capacity (WN-9 of Panchkhal Municipality, Palanchowk Bhagwati) RVT 11: 50 m³ capacity (WN-9 of Panchkhal Municipality, Kharelthok) Backwash RVT RVT 12: 150 m³ capacity (WN-9 of Panchkhal Municipality, Tapaldanda) Total storage capacity: 2,300 m³
	Pumping Chamber/Sump for pumping	• 3 Compartments at Stage 2 & 3-WN 10 of Bhumlu Rural Municipality • 3 Compartments at Stage 4-WN 9 of Panchkhal Municipality • 2 Compartments at Stage 5 (WTP Site)-WN 9 of Panchkhal Municipality
	Valve Chamber (Bricks/ RCC)	36 Nos
	Pipe valve box	179 Nos
	IC/BPT	6 nos (1 at branch transmission of 50cum, 10cum)

ToR for IEE of Sunkoshi Panchkhal WSSP

SN.	Items	Description
		each at RVT-9 distribution system (1no), RVT-10 distribution system (2nos) and t Kharelthowk distribution system (2nos).
	Office Cum GH (O1) /Guard House (G 1) / Small Guard House (G2) /Dosing House (DS), Generator House, Boundary wall	At Sump Well (1st stage site): Small Guardhouse G1-1no; Generator house (140kVA) -1no; Boundary wall Stage 2,3 & 4 sites: Small Guardhouse G1 -3nos; Generator house (140 kVA) -3nos; Boundary wall At WTP Site (5th stage site): Medium Guard house G2-1no; Generator house (50kVA)-1no; Dosing Pump House-1no; Boundary wall & Retaining Wall At Backwash Reservoir Site: Small Guardhouse G1 – 1no; Boundary wall At service reservoir site: Small Guardhouse G1 – 11nos; Boundary wall Within Service Area (Panchkhal Bazaar Area): Office building O1-1no; Boundary Wall
	Fire Hydrant (m)	20
	River crossing (Nos)	12
	Length of Main Transmission	9135.00m
	Length of Branch Transmission Main (from WTP/ storage to RVT 1 to RVT 9 (Gravity), Backwash RVT (Pumping) (Filter Backwash and to supply water to Kharelthok RVT-11 by gravity), RVT-10 (Pumping)	37,237.00m
	Length of Distribution Mains	189,309.00m
	Number of DMAs	11 Nos
	Number of HH connection	5,998
	Number of connections for institution	39
9	Total Cost of WS Component (Inclusive of all) NRs.	1,966,259,486.67
10	Cost Sharing Arrangement (NRs)	
	GON Component (70 %)	1,376,381,640.67
	TDF Loan (25 %)	491,564,871.67
11	WUSC's upfront (Cash contribution 5%)	98,312,974.33
12	Tariff	
	Up to 6 cum/monthly (NRs)	60.00
	7 to 10 cum/monthly (NRs)	70.00
	11 to 15cum/monthly (NRs)	80.00
	16 to 25 cum/monthly (NRs)	90.00
	Institutional	120.00
	Weighted av. Tariff (NRs. /cum)	83.25
13	Financial Indicators	

ToR for IEE of Sunkoshi Panchkhal WSSP

SN.	Items	Description
	EIRR (Base case), %	18.34
	FIRR (Base case), %	14.75
	AIFC (Base case), NRs per cum	72.35
	AIEC (Base case), NRs per cum	77.34
14	Environment	
	ADB Category	B, Only IEE necessary
	IEE finding	No significant adverse impacts
15	Per Capita Cost for W/S component	
	Per Capita Cost (for base year pop.), NRs	62,589.83
	Per Capita Cost (for design year pop.), NRs	42,961.45
16	Total cost of Sanitation Component (including all), NRs	8,528,288.39
	GON Component (85 %)	7,249,045.13
	Local Authority (15 %)	1,279,243.26
17	Total cost of Water Supply and Sanitation Component, NRs	1,974,787,775.06

Source: Final DEDR, 2019

2.5.2 Water Supply Components

The proposed sub-project is completely a new system. It comprises of both pumping system and gravity system. Firstly, water will be pumped from the proposed sump well at the proposed river bank to the proposed water treatment plant site with five stage pumping. After this, some quantity of water will be pumped towards Palanchowk Bhagawati RVT. The remaining water from WTP site will be supplied to other ten reservoirs through gravity system.

The required flow for the proposed water will be drawn from the seepage of Sunkoshi River by pumping with double pipes and will be supplied to the distribution system by the proposed eleven RVTs.

The following sections describe the proposed sub project components.

i) Source/Intakes

Regarding the water sources, the team had discussed with the WUSC members, local bodies, concerned beneficiaries and key personnel of the project area. As per the information given by the community people during mass meeting, there is only one reliable source available in the area that is not other than Sunkoshi River. The existing source will be used as it is but they are not considered for the new system. Sunkoshi river surface water source is used in the new system. They are demanding to use Sunkoshi river surface water source rather than using small stream water source available in the vicinity of the service area. The DSMC team had closely monitored and verified the use of sources in the project area during the survey period for preparation of the inception report. This has been continued during FSR report and

ToR for IEE of Sunkoshi Panchkhal WSSP

DEDR phase. The yields of these sources are much more than required, so population of the project area become benefited to use water for longer time.

The source Sunkoshi river has plenty of water. The seepage water of the river will be tapped through the construction of Infiltration Gallery. The proposed intake site is located at the right bank of Sunkoshi river at Bimiredobhan, which is about 2.5 km downstream of Dolaighat Bazaar (i.e. 2 km downstream of the confluence of Sunkoshi and Indrawati).

The exact location of sump well and collectors will be finalized during implementation after test drilling at site. If the soil starts at the proposed site has layer of rock, the location will be shifted or altered nearby proposed location. Based on the drilling, the collector and sump well site will be finalized with minor modification in design, if necessary. There are two sump wells designed in the system. Each sump well will have two collector wells. The collector well as well as sump well will collect water at the sump well and the water will be pumped. The perforated pipes are designed to flow the water from the filter media to collectors and sump well. The retaining wall at the hill side and river side have been designed to protect the structures. The river side RCC retaining wall will be constructed to prevent the flood into the intake site. It is envisaged that each sump well will collect water more than 42 lps. Accordingly, the perforated pipes are arranged considering the possibility of clogging of perforation in pipes.

The system will be pumping system. First of all, water will be pumped from sumpwell (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head about 210m to 220m at each stage to reach the water at treatment plant at an elevation 1,337.50m. The water treatment plant is located at about 250m downstream of Bhimsenthan Mandir beside existing NEA transformer. After treatment, the clear water will be stored at 400cum ground storage reservoir. Small individual pumps are used to pump the required quantity of water towards Palanchowk Bhagwati RVT-10 and filter backwash RVT-12. Another major pipe line goes to the nine reservoirs by gravity system. Filter backwash reservoir will supply water to Kharelthok RVT-11 and back wash of filter by gravity.

The perforated lateral pipes are connected at collector and sump well and extended to wards the river. Each collector will have 7 m long 20 numbers and sump will have 16 numbers pipe of perforated top half dia. of 140mm dia PE100-PN10 pipe. The perforation 7mm has been provided 25% opening on top half dia of pipe sloping 1% towards collector/ sump well. The pipes covered with layers of filter material.

Likewise, arrangement has been made to supply water directly from Sunkoshi river to the collector/ sumpwell, if infiltrated water into sumpwell will not meet the required demand. Also two sump well are connected each other to allow the water from each other.

Water pumping required from each sump well is 42 lps. Each sump well shall have two pumps and both will be operated at a time. Each pump will be operated 20hours in a day during design year.

River seepage water infiltrate from gravel/ filter media is collected in collector/ directly into sump well. The water may bring small silt particle. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement are made.

ToR for IEE of Sunkoshi Panchkhal WSSP

The proposed water source is deemed to be technically viable regarding the stability, source discharge, less transmission main etc. However, test drilling shall be carried out during implementation to fix the exact location of collectors and sumpwells.

ii) Electrical System

The proposed project has pumping station at each stage to reach water at WTP site. The overhead electrical transmission line will run along the pipe line route to supply power to each stage to run the pump. All the pumps at sump well, stage 2, stage 3 and stage 4 will be operated at a time to supply water at WTP/ storage reservoir. These pump stations are connected in series cascade mode. If one of the pumps fails to run due to any technical fault, the remaining pumps can deliver water from sump well to WTP/ storage reservoir. Hence, as per design of the electrical system, there is provision to shut only one pump in a control system if any of the pumps fails to run. Similarly, among the two pumps at WTP site and at backwash RVT, only one will be operated at a time. The capacity and number of pumps at various stages are given in **Table 4**.

Table 4: Capacity and Number of Pump

Location	Number and capacity of pump	Remarks
Stage-1 Sump well	4 nos × 85 HP	All pumps run at a time
Stage-2	4 nos × 85 HP	All pumps run at a time
Stage-3	4 nos × 85 HP	All pumps run at a time
Stage -4	4 nos × 85 HP	All pumps run at a time
WTP/RVT Site for RVT-10	2 nos × 20 HP	Only one pump runs at a time
WTP/RVT Site for Backwash RVT	2 nos × 5 HP	Only one pump runs at a time

There will also be the arrangement of Spare Pumps for Stage 1 to 4 at designated storage area for replacement such that if any pump does not function properly, it can be replaced immediately. The capacity of pump at each pipe will be divided by two to obtain small size of pump at each option; this will be easy for the future operation & maintenance and to obtain spare parts.

One transformer with 2 -diesel generator back-up will be arranged at each pumping stage to supply the power for the pumps at four major stages. Likewise, for minor stage (5th stage i.e. WTP/ storage RVT), one small transformer and generator has been designed. The transformer and diesel generator is designed as given in **Table 5**:

Copy

 Engineer

ToR for IEE of Sunkoshi Panchkhal WSSP

Table 5: Transformer and Diesel Generator

Description/ Pumping Stage	Pumping Stage 1		Pumping Stage 2		Pumping Stage 3		Pumping Stage 4		Pumping Stage 5	
Pump	HP		HP		HP		HP		HP	
Pump 1	85	63.75 KW	85	63.75 KW	85	63.75 KW	85	63.75 KW	20	15 KW
Pump 2	85	63.75 KW	85	63.75 KW	85	63.75 KW	85	63.75 KW	5	3.75 KW
Pump 3	85	63.75 KW	85	63.75 KW	85	63.75 KW	85	63.75 KW		
Pump 4	85	63.75 KW	85	63.75 KW	85	63.75 KW	85	63.75 KW		
Other load		3 KW		3 KW		3 KW		3 KW		7 KW
Total load		258		258		258		258		25.75
Safety factor		1.25		1.25		1.25		1.25		1.25
Net total load		322.5		322.5		322.5		322.5		32.19
Transformer size		403.1		403.13		403.13		403.13		40.23
All pump operate at a time		3 KVA		403.13 KVA		403.13 KVA		403.13 KVA		40.23 KVA
Adopt : Transformer Capacity		500 A		500 KVA		500 KVA		500 KVA		50 A
Generator size		503.9		503.91		503.91		503.91		50.29
Reqd: Generator size (total)		600 KVA		600 KVA		600 KVA		600 KVA		50 KVA
Adopt:Generator -2nos of each		160		160 KVA		160 KVA		160 KVA		50 A
to meet 50% demand		160		160 KVA		160 KVA		160 KVA		50 A

Source: DEDR, 2019

Distribution System: The power cables from control panels to each load are calculated to satisfy the following criterions:

- Current carrying capacity of the cable is enough to carry the full load current continuously.
- Maximum voltage drop in the cable is less than 2% of the system voltage.
- The control panels at pump house are provided with the Star-Delta starter to reduce the high starting current drawn by the pump-motors.
- It is envisaged that the pump will be operated 97.5% and generator will be operate 2.5% in total operation hour.

iii) Interruption Chamber/ Break Pressure Tank

This tank has been proposed at the location where the pressure at the pipe is more than the rated pressure. The proposed Break Pressure Tanks (BPTs) will be constructed at six locations that includes a) 50m³ capacity along Branch Transmission Line, b) 10m³ capacity along RVT-10 distribution system for Chisapani, c) 10m³ capacity along RVT-10 distribution system for Gairigaun, d) 10m³ capacity for RVT-9 distribution system, e) 2 nos -10m³ capacity for Kharelthok distribution system. Introducing the IC/BPT, the pressure will become zero at its outlet and pressure in the downstream pipe is designed based on the pressure of IC/BPT. Here, RVT-9 will supply water for distribution system and serve the purpose of IC for branch transmission system.

iv) Transmission Main & Pumping

Transmission mains refer to the pipe line running from intake to reservoir which comprises of two parts i.e. Main Transmission (Sump Well to WTP at the ridge of Bhairab Mandir) & Branch Transmission (WTP to various reservoirs). The transmission line passes via road, barren land and public land. The main transmission main comprises three mains that includes a) Mains that goes to branch transmission by gravity; b) Mains that goes to Palanchowk Bhagwati by pumping and c) Mains that goes to Bhimsentahn WTP backwash RVT by pumping.

ToR for IEE of Sunkoshi Panchkhal WSSP

The total pipe length of the main transmission from the proposed Sunkoshi river intake/ Sump well to the proposed treatment plant site/storage reservoir is about 9,135.00m including 5% more than the actual one, which comprises of combination of DI with Socket End of diameter 200mm, DI pipe with Flanged End of diameter 200mm and PE100 PN16-250mm. Submersible pumps of total 4 nos.-85HP (at each stage 1, 2, 3 and 4) capacity are installed in two sumpwells/ intakes to various stages and these pumps will pump water upto the water treatment plant at 5th stage site at the downstream of Bhimsenthan beside NEA transformer. There is also provision of two parallel pipes for water lifting purpose along the transmission mains to avoid the interruption of water supply service if one pipe need repair.

Each pump will pump 21.0 lps water to WTP. In total, one pipe will carry 42.0 lps water by pumping. Two pipes will withdraw 84lps water to WTP. The pump capacity is determined accordingly. But, based on the pump catalogue, each pump will pump 22.21 lps and 4 pumps will pump 88.84 lps, which is more than required. After treatment, 5.71 lps water will be pumped to Palanchowk Bhagwati (RVT-10), 4.98 lps will be pumped to Filter Backwash RVT-12 and the remaining 73.31 lps water will be supplied to other proposed nine service reservoirs RVT-1 to RVT-9 by gravity. The Filter Backwash RVT 12 will supply 1.75 lps water to Kharelthok (RVT-11). The remaining 3.23 lps water will be used for the filter backwash purpose. There is also provision of disinfection before the storage of water within the ground storage reservoir at WTP site.

The total branch transmission length i.e. from WTP/storage reservoir to 11 RVTs is 37,237.00 m including 10% more than the actual one having pipe size PE pipe (63-110) mm dia. and 5% more than the actual having pipe size DI 100mm to 250mm dia are used. No house connection will be permitted from branch transmission before reaching water to RVTs except RVT-11. Branch transmission for RVT -11 comes from filter backwash RVT. Due to topography, some houses will get water from the branch transmission main before water reaches to RVT-11. Four types of pipes will be used in this branch transmission main system that includes PE-100 PN 6 of diameter 110 mm, PE-100 PN 10 of diameter 63 mm, DI pipe with Socket End of diameter (100-250)mm and DI pipe with Flanged End of diameter (100 to 250) mm.

v) Thrust Blocks, Saddle Blocks and Thrust Beam

Thrust blocks have been proposed for DI pipes (transmission and distribution mains for both alternatives) from being moved by forces exerted within the pipes arising from the internal pressure of the pipeline or the flow of water hitting bends, tapers and closed or partially closed valves. Typical thrust blocks have been designed for a pressure of 24 kg/sq cm for both transmission lines and distribution line.

Similarly, there is also provision of Thrust Beam & Saddle Blocks for DI pipes that will be laid up in sloppy areas and un-buried portions. All saddle blocks are proposed to be anchored with concrete at the center of each pipe to prevent movement. Provision of RCC support for the stretches of buried & un-buried DI pipe line has also been made to prevent pipe movement which are laid-up in sloppy area.

vi) Water Treatment Plant and Chlorination

Based upon the water quality, secondary data available, discussion with community in the surrounding of the service area, the following treatment plant has been proposed for the seepage/ infiltrated water pumped from the proposed Sunkoshi river water source.

The water quality of the streams/ river varies from time to time at every rain and carries suspended solid, other organic and inorganic impurities. However, it is envisaged that the seepage water will have better quality than the surface water. First level filtration will be provided.



ToR for IEE of Sunkoshi Panchkhal WSSP

carried out at sump well site while preparing the infiltration gallery surrounding the collector and sumpwell. River seepage water infiltrate from gravel/ filter media is collected in collector and directly into sump well. The water may bring small silt particles. This partly deposits in bed and partly goes to the treatment plant. A washout pipe is arranged at the bottom of the collector/ sump well to the top. The slush water will be pumped when significant silt deposition occurs in the bed. Necessary valves arrangement has been made. If the quantity of water collected at the sump well is not enough, direct water feed from the river is also provisioned.

After pumping, the rapid mixing chamber (coagulation) followed by flocculator followed by sedimentation followed by rapid sand filter followed by disinfection are designed in sequence. After the treatment the water will be stored into storage reservoir.

Small rapid flash mixture one unit of size 2.0m x 2.0m x 2.0m, baffle wall flocculator 5 units of each 7.50 x 2.50m x 1.20m; sedimentation tank 4 units 19.50m x 6.50m x 3.00m, rapid sand filter 2 units of each 8.25m x 6.25m x 3.5m and disinfection are designed. Accordingly, the inlet outlet arrangement of each filter units together with necessary valve arrangements are provided in the detailed drawings. The bypass arrangement from each filter inlet/ outlet are also provisioned for the repair and maintenance of the structures or the quality of water available from the infiltration would be good enough for some period during seasonal variation and may not need all filter to operate. Also, the backwash arrangement of rapid filter has been arranged. A backwash reservoir (RVT-12) is provisioned and will supply water to Kharelthok RVT-11 by gravity and supply water to backwash the filter. Only one filter will be backwashed at a time at every 20-24 hours interval for 15 minutes by water. About 129.2 lps water will be used to backwash the filter with pressure head 10-12m. About 4% water is provisioned for filter backwash. Accordingly, the filterback wash reservoir is designed. In addition, air compressor has been kept provisionally to back wash the filter, this will be finalised during implementation. However, pipe and fittings arrangement have been made.

An emergency feeder line consisting of a solution tank connected with feeding tank having a constant level is proposed for the chlorination. FRP pump is used for this purpose. Bleaching powder 6.62kg / day and 9.65 kg / day require during base year and design year respectively. After disinfection some part of the lime will be settled at the bottom of the ground reservoir as residue. This residue shall be removed through washout. The washout pipe will be connected with the drain.

vii) Sump Reservoir/Service Reservoir

The distribution system has been designed by using multi-reservoir concept due to topography of the town which was also adopted in the existing system at various elevations. The total storage requirement for the system at the end of the design period shall be about 2,300m³. This capacity will be divided into various reservoirs that will be constructed at various locations. There is provision of sump RVT of 150m³ capacity, each at pumping Stage 2, 3 & 4 and 1no of 400 cum capacity at WTP site. These reservoirs act as storage reservoirs. Similarly, there is also provision of backwash RVT of 150m³ capacity that will also distribute water to Kharelthok RVT by gravity.

There is also provision of eleven service reservoirs that include 6 no RVTs of 150 m³ capacity at six locations (RVT 1-U/S Municipality, RVT 2-Anekot, RVT 3-Sashastra RVT, RVT 4-Bakhrel Dihi RVT, RVT 7-Jaretar and RVT 8-Shikharpur RVT), 3 nos RVT of 100cum capacity at three locations (RVT 5-Radha Krishna School, RVT 6-Nayagaun RVT and RVT 10-Palanchowk RVT) and 2 nos. of 50m³ capacity at RVT-9(9N29) & RVT11-Kharelthok. The storage at each pumping stage is provided for only 0.5hr and ground storage at WTP site is provided for 1.25hr. All reservoirs will supply water in independent/ separate sub-service area.

ToR for IEE of Sunkoshi Panchkhal WSSP

viii) Distribution Main and District Metering Area

The distribution system comprises a pipe network, which is designed in loop network system. The entire new distribution system has been designed by using GI, DI and PE-100 pipe. The PE-100 pipes of a) PN 6-(50mm to 250mm) dia., b) PN 10-(50mm to 250mm) dia and c) PN 16-(50mm to 225mm) dia. have been used in the design. Similarly, DI pipes with socket end of diameter 150mm & 200 mm have been used in the design. GI pipe of 40mm to 100mm dia. are also used in the design. The minimum pipe size for the distribution mains used in the design is PE100- 50mm, which governs the velocity. PE100 pipe above 4 kg/cm² pressure are proposed in the distribution network design as per technical requirement. PE100-PN6 pipe of 50mm and 63mm pipes are not used in the design due to technical difficulties to join the pipe with electrofusion technology. All PE pipes will be joint using electro fusion technology. The washout and air valve have been arranged in the distribution system in control valve/ pipe valve chamber, where possible. In some nodes, the residual head is considered high to maintain the residual head in the downstream node.

The flow in each line has been calculated based on the socioeconomic survey data and possibility of rapid increment of settlement in the near future. The Pipe Valve Box/ Valve Chamber have been proposed at suitable junctions to regulate the design flow in each pipe line and to stop the flow in the particular area without affecting the other area during repair & maintenance. All the distribution lines pass along the road network and public land. The distribution lines have been proposed on both sides in core bazaar area while, single pipeline has been designed in other remaining areas. Due to undulations/ irregular topography, two pipes are designed along one road among which one pipe will supply water at the highest level without distributing water to the households and the other pipe will distribute water to the households upto bottom.

The pipeline is designed by adding 10% extra length of actual one. The estimated distribution pipe is taken as 10% more than the actual one for PE pipe up to 90mm dia. and 5% more than the actual one for remaining all pipes is 189,309.00m. The design of this distribution system is based on the concept of District Metering Area (DMA). Each DMA will have bulk meter to determine the flow into respective service area. Each service reservoir is treated as one DMA. Hence, there are 11 DMAs within the proposed service area to supply water from each service reservoir. RVT location/ DMA boundary is fixed depending upon the elevation difference, location and easy for operation and maintenance. It is presented in **Figure 2** given below:

ToR for IEE of Sunkoshi Panchkhal WSSP

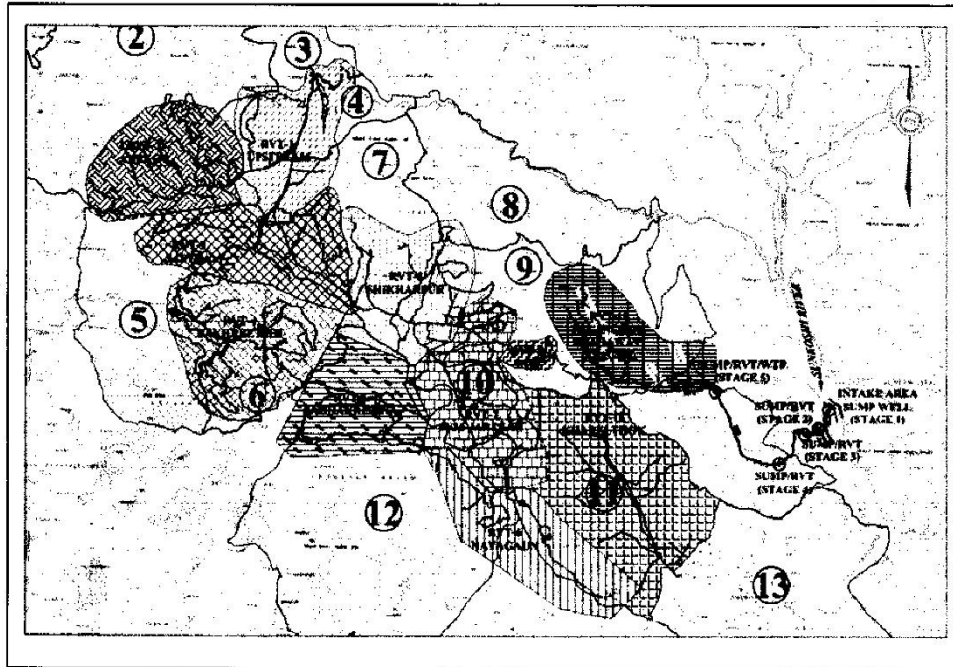


Figure 2: District Metering Area (DMA) of the Proposed System

ix) Household Connections

The household shall connect the tap to their household by directly from main distribution pipe. The average 15m length of 20mm dia. of PE 100-PN16 pipe with compression joint, joined with GI fittings and valves up to meter for each HH connection. There will be 5,998 taps in the system during base year. The meter shall be kept near and adjoining the compound of the houses. After meter, each HH should extend the pipe themselves as they desire. The necessary fittings have been designed. Electro fusion saddle has been proposed to join the HH connection at main pipe to connect ferrule in the saddle. Likewise, GI and DI saddle clamp are proposed to join the HH connection at main pipe to connect the ferrule for GI or DI pipes.

Two types of tap stands have been designed for the project. At the end of the design period, it is anticipated that about 76.50% of the total household shall have fully plumbed, 23.50% of the total household shall be served through yard connection. The poor house connect tap at free of cost through OBA. There will be total 7,094 fully plumbed and 2,179 yard taps will be connected during design year. In total, there will be 9,312 connection including institutional 39 connections during design year.

x) Appurtenances

- **Bulk Water Meter:** The bulk water meter is designed at various locations in the distribution system to ascertain the leakage in the distribution system. The main bulk meter is kept at the outlet of service reservoir. Each reservoir is served as DMA. Each bulk meter will provide the quantity of water supplied in the particular area and leakage in that area can be determined calculating the sum of HH water consumption.

ToR for IEE of Sunkoshi Panchkhal WSSP

Accordingly, the repair and maintenance works can be carried out, if the leakages more than the permissible range.

- **Types of Connections:** Consumers have been classified in three categories depending on their income level. The consumers having high level of income requiring more consumption of water are placed in fully plumbed category, consumers having medium income and medium consumption level and consumers of low income group and who can't afford tariff of fully plumb connections and use less water through tap connection at their household will be benefitted through yard connection. The social survey has been carried out. The poor household will get tap free of cost with OBA programs. However, WUSC has to reconfirm the poor household during implementation of the scheme.

The cost estimate of the taps for all household and institution has been included in project cost estimate. During execution of the project, the poor household shall connect tap from OBA facilities with recommend of WUSC.

- **Wash out Valve:** Washout valves have been provided at depressions points in the pipeline, where necessary. The purpose of the valve is to clean the debris collected in the pipeline. Sometimes, the valve can also be used for the maintenance of the pipe line without closing the whole distribution system.
- **Air Valve:** The air valves are provided in transmission and branch transmission main. The air valves have been designed to release the air accumulated in the pipes. The water flowing through pipes always contain some air. This air tries to accumulate at the highest points and may interfere in the flow by narrowing pipe opening area. Air relief valve is provided in the distribution pipe near the overhead reservoir to provide the exit for such accumulated air. Also, the automatic air release valve is provided in distribution system at several locations.
- **Check Valve:** This type of valve normally allows water to flow through it in only one direction. This valve is a two port valve which has two openings in the body; one for water to enter and other to leave. This valve is mainly for a specified cracking pressure which is the minimum differential upstream pressure between inlet and outlet at which the valve will operate. This type of valve has been proposed at each pumping stage.
- **Control Valve:** The purpose of the control valve is to regulate the required flow in each distribution main from the junction/ node. Sometimes, it can be used for the maintenance of distribution system in particular area without closing whole distribution system. A control valve is provided in the system where there are more than two branches from one junction or where it is necessary. Control valves have been designed in suitable distribution junctions having more than two mains and in required places to regulate the design flow in the main. The design flow in each pipe line is based on design population, non-domestic demand and system wastage and leakage. The future demand in the main may fluctuate and the control valve/ regulating valve shall be useful to deliver the required flow in pipe line.
- **Pressure Relief Valve:** The pressure relief valve is a safety valve that keeps the pressure within safety limits to prevent equipment failure, mishaps or other undesirable outcomes. Pressure relief valves will be designed with controls to increase or decrease the level of pressure in a pressure vessel. This type of valve will be installed at each pumping stage.

2013/11/11
Project Management Office
Water Supply and Sanitation Department
Ministry of Water Resources
Government of Nepal

ToR for IEE of Sunkoshi Panchkhal WSSP

- **SCADA Valve:** This type of valve is operated by SCADA (Supervisory Control and Data Acquisition) system. This SCADA system is a control system that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management, but uses other peripheral devices such as Programmable Logic Controller (PLC) and Discrete PID controllers to interface with the process plant or machinery.

A collection of equipment that will provide an operator at remote location with enough information to determine the status of a particular piece of a equipment or entire substation and cause actions to take place regarding the equipment or network.

Supervisory Control and Data Acquisition (SCADA) achieves this requirement collecting reliable field data through remote terminal units (RTUs), Intelligent Electric Devices (IEDs) and presenting them to user requirement. The user interface or the man machine interface (MMI) provides various options of data presentation according to specific application and user needs. There are many parts of a working SCADA system. A SCADA system usually includes signal hardware (input and output), controllers, networks, user interface (HMI), communications equipment and software. All together, the term SCADA refers to the entire central system. The central system usually monitors data from various sensors that are either in close proximity or on-site.

Basic SCADA is proposed/ designed for Sunkoshi Panchkhal town. The outlet management system (OMS) from each pumping stage outlet and reservoirs outlets, Reservoir management system (RMS) at each inlet of reservoirs. These are not provided in pumping stage reservoirs inlets. The automation to link all the components through hSCADA (Hydraulically Supervised Control and Data Acquisition) and all the mentioned components which shall be capable to enable to control and monitor the parameters from hSCADA room/ master control center for submersible pumps of all for main and one small stages. Water level sensors for all RVTs are provided. Likewise, water supply system operation and maintenance, one year operation and maintenance for SCADA is also provisioned.

The proposed system shall work under Wi-Fi coverage area, on the GPRS network or on a given radio frequency. The radio frequency is a free of cost communication media, but the limitations it has are, eye visibility of two connecting devices and the distance between them. Similarly, it would be difficult to reach all equipment within Wi-Fi coverage also. The other way out is the GPRS which shall work with the 3g and above cell phone network area. The services of the network providers having a full network in the given area can be used.

xii) **Valve Chambers**

- Two type of Chambers have been proposed in the project to control or regulate the flow of the proposed water supply system. The chambers constructed by brick masonry have been provided in non-vehicular areas and rural area. In other vehicular carriageway and city area, chambers constructed with RCC has been provided.
- The chambers shall serve as housing, protection and convenient access to these pipe appurtenances. Inside the concrete chambers, necessary supports shall be provided for pipes and valves at appropriate locations. Access to the valve chamber will be given via lockable cast iron covers with frames. Manhole covers of the heavy

ToR for IEE of Sunkoshi Panchkhal WSSP

duty type have been recommended in RCC chambers. Covers for manholes in paths may be proposed of medium duty type.

- In total, there are 179nos. pipe valve boxes and 36 washout/ air release/ control valve chambers designed in the distribution system.

➤ **Fire Hydrants:** Fire hydrants will be provided at major road junctions. These fire hydrants shall also be used for flushing of the system as required. Fire hydrants, namely, stand post type, conforming to IS908 is recommended.

xii) **Generator House**

A Generator house will be constructed at each pumping stage and WTP site. The Generator will supply power mainly for pumps installed at various stages of pumps, when there is no regular power from NEA. The generator of capacities will be of 2 nos. of each 160 kVA at each stage 1, 2, 3 and 4 and 50 kVA at WTP site for stage 5. Only two pumps among four will run at a time at stage 1, 2, 3 and 4 and one pump for filter backwash RVT-12, one pump for RVT-10 will run at a time for stage 5 (WTP) site. Two generators at stage each will pump 50% of the demand. If one generator gets out of order, only one generator will be operated and supply 25% of water.

xiii) **Laboratory Building cum WUSC Office Building, Guard House and Dosing House**

A two storeyed laboratory building cum WUSC office building has been designed and this has been proposed to be constructed in Panchkhal Bazaar. WUSC will provide the land for the construction of office. The preliminary water quality test kits are arranged for regular water quality monitoring.

There is provision of Small Guard House (G1) at each pumping stage (Stage 1 to 4), at Backwash RVT and at 11 service reservoir locations. Hence, in total, 16 small guard houses have been proposed. Similarly, one Medium Guard House (G2) have also been proposed at WTP site.

xiv) **Boundary Wall & Retaining Wall**

The retaining wall has been proposed at sumpwell site, stage 2,3,4 and WTP site and each reservoir site as necessary. In some case, boundary wall will be above retaining wall and some cases boundary will be from foundation. The metal post with chain link fencing above brick masonry wall has been proposed to protect the structures such as Sumpwell/ Intake, Office Building, Pumping Stages, Reservoir Sites, Generator House, WTP, Backwash RVT and IC/BPTs etc. as required.

2.5.3 Sanitation Components

The sanitation component is considered as an integral part of the water supply project so as to minimize the coverage gap between water supply and sanitation components. The main issues that need to be addressed in the sanitation components as they would have consequential impacts on all the activities are:

- Toilets/Septage/Sludge Management
- Drainage System
- Solid Waste Management
- Institution Building/Strengthening
- Raising Awareness

[Handwritten signature]



ToR for IEE of Sunkoshi Panchkhal WSSP

The sanitation practice is directly related with their hygiene consciousness. The socioeconomic survey shows that there is no separate sewerage system within the proposed service area. But almost, all the households in the urban areas as well as in rural areas have their own latrines with septic tanks. The survey revealed that out of 5998 households, about 53.7% (3222) households have water sealed latrines whereas, 34.4% (2065) households have pit latrines. About 5% (287) HHs have ventilated pit latrines whereas 1% (53) of household are using cistern flush type of pit latrine.

The survey also revealed that there are not any public toilets or institutional toilets within the project town. Hence, the basic sanitation requirement of the proposed project is the construction of public toilets for institution as well as general public for the betterment of facilities in this area. The thrust point will be to avail basic sanitation facilities and declare the whole municipality as ODF. The aim of sanitation is universal coverage. ODF, based on multiple approaches like basic sanitation package, School sanitation and hygiene education program, Community-led total sanitation, School-led total sanitation, Local body-led total sanitation, is considered as the bottom line for program intervention.

There is provision of one institutional toilet & one public toilet under the sanitation components of this proposed project. Similarly, there is also provision of one tractor for solid waste collection. These sanitation components will contribute towards the betterment of sanitation facilities in this area. These facilities also inculcate behavior of toilet use as well as of effective solid waste management among students and the general public. Hence, the proposed project also will address basic sanitation issues through the provision of toilets and solid waste management.

2.6 Proposed Service Area

Discussion was held with WUSC for the delineation of service area of the proposed project. Regarding this, the initial discussion was carried out with users committee on various dates. As per WUSC, the following areas of Panchkhal municipality have been selected for the proposed project. The names of the major settlements of the service area of the project town are as follows:

- Ward no 2:** Tinkune, Bagaladihi, Dwaredihi, Majhdihi, Takedihi, Ratopahiro
- Ward no 3:** Lamidihi, Jantadihi, Kaplihi, Baniyadihi, Thumka, Rampur, Rampurdada, Bramhapur, Jorpati, Khok
- Ward no 4:** Zero Kilo, Lamidanda, Pachkhal, Purano Bazar, Tamaghat
- Ward no 6:** Dulalthok, Bakhreldi, Tinpipe Bazar, Ekatabasi, Paudelthok, Jhinganpur, Pipaltar, Dhotra, Dhunganabesi
- Ward no 7:** Sigrampati, Shikharpur, Jorpipe
- Ward no 8:** Khattar, Padalla, Simradi, Kharani (Madi Gau)
- Ward no 9:** Bhimsenthan, Bhetwalthok, Dadgaun, Ramche, Sathighar, Thulogaun
- Ward no 10:** Nayagaun, Luitelgau, Ranipani, Chapkobot, Bakultar, Baluwa bazar
- Ward no 11:** Luitelgaun, Devbhumi, Ojhatar, Karketar, Kharelthok, Jaretar, Bakultar, Ranipani, Serabesi
- Ward no 12:** Devbhumi, Ojheltar, Sherabeshi, Karketar, Kashkote, Tinghare, Nagbeli, Aapghari.

ToR for IEE of Sunkoshi Panchkhal WSSP

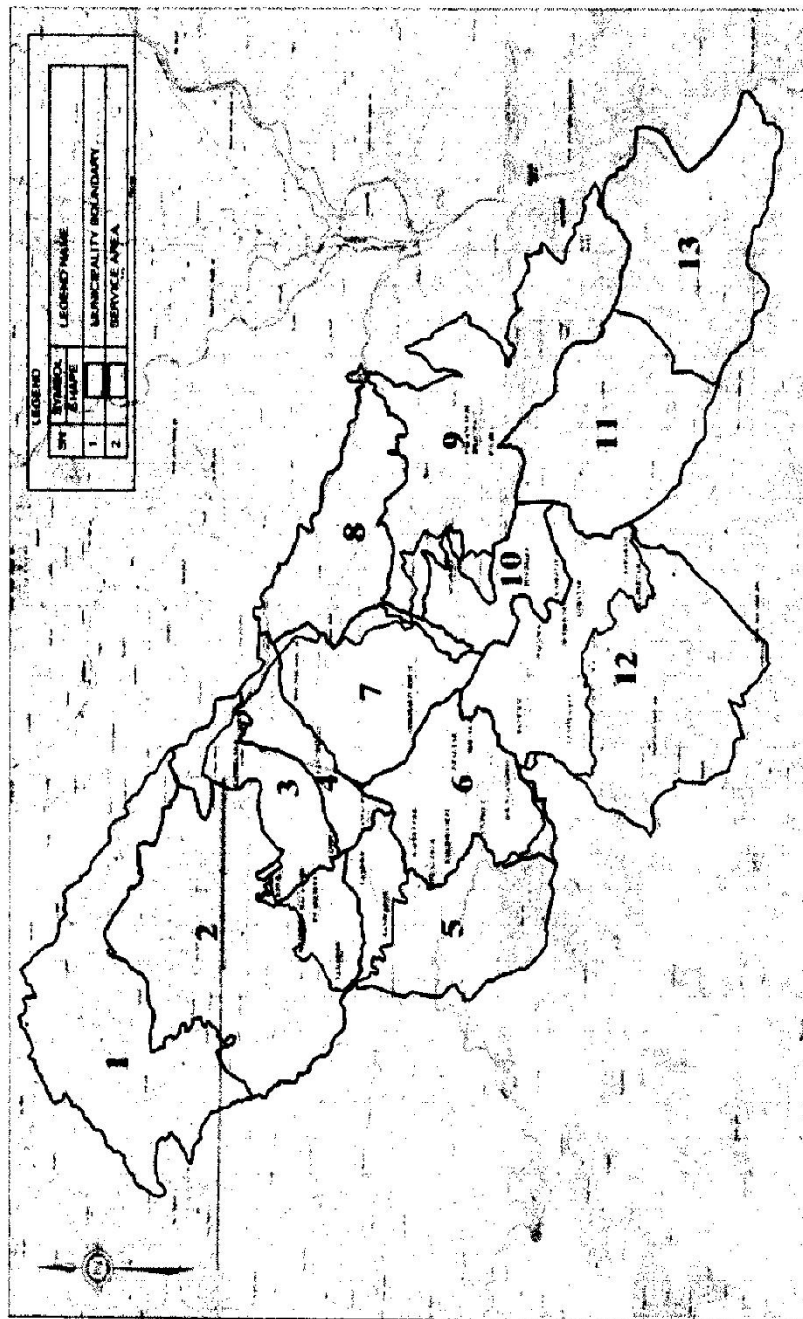


Figure 3: Proposed Service Area

TAEC-ICON JV

ToR for IEE of Sunkoshi Panchkhal WSSP

2.7 Population and Demographic Characteristics

The present permanent population in the service area is 29,603 and the rental population is 960. According to the social survey, there are 5,998 households (HHs) in the proposed service area. The population growth rate of the Panchkhal Municipality of Kavre district is taken as 2%. The growth rate is based upon the population census 1998 to 2011 of Kavre district, Dhulikhel (nearest municipality) and Panchkhal town. The population may increase more in comparison to the present growth rate in that area after availability of water supply facilities in the future. The Table 6 gives brief details on the population growth rate of the project district and the neighboring municipality, Dhulikhel.

The annual growth rate of Panchkhal Municipality is ranging from -2.5% to 1.55% in proposed service area wards. The growth rate is different at each ward as shown in Table 7. The growth rate of the district and neighboring Municipality is compared to establish the growth trend. It is envisaged that the population will be increased than the present scenario after implementation of the scheme. With this assumption and referring NUDS documents, the growth rate 2% is adopted considering that the number of household will be constructed along both sides of major road within design year.

Table 6: Population and Growth Rate

Description	Population 1981 AD	Growth Rate %	Population 1991 AD	Growth Rate %	Population 2001 AD	Growth Rate %	Population 2011 AD
Kavrepalanchok District	307150	0.55	324329	1.75	385672	-0.1	381937
Dhulikhel Municipality			9664	1.77	11521	2.17	14283

Table 7: Details of Newly Formed Panchkhal Municipality

Ward	Ward Area (Ha)	Census 2001			Census 2011			Growth Rate	Remarks
		HHs	Pop	P. Densities (PPHA)	HHs	Pop	P. Densities (PPHA)		
1	1079.05	482	2665	2.47	794	3825	3.54	3.68	Not in-service area
2	1373.34	771	4124	3.00	699	3275	2.38	-2.28	
3	392.39	458	2198	5.60	519	2221	5.66	0.10	
4	294.29	606	2998	10.19	796	3498	11.89	1.55	
5	686.67	465	2380	3.47	527	2543	3.70	0.66	Not in-service area
6	588.58	835	4296	7.30	924	4077	6.93	-0.52	
7	588.58	381	1941	3.30	431	2208	3.75	-1.30	
8	588.58	519	2528	4.30	539	2405	4.09	-0.50	
9	1177.15	608	3111	2.64	650	2657	2.26	-1.57	
10	294.29	383	2084	7.08	431	1839	6.25	-1.24	
11	1569.53	653	2939	1.87	626	2389	1.52	-2.05	
12	686.67	845	4689	6.83	1147	5299	7.72	1.23	
13	980.96	454	2016	2.06	461	1761	1.80	-1.34	Not in-service area
Total	10300.00	7460	37969	3.69	8544	37997	3.69	0.01	

Source: CBS, 2001 and 2011

ToR for IEE of Sunkoshi Panchkhal WSSP

As per socioeconomic survey (2018), the present population in the proposed service area is 29,603 in 5,998 HHs. Out of the total 29,603 permanent population, there are 14,748 male and 14,855 females living in 5,998 HHs. The permanent population of the project area at the end of design period of 23 years (1-year survey year + 2-year construction + 20 years project life) is projected as 45,768 with an average annual growth rate 2%. The rental population is very less i.e. 960 in comparison with permanent population. The water demand for this insignificant rental population is kept in non-domestic demand category.

The population growth rate percentage of the project area is determined based upon population census 1991 A.D., 2001 A.D. and 2011 A.D. of Kavrepalanchowk district, Panchkhal Municipality and possibility of population migration from surroundings in the proposed service area. This has been consulted with WUSC.

2.8 Settlement pattern

The settlement pattern of project area is mixed type. The core bazaar area which is located in ward no 7 is dense and populated. Similarly, the settlement pattern of other wards is scattered type due to semi urban and rural in character. The settlement pattern is gradually changing and the rural clusters are developing as market. The rate of migration in to the service area from the surrounding villages and from other districts is increasing during the last few years.

2.9 Ethnicity and caste

The composition of community by caste/ethnic is heterogeneous in nature. So, diversity of culture, custom, tradition, norms and values exists in this project area. The household survey of the sub project area has also reflected the cross section of major ethnic groups of the country.

The survey revealed that Janajati/ethnic (Tamang, Danuwar, Magar, Newar, etc.) are major group comprising of 48.3%(2896) households in the service area. Similarly, Brahmin/Chhetri are the second largest group comprising of 40% (2402) of total household where as, Dalit and other cast (Madhesi, Musalman etc.) comprising 9.4% (565) and 2.3% (135) respectively. Details of information are presented in the table below.

Table 8: Distribution of Households and Population by Ethnic Composition

S. No.	Caste/Ethnic Status	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	Brahmin/ Chhettri	316	370	277	377	253	29	295	156	115	214	2,402	40.0
2	Janajati	172	99	405	329	168	52	390	68	84	1,129	2,896	48.3
3	Dalit	22	67	45	76	104	3	181	2	2	63	565	9.4
4	Others (Madhesi)	1	60	63	2	3		3		3		135	2.3
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100.0

Source: Socio-economic Survey, 2018

2.10 Education and Health

Education: There are various educational institutions in the project town. According to the institutional data obtained from the survey, 31 educational institutions including campus for higher education, higher secondary schools, secondary schools as well as primary schools in service area with 8,469 people including students (Total: 7,936, Male: 4,797, Female: 3,139), staffs (Total: 55, Male: 32, Female: 23) and teachers (Total: 478, Male: 186, Female: 292). Almost of all educational institutions are relying on ground water, tap water and other sources. All of these educational institutions have water sealed latrines.

ToR for IEE of Sunkoshi Panchkhal WSSP

Health: Medical facilities for diagnosis and treatments are also available in the service area. There are various local hospitals and health centers in the project area that includes Sanjeevani Community Hospital, District Community Hospital, Panchkhal UN Training Institution Hospital, Panchkhal Primary Health Center and Baluwa Health Center. Similarly, some poly clinics, pharmacy and medical shops are also available in Panchkhal Bazar. For further medical services, most of the people prefer going to Dhulikhel Hospital which is just 17.8 km from the project town.

2.11 Waterborne and Communicable Diseases

The survey also collected cases of water born diseases such as diarrhea, dysentery, stomach ache and skin disease etc. within the service area. It was found that cases of mortality by water related diseases are nil. The information related to water borne and communicable disease was cross checked by visiting hospital and health posts within the service area. According to the obtained information, about 3.60% (622) were suffered from diarrhea where as 2.31% (684) were suffered from dysentery. Similarly, about 2.1%(77) were suffered from other diseases such as skin, stomach pain, fever etc. In total, about 8 %(2372) of populations are suffered from water related diseases.

2.12 Economic Activities

The survey shows that there are various banks, cooperatives, hotels & lodges within the project area that have been boosting the economic activities of the project town. During the course of household survey of project area, the detailed information on the major occupation and economic activities of all household head has been collected. The survey shows that the highest number of population i.e., 72% are engaged in agriculture, whereas 11.45% population depend on business and 9.5% of population in service. Similarly, about 78% and 2% of household head are dependent upon remittance and labour respectively.

2.13 Income Level and Poverty Conditions

The survey revealed that main sources of household income of the service area are agriculture, service, remittance and wage labour, respectively. Among the total households, 24.6% have monthly income of more than Rs. (20,001-50,000) and about 38.8% of household have monthly income of Rs. (10,876 - 20,000). Likewise, 3% of households are earning more than Rs. 50,000. The study shows that only 11%(659) of households falls under poor category that covers the households with income less than Rs 7,500 per month. The monthly income of HHs in the service area is given in table below:

Table 9: Income Level of Households by Ward

S. N.	Income Level Range	Ward #										Total	%
		2	3	4	6	7	8	9	10	11	12		
1	<Rs.7500	25	39	32	127	41	13	191	26	17	148	659	11.0
2	Rs. 7,501-10,875	40	53	146	240	86	33	189	78	50	437	1352	22.5
3	Rs. 10,876-20,000	237	258	217	263	224	27	340	60	67	633	2,326	38.8
4	Rs. 20,000-50,000	193	227	346	132	151	9	134	52	70	163	1,477	24.6
5	>Rs. 50,000	16	19	49	22	26	2	15	10	0	25	184	3.1
	Grand Total	511	596	790	784	528	84	869	226	204	1,406	5,998	100

Source: Socio-economic Survey 2018

ToR for IEE of Sunkoshi Panchkhal WSSP

2.14 Existing Water Supply & Sanitation Situation

2.14.1 Existing Water Supply

a) Source to House Connections

There are several existing water supply systems in the new service area. Among them, the major systems are described briefly as follows:

Amarkot Water supply system

There is an existing water supply water system from deep boring system. Altogether there is provision of 40 taps that serves about 700 households. The ground water is extracted through 40m³ RCC tank (1 no) and Ferro-cement tanks (2 no), each with 20m³ capacity. Six new tanks are also proposed. This supplies water in ward no.3 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for per tap is NRs. 1000. The tariff collection is well maintained. The average supply hours are two hours each day.

Panchkhal Jal Water supply system

This system supplies water from deep boring system. Altogether, there is provision of 650 taps in this system. The ground water is extracted through RCC tanks-150m³, Brick Masonry tank- 100m³ and Ferro- cement tank- 20m³. This system supplies water in ward no.3 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff is NRs.150 for per 6000 liters and it increases at the rate of NRs 25 per thousand-liter consumption. Initial charge for taps connection is NRs. 6660. The tariff collection is well maintained. The average supply hours are two & half hours in each day.

Bhagawati Temple Water supply system

This system supplies water from lifting system. Altogether, there is provision of 350 taps while other available 50 taps are not in operation. The ground water is fed through stone masonry tank having capacity 50m³ (1 no) and ferro- cement tank having capacity 20m³-(4 no) and 10m³ (2 no) respectively. This supplies water in ward no.9 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for 10000 liters is NRs.350 and it increases with increase in consumption. The tariff collection is well maintained. The average supply is two times in day.

Dhungana Besi Water supply system

This system supplies water via deep boring system. The ground water is fed through 100m³ RCC tank. This system has been constructed by GON but currently, it is not in operation.

Mayagaun Water supply system

This system had been constructed by UNICEF and had been rehabilitated by FDB in 2044 B.S. and 2065 B.S. respectively. Altogether 15 taps are provided to feed water supply system that serves about 400 household. The ground water is fed through ferro-cement tank having capacity 20m³ (2 Nos) and 10m³ (1 Nos) respectively. The existing water supply has proper tariff collecting system. The minimum tariff for each tap is NRs. 3000 annually. The tariff collection is well maintained.

Bakhrel Di Water supply system

Altogether 160 taps are connected to supply water. The ground water is fed through a completely constructed Ferro-cement tank having capacity 20m³ while another tank with 20m³ capacity is under construction. The existing water supply has proper tariff collecting system. The minimum tariff for 6000 liters is NRs. 250 annually. The tariff collection is well maintained.

ToR for IEE of Sunkoshi Panchkhal WSSP

Satya Sai Water supply system

This system supplies water via deep boring system. Altogether, there is provision of 118 taps. The ground water is fed through Ferro- cement tank (2 no) having capacity of 20m³. This system supplies water in ward no 12 of Panchkhal Municipality. The existing water supply has proper tariff collecting system. The minimum tariff for 8000 liters is NRs. 300. The tariff collection is well maintained.

The survey revealed that largest numbers of household i.e., about 28.86% (1731) and 28.58% (1714) are fetching water from public taps and private taps by various water supply system respectively. Whereas, about 42.56% (2,553) households depend on well/spring/stream/Dhungedhara etc. The survey shows that they use same source of water for all purposes as drinking, cooking, bathing, washing clothes, watering in kitchen garden etc.

There is no provision of water treatment system in all above described existing system as water is directly distributed into small settlements throughout the town through small service reservoirs.

b) Consumption Level

People are using water from stream, kuwa and piped water. The water quality is not good except the piped water. The above-mentioned water supply system supplies water into small settlements and are not well managed. The survey team has collected information related to water consumption level during dry and wet season in the service area. Due to consumption of water from private/public tap & well, spring, and dhunge dhara (stone spouts), the consumption pattern and quantity do not vary between two seasons.

The survey revealed that water consumption level of each household is found to be 260.6 liters per day and the total time spent is about 49.6 minutes (per trip about 6.4 minutes) to fetch water. Similarly, the total trip to be carried out for fetching water is about 7.7 trips daily. The per capita per day consumption is about 52.43 liters per day.

c) Operation costs and current Tariff

There are several existing piped water supply system. In addition, the communities depends upon stream and spring water. The communities are willing to pay handsome amount for the piped water supply service they may receive through the proposed project. They are also aware of the quality of supplied water. Hence, the community is ready to pay the water tariff that will be reasonably fixed by the concerned committee.

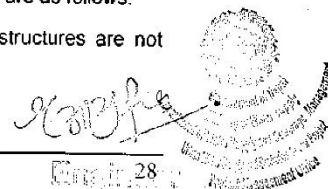
Now, they are fetching water through stream and kuwa, where the tapped aquifer is easily susceptible to pollution and contamination. As there is hardship of water during dry season and the quality of water is not good, they are ready to pay the tariff to any extent. Their main & only demand is to get water in sufficient quantity.

Different water tariffs are allocated in the existing systems. The minimum tariff is NRs.150 for per 6000 liters and it increases at the rate of NRs 25 per thousand liter consumption. The minimum tariff for 10000 liters is NRs.350. The minimum tariff for 6000 liters is NRs. 250 annually. The minimum tariff for 8000 liters is NRs. 300.

d) Problems of the Existing System

The problems of the existing water supply system in Panchkhal Municipality are as follows:

- The existing system is an old system, and the available water infrastructures are not sufficient to meet the current water demand.



ToR for IEE of Sunkoshi Panchkhal WSSP

- The water source is not sufficient to meet the present water demand of the service area. The water shortage is acuter during the dry season;
- There is only an intermittent supply of water. The present system capacity is not sufficient to meet the water demand of the population;
- The existing system supplies water without treatment. Therefore, the existing system has not been able to deliver water quality conforming to NDWQS standards especially turbidity during rainy season;
- WUSC has not been able to extend the distribution system to new areas where the demands of water exist.

2.14.2 Existing Sanitation Situation

a) Sanitary Facilities

The survey shows that about 53.7% (3222) household have water sealed latrine where as 34.4% (2065) household have pit latrine. About 5% (287) have ventilated pit latrine where as 1% (53) of household are using cistern flush type of pit latrine. Table below shows the data information about latrine facility in the project area.

Table 10: Coverage of sanitary facilities

Type of Toilet	Ward #											Total	%
	2	3	4	6	7	8	9	10	11	12			
No Toilet	34	35	35	43	60	5	91	6	3	59	371	6.2	
Pit Latrine	1	493	120	7	6	2	114	4	1	1317	2065	34.4	
Ventilated Pit Latrine	5	14	1	38	2	10	158	38	2	19	287	4.8	
Water Sealed	470	54	630	689	428	67	499	176	198	11	3222	53.7	
Cistern Flush	1	0	4	7	32	0	7	2	0	0	53	0.9	
Grand Total	511	596	790	784	528	84	869	226	204	1406	5998	100.0	

Source: Socio-economic Survey 2018

b) Drainage Facilities

The service area has roadside drains along Araniko highway but these drains are not maintained properly. Most of the parts of service area has not been facilitated with drainage facilities. It has been reported that major problem occurs during monsoon due to the insufficient capacity of surface drainage to drain out the run off water that comes from the upstream hill forest to the town. The Panchkhal bazaar gets flooded if the rainfall continues for more than 4-5 hours. This is due to the bed level of Jhigu khola and level of settlement areas. The roadside drains are situated along the blacktopped road. WUSC is much more enthusiastic for the construction of combined sewer and committed for necessary contribution.

c) Wastewater Management Practices

There is no sewerage system in the proposed service area. Almost all households in the urban areas have their own latrine with septic tanks. Similarly, private toilet with septic tank has been constructed in some households in rural area also. Such toilet with septic tank has been constructed in more than 61% HHs of service area. Hence, it is concluded that the people of the service area are much more aware in sanitation.

d) Solid Waste

The survey revealed that 83% of households are disposing domestic solid waste in the pit near to the house whereas 5.3% of household disposing their wastes by private collector. It was observed that the respondent have sufficient knowledge about the improperly managed

ToR for IEE of Sunkoshi Panchkhal WSSP

solid waste that may affect the public health and surrounding environment. Details information are given in the table below:

Table 11: Existing solid waste management practices

S.N	Waste Management Practice	Ward											Total	%
		2	3	4	6	7	8	9	10	11	12			
1	Pit Near to House	15	36	10	1	14	4	68	5	18	78	249	83.0	
2	Private Collector	1	1	7	0	0	0	7	0	0	0	16	5.3	
3	Pit/Container managed by VDC/Municipality	0	4	14	1	5	0	1	0	1	0	26	8.7	
4	Others	0	2	2	1	2	0	0	0	2	0	9	3.0	
	Grand Total	16	43	33	3	21	4	76	5	21	78	300	100.0	

Source: Socio-economic Survey 2018

2.15 Project Rationale

The existing water supply system is intermittent and is limited to only certain parts of the proposed area. Similarly, there is no provision of treatment system in the existing water supply system of the proposed town.

Considering the water demand and condition of the existing system, there is a need for a project to upgrade the existing water supply situation in the service area to meet the growing demand for private connections and to make drinking water available to the people of service area throughout the year.

2.16 Willingness and Affordability to Pay

Although households may have the ability to pay, willingness to pay is usually related to the quality of service. An urban household in Nepal, generally have access to less than adequate water supply. Thus, among many urban dwellers, there is a willingness to pay a higher price for improved WS services.

Focusing on Affordability to Pay rather than a willingness to pay, the households should be expected to be able to pay at least 2.0-2.8% of their household incomes for good quality WS services. That is, they should pay up to the accepted levels of Affordability to Pay. The reason behind this is that consumers get benefitted from the service that is not only convenient but also results in clear health-related benefits when coupled with a sanitation and hygiene education program designed to maximize the health benefits of the improved WS services.

The survey revealed that the beneficiaries are paying water tariffs regularly for the existing water supply system. They are also committed to collect required amount in time for the proposed project.

2.17 Water Tariff

The existing tariff collection system is well maintained. The minimum tariff is NRs. 125 for 6,000 liters and it increases at the rate of NRs 25 per thousand liter consumption.

The determination of water tariff for the proposed project is based on the consumption-based system. The tariff structure is designed by affordability and willingness to pay, and tariff has also been set to ensure benefits to sustain the project after the design period.

Tariffs are set out in progressive block structure which is shown in the table given below. The tariff structure is based on the weighted average of all the categories.

ToR for IEE of Sunkoshi Panchkhal WSSP

Table 12: Tariff Band for Different Alternatives

Description	Water Volume Band (cum)				
	0-6 cum	7-10 Cum	11-15 Cum	16-25Cum	Institutional
Consumption of water in Cum					
Proposed Tariff/cum	60 per cum.)	70 per cum	80 per cum	90 per cum	120 per cum

Source: Final DEDR, 2019

The calculated monthly water tariff for low-income households (average income of NRs. 10,000 per month) that represents 11.0% of the project population is NRs. 390. Similarly, the monthly water tariff for low & average income households (NRs 20,000 and NRs 40,000) is fixed as NRs 901 and 1,660 respectively. The low and average income households represent 61% and 27% of the total project population. The table given below shows the monthly tariff for HH connection:

Table 13: Monthly Tariff Structure

Monthly Tariff for Household Connection					Average Income NRs
	Cum/month	NRs. /HH/ Month	% of HH Income	Average NRs. /cum	
i. Poor Income HH	6.0	360	4.8%	60.00	7,500
ii. Low Income HH	12.30	985	4.9%	80.00	20,000
iii. Average Income HH	21.30	1,919	4.8%	90.00	40,000
Weighted Average Water Cost (Rs/HH/Month)		1,175		83.25	
iv. Community	0	0		0.00	
v. Institutional	370	44,376		120.00	

Source: Final DEDR, 2019

2.18 Poverty Alleviation Aspects

The socio-economic survey shows that 11% of the total HHs in the project area is below the poverty line. The wardwise distribution has been given in the socio-economic profile of the proposed project.

2.19 Description of the Environment

a) Hydrology and Climate

The climate of the project area is humid sub-tropical temperate climate with dry in winter and warm in summer. The temperature ranges from 13.4°C to 26.1°C. The temperature may rise up to 38°C in the summer season and winter are generally dry with record low temperature of -10°C in 2008.

There are several rain gauge stations and climatological stations in Kavre district. The nearest station no 1036 is situated at Panchkhal. The required data from this station is used for the project. The average mean annual rainfall is 1020 mm, which is slightly less than 1500 mm, the average precipitation of Nepal.

The driest month is November, with 7 mm of rain. The rainy season starts from June and ends in September when the monsoon blows across the Bay of Bengal and delivers about 80 % of the annual rainfall. The most precipitation falls in July. The average monthly average rainfall (in mm) is presented in Table 14

ToR for IEE of Sunkoshi Panchkhal WSSP

Table 14: Average Monthly Rainfall at Panchkhal (Station no. 1036)

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Average Rainfall (mm)	10	16	29	54	100	194	305	229	191	63	7	18

Source: DHM, 2016

June is the warmest month of the year. The temperature in June averages 26.1 °C. January has the lowest average temperature of the year. It is 13.4 °C. December and January are cooler months with average temperatures of 14 and 13.4° C respectively. The monthly average temperature is presented in **Table 15**.

Table 15: Average Monthly Temperature at Panchkhal (°C)

Average Monthly Temperature	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
	13.4	15.2	19.9	23.5	25.2	26.1	25.3	25	24.3	22.2	17.7	14

Source: DHM, 2016

There is a difference of 298mm of precipitation between the driest and wettest months. During the year, the average temperatures vary by 12.7 °C.

Though there is a lack of secondary information on air quality for the project area, the ambient air quality is expected to be within the National Ambient Air Quality Standards of Nepal as there are no such big industries and the traffic volume is also very low. Due to a similar reason, noise levels in the project area are expected to be within permissible standards prescribed by the Ministry of Environment of the GoN.

b) Flora & Fauna

The major plant life forms (floral species) available in the project area are given in **Table 16**.

Table 16 : Major Plant Life Forms of the Project Area

Local name	English Name	Botanical Name	Life Forms
Aasuro	Malabar Nut	<i>Adhotoda vasica</i>	Shrub
Aiselu	Raspberry	<i>Rubus ellipticus</i>	Shrub
Amliso	Tiger Grass	<i>Thysanolaena maxima</i>	Grass
Bakaino	China Berry	<i>Melia azedarach</i>	Medium Sized Shrub or Tree
Bans	Bamboo	<i>Babusa Vulgaris</i>	Grass
Bar Peepal	Banyan	<i>Ficus religiosa</i>	Tree
Bot Dhaiyanro	Small Flowered Crape Myrtle	<i>Lagerstroemia parviflora Roxb.</i>	Tree
Champ	Golden Michelia	<i>Magnolia champaca</i>	Tree
Chilaune	Needlewood	<i>Schima wallichii</i>	Tree
Dhale Katus	Indian Chestnut	<i>Castanopsis indica</i>	Tree
Dudhe Jhaar	Asthma Plant	<i>Euphorbia hirta</i>	Herb
Dudhilo	Willow Leaf Ficus	<i>Ficus neriifolia</i>	Tree
Gulaf	Rose	<i>Rosa rubiginosa</i>	Shrub

ToR for IEE of Sunkoshi Panchkhal WSSP

Local name	English Name	Botanical Name	Life Forms
Kafal	Bayberry	<i>Myrica esculenta</i>	Large Shrub/Tree
Kalimunte	Crofton Weed/Sticky Snakeroot	<i>Ageratina adenophora</i>	Shrub
Kamle	False Nettle	<i>Boehmeria platyphylla</i>	Grass
Lajjavati	Shame Plant	<i>Mimosa pudica</i> L.	Weed
Lapsi	Hog Plum	<i>Choerospondias axillaries</i>	Tree
Paiyun	Wild Himalayan Cherry/Sour Cherry	<i>Prunus ceratoides</i>	Tree
Sal	Sal	<i>Shorea robusta</i>	Tree
Sallo	Chir Pine	<i>Pinus roxburghii</i>	Tree
Sajivan/Kadam	Oregano	<i>Origanum vulgare</i> L.	Herb
Simali	Chinese Chaste Tree	<i>Vitex negundo</i>	Shrub
Sisno	Stinging Nettle	<i>Urtica dioica</i>	Herb/Flowering Plant
Paulownia	Empress Tree	<i>Paulownia tomentosa</i>	Tree
Titepati	Mugwort	<i>Artemisia vulgaris</i>	Herb
Uttis	Nepal Alder	<i>Alnus nepalensis</i>	Tree

Source: Field survey, 2018

As per the above given table, Sal & Chilaune are found at the lower elevation and Pine, Uttis & Chilaune are found at higher elevation. Earlier, Pine trees used to be the most common trees of the project area which are mostly useful for afforestation. However, pine needles on the ground promote rainwater runoff reducing infiltration capacity thus reducing groundwater recharge. These pine needles do not give good quality compost. The pine trees cannot be used for fodder too. Regarding this, more emphasis are given to the indigenous species like Chilaune, Champ, Uttis, Bakaino, Paiyun & Lapsi. Recently, an exotic tree native to China called Paulownia (*Paulownia tomentosa*) has been introduced in regard to its greater economic value. Similarly, high value species i.e., Amriso has also been introduced in the project area.

The project area is rich in shrubs and small tree species with medicinal and aromatic values and performs important soil conservation functions. They provide close canopy cover to the ground and thereby prevent losses through surface run-off and soil erosion even during the high intensity of rainfall.

Some of the mammals reported to be present in the nearby forests are listed in the Table given below:

Table 17: List of Mammals in the project area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Herpetes auropunctatus</i>	Small Indian Mongoose	Nyauri Musa	LC
2	<i>Macaca mulatta</i>	Rhesus Monkey	Rato Badar	LC
3	<i>Felis Chaus/Prionailurus bengalensis</i>	Jungle Cat	Ban Dhade	LC
4	<i>Funambulus Pennantii</i>	Five Stripped Palm Squirrel	Paanch Dharke Lokharke	LC



ToR for IEE of Sunkoshi Panchkhal WSSP

S. No.	Scientific Name	English Name	Local Name	Status
5	<i>Canis lupus</i>	Gray Wolf	Bwanso	LC
6	<i>Panthera pardus</i>	Common Leopard	Chituwa	VU*
7	<i>Rattus Rattus</i>	House Rat	Musa	LC
8	<i>Vulpes Bengalensis</i>	Bengal Fox	Fyauro	LC
9	<i>Canis aureus</i>	Golden Jackal	Syaal	LC
10	<i>Sus Scrofa</i>	Wild Boar	Bandel	LC
11	<i>Paguma Larvata</i>	Masked Palm Civet	Bharse	LC
12	<i>Cynopterus sphinx</i>	Greater Short Nosed Fruit Bat	Chamera	LC
13	<i>Martes flavigula</i>	Yellow Throated Marten	Malsapro	LC
14	<i>Macaca mulatta</i>	Monkey	Badar	LC
15	<i>Semnopithecus schistaceus</i>	Nepal Gray Langur	Kalomukhe Badar	LC

Source: Field Survey, 2018

According to the local people, local and migratory birds are found within the project area. However, none of these are protected or endangered. Species The commonly found species of birds are given in the table given below:

Table 18: Bird Species in the project area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Acridotheres tristis</i>	Common Myna	Dangre Rupi	LC
2	<i>Aethopyga Siparaja</i>	Crimson Sun Bird	Sipraja Bungechara	LC
3	<i>Amaurornis Phoenicurus</i>	White Breasted Water Hen	Sim Kukhura	LC
4	<i>Ardeola Grayii</i>	Indian Pond - Heron	Aaskote Bakulla	LC
5	<i>Athene Brama</i>	Spotted Owlet	Kochalgaade Latokoshero	LC
6	<i>Bubulcus Ibis</i>	Cattle Egret	Bakulla	LC
7	<i>Columba Livia</i>	Rock Dove (Blue Rock Pigeon)	Malewa	LC
8	<i>Copsychus Saularis</i>	Oriental Magpie Robin	Dhobini Chara	LC
9	<i>Corvus macrorhynchos</i>	Large Billed Crow	Kaalo Kaag	LC
10	<i>Corvus Splendens</i>	House Crow	Kaag	LC
11	<i>Lophura leucomelanos</i>	Kalij Pheasant	Kalij	LC
12	<i>Cuculus Canorus</i>	Common Cuckoo	Cuckoo Koili	LC
13	<i>Cuculus Micropterus</i>	Indian Cuckoo	Kafal Pakyo	LC
14	<i>Dendrocopos Macei</i>	Fulvous breasted Woodpecker	Kaasthakut	LC
15	<i>Dicrurus Macrocerus</i>	Black Drongo	Keshraj Chibe	LC
16	<i>Egretta Garzetta</i>	Little Egret	Sano Seto Bakulla	LC
17	<i>Eudynamis Scolopaceus</i>	Western (Asian) Koel	Koili	LC
18	<i>Francolinus Francolinus</i>	Black Francolin	Titra	LC
19	<i>Halcyon Smyrnensis</i>	White Breasted Kingfisher	Matikire	LC
20	<i>Hirundo Rustica</i>	Barn Swallow	Ghar Gauthali	LC
21	<i>Megalaima zeylanica</i>	Brown Headed Barbet	Nyuali	LC
22	<i>Megalaima lineate</i>	Lineated Barbet	Kuthurke	LC

ToR for IEE of Sunkoshi Panchkhal WSSP

S. No.	Scientific Name	English Name	Local Name	Status
23	<i>Merops Leschenaulti</i>	Chestnut Headed Bee Eater	Katus Tauke Murali Chara	LC
24	<i>Milvus Migrans</i>	Black Kite	Kalo Chil	LC
25	<i>Motacilla Alba</i>	White Wagtail	Seto Tiklike	LC
26	<i>Motacilla Mederaspatensis</i>	White Browed Wagtail	Khole Tiklike	LC
27	<i>Parus Major</i>	Great Tit	Chichilkote	LC
28	<i>Passer Domesticus</i>	House Sparrow	Ghar Bhangera	LC
29	<i>Passer Montanus</i>	Eurasian Tree Sparrow	Rukh Bhangera	LC
30	<i>Pavo Cristatus</i>	Indian Peafowl	Mujur/Mayur	LC
31	<i>Psittacula cyanocephala</i>	Plum headed Parakeet	Tuisi Suga	LC
32	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Jureli	LC
33	<i>Saxicola caprata</i>	Pied Bushcat	Kale Jhyapsi	LC
34	<i>Saxicola torquatus</i>	Common Stonechat	Jhekjhek Jhyapsi	LC
35	<i>Streptopelia orientalis</i>	Oriental Turtle Dove	Dhukur	LC
36	<i>Upupa epops</i>	Common Hoopoe	Fapre Chara	LC
37	<i>Urocissa flavirostris</i>	Yellow billed Blue Magpie	Sunthude Lampuchhre	LC
38	<i>Vanellus cinereus</i>	Grey-headed Lapwing	Raj Hutittyau	LC

Source: Field Survey, 2018

As per Wikipedia - List of Butterflies of Nepal based on the list prepared by Colin Smith in 2006, there are 690 species or sub species of butterflies in Nepal. The project area also provides habitats for a variety of butterflies, and during the walkover surveys, various types of butterflies were observed.

The commonly found Herpito-fauna (reptiles & amphibians) observed in the project area are shown in Table 19 given below:

Table 19: List of Herpito-Fauna in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Ptyas mucosus</i>	Rat snake	Dhaman	LC*
2	<i>Aretium Schistosum</i>	Olive Keelback Water Snake	Pani Sarpa	LC
3	<i>T. albolabris</i>	Green Pit Viper	Hariyo Sarpa	LC*
4	<i>Varanus Bengalensis</i>	Common Indian Monitor	Bhainse Gohoro	LC
5	<i>Calotes versicular</i>	Garden lizard	Chheparo	LC*
6	<i>Hemidactylus Flaviviridis</i>	House Lizard	Mausuli	LC*
7	<i>Bufo melanostictus/Duttaphrynus Himalayanus</i>	Common toad/Himalayan Toad	Khasre Bhyaguto	LC
8	<i>Rana cyanophylectis</i>	Stream Frog	Bhyaguto	LC*

Source: Field Survey, 2018

c) Aquatic Life

Similarly, the list of common fishes found in the project area is given below in Table 21. These species are found in the nearby water bodies of the project area that includes Sunkoshi River (Proposed Source) and Jhiku Khola.



ToR for IEE of Sunkoshi Panchkhal WSSP

Table 20: List of Fishes in the Project Area

S. No.	Scientific Name	English Name	Local Name	Status
1	<i>Garra Annandalei</i>	Stone Roller	Chuche Buduna	LC
2	<i>Glyptothorax Indicus</i>	Catfish	Mungri/Kavre	LC
3	<i>Heteropneustes fossilis</i>	Stinging Catfish	Singhi	LC
4	<i>Neolissocheilus hexagonolepis</i>	Katli	Katle	LC
5	<i>Mastacembelus Armatus</i>	Spiny Eel	Bam	LC
6	<i>Psilorhynchus Pseudecheneis</i>	Stone Carp	Tite	LC
7	<i>Schizothorax Progastus</i>	Dinnawah Snowtrout	Chuhhe Asala	LC
8	<i>Channa Gachua</i>	Dwarf Sankehead	Hile	LC

Source: Field Survey, 2018

There will be no significant effects on the lives of fish species as well as fisheries by the proposed project activities.

*Note:

(LC= Least Concern; VU= Vulnerable)

*Note: Though some species fall under VU category, the project activities will not affect the habitat of these species as the construction area does not interfere their habitats.

LC* are the status of the species according to IUCN Red List of Threatened Species however it is not included in IBAT report.

d) Protected Areas

The project area is not located in or near any national park, wildlife reserve, conservation area, hunting area, including a buffer zone area, world heritage site, and other protected areas. Hence, there is no possibility of intervention from the construction works of the proposed project in any of the protected areas.

e) Infrastructure facilities

i) Transportation, Electricity, and Communication

Panchkhal Bazaar, the project site is linked at Dhulikhel with Barhabise and Kathmandu along Arniko Highway. The project has all-weather black topped road passes from the middle of the service. The internal road in the service are mostly gravel and earthen. A few kilometer stretches from zero kilo to Palanchowk Bhagwati road has been black topped. The town is about 45km away towards east from capital city, Kathmandu.

The nearest airport from the project town is Tribhuvan International Airport, 43.7 Km west from the Panchkhal via Araniko Highway.

The area is well connected to the national electricity grid. The project area is connected to national and international telecommunication networks. Major national daily newspapers print regional editions and are available to readers.

ii) Educational Institutions

Panchkhal Municipality has well managed education facilities. There are various public and private educational institutions such as schools and colleges. The biggest school in entire Panchkhal town is Shree Sarbamangala Higher Secondary School. Likewise, there are various schools like Azad Higher Secondary School, Saraswati Shiksha Griha, Golden Future Higher Secondary School, Nawa Prativa Secondary School etc.

ToR for IEE of Sunkoshi Panchkhal WSSP

iii) Other institutions

There are several government and non-government offices including private institutions, community-based organizations, NGOs, banks and financial institutions within the service area. Likewise, about 39 governmental including Ilaka Forest Office, Ilaka Animal Husbandary Office, Panchakhal Ilaka Police Office, NEA Office, Nepal Telecom, Panchakhal Municipality office etc, non government and financial institutions; Bank and cooperatives are existing in the area and providing services to the community. The existing financial institutions are NCC Bank, Prabhu Bank, Laxmi Bank, Nepal Bank, Sindhu Bikash Bank, Dev Development Bank etc. Similarly, some cooperatives are also in operation in the area. Similarly, 22 hotels and lodge are available in the area.

iv) Quality of Life Values

The Project is not expected to affect any cultural or recreational resources adversely instead it will increase the existing quality of life due to the improvement in personal, household and community hygiene practices and community health.

f) Cultural and religious sites

This project town is famous for the existence of popular goddess temple Palanchowk Bhagwati temple. The project district, Kavre Palanchowk is named after the Goddess. The Project is not expected to affect this religious site.

2.20 Resettlement, Relocation and Compensation Issues

The proposed Project does not have any issues related to resettlement, relocation, and compensation.

2.21 Project Impact Area

The project impact area refers to the area of the project town which is susceptible to either significant or insignificant impacts by the proposed project. This impact area is delineated by demarcating the geographical boundary of the impact area on the topographical map. The impact area has been delineated on the basis of proximity of the construction site to the nearby surrounding areas. This area is divided into 'Core Area' and 'Surrounding Area' on the basis of vicinity and magnitude of the impacts due to construction and operation of the proposed project.

Here, the Core Area refers to the area required permanently as well as temporarily for the proposed project activities. This area includes service area of the project town which comprises of partial areas of ward 2, 3, 4, 6, 7, 8, 9, 10, 11 & 12.

The Surrounding Area refers to the area within the immediate surroundings of the proposed project. It includes the area of the project town which is not covered under the service area of the proposed project. It involves complete areas of ward 1, 5 & 13 and partial areas of ward 2, 3, 4, 6, 7, 8, 9, 10, 11 & 12 that are not covered under the service area.

ToR for IEE of Sunkoshi Panchkhal WSSP

3 PROCEDURES TO BE ADOPTED FOR THE STUDY

This ToR will explain various approaches, methodologies and procedures adopted to prepare a comprehensive IEE report which should follow the provisions of the EPA & EPR and related national and sectorial guidelines. The IEE study should focus on impact identification, prediction and finally evaluating the extent and weight of the impact. The Consultant should follow the following methodology for preparation of the report:

3.1 Literature Review/Desk Study

Available primary and secondary literature in the form of reports and maps; topographic maps, land use maps, aerial photographs, cadastral survey maps, etc. will be collected and reviewed. Feasibility Study Report and Detailed Engineering Design Report of the proposed project will be the key documents to determine the nature and scope of activities of the project that influences the environmental conditions of the proposal area. Rainfall & Other Meteorological data of the project town will be collected from the concerned authority. Similarly, published and unpublished reports about environmental policies, laws, rules, standards, Acts, Regulation and other legal provisions will be also collected and reviewed. Published and unpublished literature of the project area about biological, social, chemical, physical, and cultural environments in the form of maps, and reports, etc. will be collected from various sources and reviewed to get information on the coverage of the studies and fulfill the data gaps.

3.2 Impact Area Delineation

The possible areas where the anticipated impacts have either significant or insignificant effects will be delineated. To specify the area that would be covered by the assessment, the geographical boundary of the influence area will be delineated on the topographical map. This delineating methodology is called Impact Area Delineation. The impact areas will be delineated on the basis of proximity of the construction site to the nearby surrounding areas. The impact areas has been delineated as "Core Project Area", and "Surrounding Project Area" on the basis of proximity and magnitude of the impacts due to the proposed project activities.

Core Area: Here, the Core Area indicates the area required permanently as well as temporarily for the proposed project. This area refers to the service area as well the area where the construction of the project components will be carried out.

Surrounding Area: Here, the Surrounding Area indicates the area within the immediate surroundings of the core area of proposed project. It includes the area of the project town which is closely associated with the core area of the project.

3.3 Field Study

Field studies will be carried out in the project site areas in an extensive manner by a multidisciplinary team comprising a) an Environmental Specialist; b) Water Supply & Sanitation Engineer; c) Sociologist; d) Geo-hydrologist and e) Botanist. During the visit, baseline information on physico-chemical, biological, and socio-economic & cultural conditions of the core area and surrounding areas of the project area will be collected through simple checklist method and Survey Questionnaire method. During field study, Rapid Environmental Assessment (REA) Checklist (*Refer Annex 1*) as recommended by ADB as per SPS, 2009 will be duly followed and filled up. This checklist should include the data regarding physico-chemical, biological, socio-economic & cultural environment. Various approaches and methodological tools that should be used for the data collection of various environmental aspects during this field study are described below:

ToR for IEE of Sunkoshi Panchkhal WSSP

3.3.1 Physico-Chemical Environment

An extensive physical & chemical environment survey will be carried out by delineating the project impact area to collect the baseline information. Topographic and geomorphological features that include Landforms, Geology & Soil, Land use pattern, Landslide susceptibility etc. will be observed and documented. The data regarding Climate & Rainfall of the project town will be collected from the concerned authority. Similarly, information on air quality and noise quality condition will be collected through field observation and expert's judgment. Information on rivers and aquatic ecology will also be collected to assess the existing condition. Various consultations programs with the local communities and Interviews with few government officials, schools & representatives of the local bodies will be also conducted.

3.3.2 Biological Environment

The baseline information regarding biological environment will be collected through walkthrough survey throughout the core & surrounding areas of the project area by adopting simple checklist method (*Refer Annex II*), through professional judgment and local interaction. Under this baseline information in regard to the biological environment, types of vegetation and forests will be identified based on the species composition. The protected vegetation (rare, endangered, indigenous, etc.) of the project area as per IUCN Red Book, CITES Appendices, IBAT Report generated by ADB and GoN list species will be enumerated based on consultation with the local people and the expert judgment.

Information on rivers of the project area and aquatic ecology will be also collected through the interaction with the locals, the expert judgment and field observation.

The data on the existing wildlife/mammals, birds, herpetofauna (Reptiles/Amphibians) will be collected through field observation and interaction with the locals. The checklists as given in *Annex II* will be filled up accordingly. The status of each of these species will be identified as either threatened or near threatened or endangered species or least concern as per IUCN Red Book, IBAT Report of ADB, CITES Appendices and GoN list species. This will be affirmed by the expert review.

3.3.3 Socio-Economic & Cultural Environment

Household surveys will be conducted through interviews by simple questionnaire method to obtain information on the socio-economic & cultural environment that primarily includes demography, ethnicity, education, health & sanitation, drinking water condition of the project area, irrigation facility, local traditions, religions, land use patterns, incomes & expenditures and to acquire their perception towards the proposed project, etc. Information on Migratory patterns of the local people and the Impact of river on settlements & agriculture will also be collected. Information on the people residing within the core area of the proposed project town will be collected through socio-economic survey. The sample of Household Survey Questionnaire that should be filled up during household survey has been included in *Annex II*.

Focused Group discussions (FGD) will be conducted to obtain suggestions and comments from all the potential stakeholders. Direct observation (Transect Walk Method) will be conducted to ascertain the existence of the cultural sites, and public institutions such as temples, cremation grounds, historical & archaeological sites, schools, and health posts within the project core areas and to determine the effect on their existence due to project construction activities. The Consultations with the village elites, Meetings and Group discussions shall be done to assess the current situation of the project area community.



ToR for IEE of Sunkoshi Panchkhal WSSP

3.4 Public Notice

As the **Sub Rule 2 under Rule 7 of Chapter 1** of EPR 1997 with Amendments 2017 states that "Whilst preparing the report, the proponent shall, in the cases of initial environmental examination affix a notice in the concerned Village Development Committee or Municipality, Office of the District Development committee school, hospital, and health post requesting the Village Development committee or Municipality and District Development Committee or concerned individuals or institution to offer their written opinion and suggestions within Fifteen days with regard to the possible impact of the implementation of the proposal on the environment where the proposal is to be implemented and prepare a deed. The said Fifteen days' notice shall also be published in a national level daily newspaper. After the publication of such notice the opinions and suggestions so received in relation to the same shall also be included in the report."

Hence, here 15 days public notice should be pasted at the concerned authorities that include Municipality Office, DCC and other related institutions like Schools, Health Posts, and Hospitals etc. Accordingly, this 15 days public notice will be published in a national daily newspaper. The main aim of the notice is to seek written opinions from the concerned people and institutions regarding the possible impacts that may result from the implementation of the proposal.

3.5 Public Consultation

The **Sub Rule 2 under Rule 7 of Chapter 1** of EPR 1997 with Amendments 2017 also states that "The proponent shall organize a public hearing about the proposal at the area of Village Development Committee or Municipality where the proposal is to be implemented and collect opinions and suggestions". Hence, the public consultation program will be conducted to collect reviews from the concerned stakeholders after the completion of 15 days of public notice. This public consultation program should include Public Hearing Programs, FGD, Meetings and Various Discussion Programs.

3.6 Collection of Muchulkas (Deed of Inquiry) and Recommendation Letters

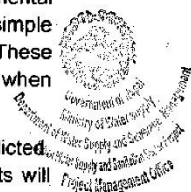
The deed of inquiry (Muchulka) from each concerned authority where 15 days public notice shall be pasted and each copy of this deed of inquiry will be included in IEE report. Similarly, recommendation letters from the local authority (Municipality) will be collected after the completion of 15 days from the date of publication of public notice.

3.7 Impact Identification, Prediction & Evaluation Methods

The information regarding Physico-chemical, Biological and Socio-economic & Cultural aspects as mentioned above will be collected to identify the susceptibility of these aspects to be affected by the proposed project activities. This will help to identify the anticipated environmental impacts of the proposed project. For this, Simple Checklist method shall be adopted for the impact identification. This will be carried out by using Rapid Environmental Assessment (REA) Checklist prepared by ADB (**Refer Annex I**) and by using simple household survey questionnaire (**Refer Annex II**) prepared during the desk study. These checklists will explain the environmental features or factors that need to be addressed when identifying the impacts of projects and activities.

Once all the important impacts will be identified, their potential characteristic will be predicted. The baseline data on physico-chemical, biological, socio-economic and cultural aspects will be used to estimate the likely characteristics and parameters of impacts that includes Nature, Magnitude, Extent and Duration.

The nature of each predicted impact will be classified into Direct (D) and Indirect (ID). The magnitude of the impact will be classified into High (H), Medium (M) and Low (L). The extent



ToR for IEE of Sunkoshi Panchkhal WSSP

will be classified into Site-Specific (SS), Local (L), and Regional (R). Similarly, the duration of impact will be classified into Short Term (ST), Medium term (MT), and Long term (LT).

Impact predictions will generally be made against a baseline established by the existing environment. Hence, during our field study, the baseline data will be used as reference point against which the characteristics and parameters of impact related changes will be analyzed. Impact predictions will also be made by considering the future state of the environment. This also requires professional judgment for accuracy.

After the impact identification and prediction method, these impacts may require evaluation to assess the adversity of adverse impacts and efficiency of beneficial impacts within the project core & surrounding areas. The impacts will be evaluated regarding the significance of the predicted impacts. This will be done by following the *National EIA Guidelines 1993* according to which scoring for each likely parameter of the impacts will be carried out and the level of significance will be assessed as recommended by these guidelines. The scoring of Impacts as per *National EIA Guidelines 1993* is tabulated below:

Table 21: Scoring of Impacts

S. No.	Likely Parameters of Impacts	Type	Scoring as per National EIA Guidelines, 1993
1.	Nature	Direct	No Scoring Required
		Indirect	
2.	Magnitude	High (H)	60
		Medium/Moderate (M)	20
		Low (L)	10
3.	Extent	Regional (R)	60
		Local (L)	20
		Site Specific (SS)	10
4.	Duration	Long Term (LT)	20
		Medium Term (MT)	10
		Short Term (ST)	5

Source: *National EIA Guidelines 1993*

Then, the significance level of Impact rated will be assessed as per the following table:

Table 22: Significance of Impacts

S. No.	Scoring as per National EIA Guidelines, 1993	Level of Significance as per National EIA Guidelines, 1993
1.	Less than 50	Insignificant
2.	50 to 75	Significant
3.	More than 75	Very Significant

Source: *National EIA Guidelines 1993*

This evaluation will be done as per the professional judgment by the key expert team involved in the IEE study.

3.8 Report Preparation

An IEE report shall be prepared in two different formats that include ADB Format & GoN Format (as per EPR 1997 & 2017). The outline of the report is given in Chapter 9 of this TOR. The draft report shall be presented to MoWS & ADB. Following to this, a final report will be prepared as soon as comments & suggestions on this draft report are received.



ToR for IEE of Sunkoshi Panchkhal WSSP

4 POLICIES, LAWS, RULES, DIRECTIVES, AND GUIDELINES

The consultant shall describe the pertinent regulations, standards that govern environmental quality, health and safety, protection of sensitive areas and endangered species, etc. at international, regional, district, municipality and Ward levels. Nepal is a signatory to many international conventions, including those concerning habitat, biodiversity, cultural heritage protection. These issues shall be considered during IEE, and their avoidance/mitigation measures shall be identified. The IEE should also be conducted in compliance with the following Laws, Acts, Rules & Regulation, Standard, Manuals, and Strategies:

Constitution of Nepal 2072 B.S. (2015 A.D.)

Plans, Policies & Strategies

- ADB's "Safeguard Policy Statement (SPS)", 2066 B.S. (2009 A.D.)
- Fifteenth Plan Approach Paper (2076/77-2080/81)
- Fourteenth Plan (FY 2073/74-2075/76)
- Land Use Policy, 2072 B.S. (2015 A.D.)
- National Forest Policy, 2075 B.S. (2019 A.D.)
- National Urban Development Strategy, 2074 B.S. (2017 A.D.)
- National Urban Water Supply & Sanitation Sector Policy, 2065 B.S. (2009 A.D.)
- National Urban Policy, 2063 B.S. (2007 A.D.)
- National Water Plan-Nepal, 2062 B.S. (2005 A.D.)
- National Water Supply & Sanitation Policy, 2071 B.S. (2014 A.D.)
- National Environmental Policy and Action Plan (NEPAP), 2050 B.S. (1993 A.D.)
- Rural Water Supply and Sanitation Sectoral Strategic Action Plan (Unofficial Translation), 2060 B.S. (2004 A.D.)
- Rural Water Supply and Sanitation National Policy and Rural Water Supply and Sanitation National Strategy, 2060 B.S. (2004 A.D.)
- Urban Water Supply & Sanitation Policy 2066 B.S. (2009 A.D.)
- Updated 15-Yr Development Plan for Small Towns Water Supply and Sanitation Sector, 2066 B.S. (2009 A.D.)
- Water Resources Strategy, 2059 B.S. (2002 A.D.)

Laws & Acts

- Essential Goods Protection Act, 2012 B.S. (1955 A.D.)
- Aquatic Animal Protection Act, 1961 A.D.
- Child Labour Prohibition and Regulation Act, 2056 B.S. (2001 A.D.)
- Environmental Protection Act 2053 B.S. (1997 A.D.) with latest amendments (2007 A.D. & 2017 A.D.)
- Forest Act, 2049 B.S. (1993 A.D.)
- Labour Act 2048 B.S. (1992 A.D.)
- Land Acquisition Act, 2049 B.S. (1993 A.D.)
- Local Government Operation Act, 2074 B.S. (2017 A.D.)
- Nepal Water Supply Corporation Act, 2046 B.S. (1989 A.D.)
- Solid Waste Management Act, 2068 B.S. (2011 A.D.)



ToR for IEE of Sunkoshi Panchkhal WSSP

- Town Development Act 2045 B.S. (1988 A.D.)
- Water Resources Act 2049 B.S. (1992 A.D.)
- Water Tax Act 2023 B.S. (1966 A.D.)
- Water Supply Management Board Act, 2063 B.S. (2006 A.D.)

Rules & Regulations

- Drinking Water Regulations 2055 B.S. (1998 A.D.)
- Environmental Protection Rules 2054 B.S. (1997 A.D.) with Amendments
- Forest Regulation 2051 B.S. (1995 A.D.)
- Labour Rules, 2075 B.S. (2018 A.D.)
- Solid Waste (Management & Resource Mobilization), Rules, 2044 B.S. (1987 A.D.) & Amendments 2049 B.S. (1992 A.D.)
- Solid Waste Management Rules, 2070 B.S. (2013 A.D.)
- Water Resources Regulations 2049 B.S. (1993 A.D.)

Standards, Manuals, Directives & Guidelines

- Guidelines for Community Noise by WHO, 2055 B.S. (1999 A.D.)
- Implementation Directives for the National Drinking Water Quality Standards 2062 B.S. (2005 A.D.)
- National EIA Guidelines 2049 B.S. (1993 A.D.)
- National Noise Standard Guidelines, 2068 B.S. (2012 A.D.)
- WHO Air Quality Guidelines, Global Update, 2061 B.S. (2005 A.D.)
- WHO Guidelines for Drinking-water Quality, Fourth Edition, 2073 B.S. (2017 A.D.)
- Working procedure for the use of national forest for national priority projects, 2074

Conventions & Treaties

Nepal is a signatory to many international agreements and conventions related to environmental conservation. However, all of those conventions are not interrelated to the proposed project. The conventions related to the proposed project are as follows:

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
- Convention on Biological Diversity (CBD), 1992
- International Covenant on Economic, Social and Cultural Rights (ICESCR), 1976
- Worst Forms of Child Labour Convention, 1999



ToR for IEE of Sunkoshi Panchkhal WSSP

5 REQUIRED TIME, ESTIMATED BUDGET AND SPECIALISTS REQUIRED FOR PREPARING THE REPORT

This includes the schedule, estimated budget and appropriate human resources (experts) for conducting the IEE study.

5.1 Time Schedule

Considering the time limitations, the study will have to be completed within about 9 weeks. The work schedule is presented in **Table 23** given below:

Table 23: Proposed Work Schedule

Activity / Work	Weeks								
	1	2	3	4	5	6	7	8	9
Literature Review/Desk Study	■								
Preparation and Approval of TOR		■							
Field Study			■	■	■				
Public Notice					■	■	■		
Public Consultation & Collection of Deed of Inquiry & Recommendation Letters							■		
Impact Identification through Data Evaluation /Preparation of Draft IEE Report				■	■	■	■	■	
Submission of Final IEE Report								■	■

5.2 Estimated Budget

The total estimated budget for conducting IEE study for the proposed project is approximately NRs.500, 000.00. This cost will not be included in detailed engineering design report as it is a separate study.

5.3 Human Resources Required

As the IEE requires different personnel for specific tasks, the following inter-disciplinary team will be required. A team leader will be required to coordinate the different tasks of the personnel involved. The Team will consist of:

- Team Leader
- Environmental Specialist
- Water Supply and Sanitation Engineer
- Sociologist
- Geo-hydrologist
- Botanist/Forester

Three to four enumerators will also be required to help the team. The IEE team will also benefit from the inputs provided by the design team.



6 ANTICIPATED IMPACTS OF THE PROPOSED PROJECT ON ENVIRONMENT

The anticipated environmental impacts are mainly categorized into two viz., Beneficial Impacts and Adverse Impacts on the basis of its negative and positive significance. This is then further categorized into four impacts that includes i) Impact on Physical Environment, ii) Impact on Biological Environment, iii) Impact on Chemical Environment and iv) Impact on Socio-economic Environment, based upon the effects on the existing environment. These impacts are sub divided into three categories based upon the project phase that includes i) Design Phase, ii) Construction Phase and iii) Post Construction (Operation & Maintenance) Phase. These impacts are discussed below in detail.

The impacts shall be characterized as (i) low, high & medium regarding magnitude, (ii) long term, short term & medium term regarding duration and (iii) site-specific, local & regional/national regarding extent. The anticipated impacts are stated below:

6.1 Beneficial Impacts

6.1.1 Impact on Socioeconomic Environment

a) Construction Phase

- i) Employment Generation
- ii) Skill Enhancement
- iii) Local Trade & Business Opportunity

b) Operation Phase

- i) Improved Health & Hygiene
- ii) Increased Economic Opportunity
- iii) Social Empowerment

6.2 Adverse Impacts

6.2.1 Impact on Physical Environment

a) Design Phase

- i) Soil Erosion and Slope Instability

b) Construction Phase

- Soil Erosion and Land Surface Disturbance
- Spoil Disposal
- Air Pollution
- Noise Pollution
- Generation of Solid Wastes & Wastewater from the construction sites and worker's camp
- Accidental Leakage or Spillage of Stored Fuel/Chemicals
- Impact on Land Use Pattern
- Disruption to Natural Drainage
- Haphazard Disposal of Dismantled Debris

6.2.2 Impact on Biological Environment

a) Construction Phase

- (i) Impact on Flora & Fauna
- (ii) Impact on Aquatic Life
- (iii) Forest Fire



ToR for IEE of Sunkoshi Panchkhal WSSP

- (iv) Forest Encroachment
- b) Operation Phase
- (i) Impact on Aquatic Life

6.2.3 Impact on Chemical Environment

- a) Construction Phase
- i) Impact on Water Quality of the nearby rivers
- b) Operation Phase
- i) Impact on Quality of Water Stored in Reservoir
- ii) Impact on Water Bodies

6.2.4 Impact on Socio-economic Environment

- a) Design Phase
- i) Structural Instability
- ii) Health & Safety of Community & Workers
- iii) Damage to the existing facilities
- b) Construction Phase
- i) Community Health & Safety Hazards
- ii) Workers' Health & Safety Hazards
- iii) Traffic Congestion
- iv) Disruption to Local Vendor's Business
- v) Mobilization of Child Labor
- vi) Impacts on Sustainability of Works
- vii) Damage to the existing facilities
- viii) Impact on Downstream Water Users
- c) Operation Phase
- i) Occupational Health & Safety Hazards
- ii) Delivery of Unsafe Water
- iii) Impact on Consumer's Health
- iv) Non-sustainability of Services or Completed Works



ToR for IEE of Sunkoshi Panchkhal WSSP

7 MATTERS CONCERNING THE PREVENTION & AUGMENTATION OF THE IMPACTS OF THE IMPLEMENTATION OF THE PROPOSAL ON THE ENVIRONMENT

To sustain the project, it is necessary to deal with the anticipated impacts properly. Hence, there is requirement of proposal of effective measures to cope with these impacts. Here, the proposed measures shall include a) Mitigation Measures to reduce or eliminate or avoid the adverse impacts and b) Augmentation Measures to maximize the beneficial impacts.

These Mitigation & Augmentation measures will be proposed for each anticipated impact. These measures shall primarily involve a) Mitigation Measures like Slope Protection Measures, Air Quality Monitoring, Noise Quality Monitoring, Waste Management, Prompt Backfilling, Awareness regarding Workers & Community Health & Safety Hazards etc. and b) Augmentation Measures like Prioritizing Local Labors, Provision of regular hands on training to the workers during the project construction period, Prioritizing Local Products, Prioritizing underprivileged group of people especially women and poor people in various capacity building programs and project related community meetings. These all will be discussed in detail in IEE Report.

These Mitigation & Augmentation measures will have to be incorporated from the planning stage onwards. In general, the following area shall be covered while preparing mitigation measures:

- a. Project design/pre-construction phase
- b. Project construction phase
- c. Project operation and maintenance phase

The concerned agencies like UWSSSP, DWSSM, WUSC and local agencies, local administration, police officers shall be consulted during the implementation of mitigation measures. The proponent will be required to prepare the Environmental Management Plan (EMP), and these measures shall be outlined in EMP to implement the proposed measures during project implementation.



Enclosure

8 ALTERNATIVE ANALYSIS

An alternative analysis of the project shall be considered as an integral part of the IEE study, which involves alternative ways of achieving the objectives of a proposed project in terms of environmental point of view. Alternative analysis will aim to attain suitable & feasible option of the proposed project, which shall be conducted during the study to minimize the possible negative environmental impacts. Alternative measures to the proposed project to meet the same project objectives will be described under the following aspects:

- a) **Without-Project or Do-Nothing Alternative:** This will help to analyze the condition of the existing environment of the project town in the absence of the proposed project.
- b) **With Project Alternative:** This will help to envisage the likely benefits of the proposed project in terms of environmental point of view. This will also assess the limitation of "Without Project" Alternatives. This will further analyze the alternatives to assess the most cost-effective, reliable and efficient system. This alternative will involve the following aspects:
 - i. **Alternatives Relative to Planning & Design**
 - Alternative Sources
 - Alternative Design
 - Selected Proposed Alternative

Alternatives regarding potential environmental impacts, capital & operating costs, institutional training and monitoring requirements should be described. The costs and benefits of each alternative should be quantified (wherever possible), and incorporating the estimated costs of any associated mitigation measures. The "Without project" option is always open.

This will also involve the analysis of "With No Forest" alternative if any national priority forests are observed to be located within the core area of the proposed project. However, our initial study shows that there will be no requirement of this alternative as there will be no interference of the proposed project components in any of the existing community forest areas.

8.1 Alternative System Analysis

The system alternatives need to be developed to assess the most cost effective, reliable and efficient system that can serve the design population. Optimization of a proposed water supply system can be done in terms of system layout, alternative technology, alternative materials, alternative source and environmental impacts. In case of the Sunkoshi Panchkhal Town Project, the system design has been done under two scenarios.

8.2 Alternative Assessment

In the feasibility study of Sunkoshi Panchkhal Water Supply System, two alternatives have been considered using alternate system layouts – keeping other parameters constant. Both alternatives is mixed (partly pumped and partly gravity).

The option I and option II are almost same but the design of transmission is different. In case of Option I, the transmission main comprises double pipe system while option 2 comprises only single pipe system.

8.2.1 System Alternative I

The proposed intake site is located at the right bank of Sunkoshi River at Bimire Dobhan, which is about 2.0 km downstream of Dolalghat Bazaar. The system will be pumping system. First of all, water will be pumped from sump well (at elevation 585m) to be constructed at river bank to four stage pumping with pumping head 175m to 200m at each stage to reach water at the treatment plant at an elevation 1425m. After water reaching at Bhairab Mandir WTP/

ToR for IEE of Sunkoshi Panchkhal WSSP

ridge, 2 nos. of the submersible pump of 20 HP (only one pump run at a time) will be used to pump the water for RVT-10 at Palanchowk Bhagwati from WTP/ storage reservoir. Likewise, another 2 no. - 5HP (only one pump run at a time) will be used to pump water for RVT-12 at Bhimsenthan for the filterbackwash and supply water to RVT-11 (Kharelthowk).

Another major pipe line from the storgae reservoir will go to nine reservoirs by gravity system. Two parallel pipes are used in main transmission for water lifting purpose from sumpwell to WTP site. The total estimated transmission pipe line length ie sump well to WTP/ Bhairab Mandir is 9,135.00 m.

8.2.2 System Alternative II

The option I and option II are almost same but in option II, the main transmission has only one pipe. The total estimated transmission pipe line length i.e. Sump well to WTP/Bhairab Mandir is 6,784.00m.

8.2.3 Selected/Proposed Sub Project

The initial project cost for the option I is about 3.31% higher than the cost of option II. But the O&M cost of both options are same. The reason behind the increase in cost is inclusion of two pipes from source/ intake/ sump well to WTP/ storage reservoir. Due to the pumping system, two parallel pipes are designed in Option I to avoid interruption of supply during pipe damage. The conventional water treatment process has been proposed for both alternatives.

The source is about 6.8km downstream towards east from the proposed WTP. All the infrastructures are proposed at WTP area. The transmission line passes through the bushes, foot trail and road. There are no other settlements along the transmission main route. Hence, there will be no human interference into the system during operation phase. There is provision of fencing works for the protection of the intake and all structures at pumping stages.

The financial indicator also indicates that the affordability percentage of the source option I and II is almost same. The affordability is in between 3%-5% in option I and II. Financially, option II is slightly economical than option I. However, the option I is financially feasible too. Despite of increase in cost, due to use of double pipeline system in Option I; it avoids interruption of water supply service during unanticipated damage periods. Apart of this, in terms of environmental point of view, both options do not pose any other significant environmental threats.

Regarding technical, financial & environmental aspects, option I is recommended for further study though the cost is slightly higher than option II. Hence, Option I has been selected as the best feasible option.

ToR for IEE of Sunkoshi Panchkhal WSSP

9 MATTERS TO BE MONITORED WHILE IMPLEMENTING THE PROPOSAL

9.1 Environmental Management Plan

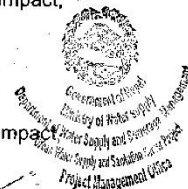
The project proponent has to develop an Environmental Management Plan (EMP) to manage all the perceived environmental impacts of the project systematically. It shall be therefore based on the mitigation measures for the project induced impacts. An Environmental Management Plan (EMP) has a dual purpose. It is designed to monitor the contractor's work during project implementation. It helps to check contractual compliance with specified mitigation measures. It also helps in making periodic checks on the actual environmental impacts of the Project over the years following completion of the works and compares these with those impacts anticipated at the time of Project Appraisal. EMP, therefore, provides the necessary feedback required for correcting potentially serious Project deficiencies; and for the planning of other projects. EMP shall include the responsibilities of different stakeholders based on preliminary plans and schedules. This program shall include measures required during the project design, construction and operational phases and shall include recommendations on allocation of components of EMP to the various parties involved. Feasible and cost-effective measures to prevent/mitigate/reduce significant negative impacts should be recommended in an Environmental Management Plan. The impacts and costs associated with implementing the measures will have to be detailed. EMP will include proposed work programs, budget estimates, schedules, staffing and training requirements and other support services to implement the mitigating measures.

9.2 Environmental Monitoring Plan

The project will develop an Environmental Monitoring Plan for the activities during design, construction and operation phase of the project. The environmental monitoring of the project includes field supervision and reporting of project activities before and during the project construction and operation to ensure that the works are being carried out by the approved design and that the environmental mitigation measures are fully implemented by EMP. A monitoring system will be developed involving (i) front line monitoring (ii) monitoring by the government line agencies or independent monitors. To ensure the effective implementation of environmental monitoring plan (EMP), EMP matrix must be prepared in a tabulated form which must be followed by the concerned authorities during each phase of the project. The sample of EMP Matrix is given in Annex III. The details in EMP matrix must be given in detail in IEE report.

The table of EMP matrix must include the following matters;

- a) Types of Environmental Impacts
 - This may be Impacts on either Physical Environment or Biological Environment or Chemical Environment or Socio-economic Environment.
 - As for e.g. If Soil Erosion & Land Surface Disturbance is an anticipated impact, this will be categorized under 'Impact on Physical Environment'
- b) Project Phase
 - Design Phase/Construction Phase/Operation Phase-This will be confirmed as per the nature of the anticipated impacts.
- c) Field of Anticipated Environmental Impacts
 - As for e.g.; If Soil Erosion & Land Surface Disturbance is an anticipated impact, the field should be "Topography/Geology".
- d) Proclamation of Anticipated Environmental Impacts
 - E.g. Soil Erosion & Land Surface Disturbance
- e) Mitigation measures for the Anticipated Environmental Impacts
 - As for e.g.; If Soil Erosion & Land Surface Disturbance is an anticipated impact, the proposed mitigation measures should be as follows;



ToR for IEE of Sunkoshi Panchkhal WSSP

- Protecting the foundation from damage during backfilling
- Using the right backfill materials
- Compacting the backfill
- Final finishing the subgrade to ensure that water drains away from the foundation
- f) Statement of Authorities responsible for the implementation of the proposed mitigation measures
 - As for e.g.; for the impact; Soil Erosion & Slope Instability, the responsible authority will be 'The Contractor' as this impact may be encountered during the construction phase.
- g) Monitoring Indicators
 - As for e.g.; the monitoring indicators for the above-mentioned impact will be Field Supervision by PMO & DSMC.
- h) Frequency of Indicators
 - As for e.g.; If Soil Erosion & Land Surface Disturbance is an anticipated impact, the frequency of the monitoring indicator will be Weekly Field Supervision.
 - As mentioned above, details of each & every impact should be given in this EMP matrix.

9.3 Information Disclosure, Public Consultation, and Participation

Public consultation is the process of exchanging information with those persons and organizations with a legitimate interest in a project and who are likely to be affected by the project (stakeholders). It is a two-way process that informs and involves the community in developing a project and informs the proponent about issues and concerns, which can then be addressed in project design. Information disclosure involves stakeholders in monitoring the development and implementation of a project and fosters openness in decision-making by presenting documents and other project materials for public scrutiny. The consultation and disclosure involve consultation with stakeholders at an early stage of project preparation, and throughout project implementation. As a minimum, stakeholders will be consulted regarding the scope of the environmental study before work has commenced in earnest, and should then be informed about the likely impacts of the project and proposed mitigation once the draft IEE report is under preparation. The report should record the views of stakeholders and indicate how these have been taken into account in project development. Information is disclosed through public consultation and more formally by making documents and other materials available and at a location in which stakeholders can easily access them. This normally involves making draft reports available (in the local language) at public locations in the community and providing a mechanism for the receipt of comments and making documents available more widely.

Public consultation and involvement should be given highest priority in the implementation of mitigation measures. Public consultation should take place and by decision of the consultation meeting, implementation of mitigation measures should be prioritized and should be carried out with the involvement of the local people.

Monitoring is one of the components of EMP. The results of monitoring should also be disclosed in the form of demonstration, charts, figures, graphs, and samples, etc., to the local people, school students, and other interested stakeholders. In the process of compliance monitoring of the project construction, local people and construction workers should be consulted.

9.4 Grievance Redress Mechanism

A project-specific grievance redress mechanism (GRM) will be established by MoWS as the project executive agency to receive, evaluate and facilitate the resolution of affected persons' concerns, complaints, and grievances related to social, environmental and other concerns on



ToR for IEE of Sunkoshi Panchkhal WSSP

the project. GRM will aim to provide a time-bound and transparent mechanism to resolve such concerns. GRM will also have support system as Grievance Redress Committee (GRC).

GRC will be formed at the Project level, comprising: (i) Chief of WSSDO; (ii) members of WUSC; (iii) two representatives of affected persons, a male, and a female; (iv) a member of IP community, preferably female; (v) a representative of a non-government organization or community-based organization actively involved in IP development/other backward communities in the area, if any; (vi) local government representatives, i.e., Municipality and DCC; (vii) DSMC social safeguard expert; and (viii) DSMC environmental safeguard expert (ESE).

The environmental safeguard assistant (ESA) of the ICG will oversee the implementation/observance of the mechanism for environmental complaints at the project level. He/she will be technically advised, supported and trained by DRTAC's environmental specialist and the DSMC ESE. PMO's Environmental Officer will oversee the implementation/observance of GRM in all projects. Representatives of affected persons (APs), civil society and eminent citizens will be invited as observers during GRC meetings. Contractors and WUSCs (as Operators) will be required to designate their respective counterpart GRM staff. The Social Development Officer at RPMO will be the focal person for facilitating the grievance redress at the local level.


Government of Nepal
Ministry of Water Supply and Sanitation
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

10 REPORT

The IEE report shall be prepared as per this ToR. The IEE report, whenever applicable, shall contain location maps, graphs, photographs, tables, and matrix. The IEE report will be prepared in two different formats which is shown in detail below:

I) ADB Format (For submission to ADB)

The outline of IEE report as per this format is as follows:

List of Abbreviations

Table of Contents

Executive Summary

1. Introduction
2. Policy & Legislative Framework
3. Analysis of Alternatives
4. Description of the Proposed Project
 - 4.1 The Study Area
 - 4.2 Description of the Site and Surroundings
 - 4.3 The Proposal
5. Description of the Environment
 - 5.1 Existing Environment
 - 5.1.1 Landforms, Geology & Soils
 - 5.1.2 Climatic Condition
 - 5.1.3 Water Quality
 - 5.1.4 Air Quality
 - 5.1.5 Acoustic Environment
 - 5.1.6 Biodiversity
 - 5.1.7 Physical & Cultural Heritage
 - 5.1.8 Socio-economic Conditions
6. Anticipated Environmental Impacts & Mitigation Measures
7. Information Disclosure, Consultation and Participation
8. Grievance Redress Mechanism
9. Environmental Management Plan
10. Conclusion & Recommendations

[Handwritten signature]
Project Manager



ToR for IEE of Sunkoshi Panchkhal WSSP

II) Format as per provided in EPR (1997 A.D. with latest amendments made in 2017 A.D.) -(For submission to the MoWS)

- List of Abbreviations
- Table of Contents
- Executive Summary (in English and Nepali)
 1. Introduction
- Name of the Consultant preparing the report
 2. Description of the Project
- General Introduction
- Relevancy of the Project
 3. Methodology Policy, Legal & Administrative Framework
 4. Estimated Time & Budget for the preparation of the report
 5. Existing Environment
 6. Anticipated Environment Impacts
- Physical Environment
- Chemical Environment
- Biological Environment
- Socio-economic Environment
 7. Analysis of Alternatives
 8. Mitigation & Augmentation Measures
 9. Monitoring & Reporting
 10. Other Necessary Matters

(Notes: Here, Other Necessary Matters include some topics like a) Information Disclosure, Consultation & Participation, b) Grievance Redress Mechanism, c) Environmental Management Plan, d) Conclusion & e) Literature Reviewed). Among these topics, first three topics will be included before the topic "Monitoring & Reporting" while the remaining two topics will be included after this topic.)

This IEE format for MoWS is as per Schedule-5 (Pertaining to Rule 7) of EPR, 1997 with latest amendments 2017 which is included as follows:



ToR for IEE of Sunkoshi Panchkhal WSSP

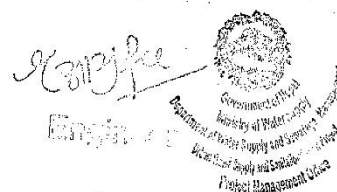
Schedule-5

(Relating to Rule 7)

Matter to be mentioned while preparing reports relating to

Initial environmental examinations:

1. **Name and address of individual or institution preparing the report:**
2. **Summary of the proposal: (To briefly mention the following matters in regard to the possibly impact of the implementation of the proposal on the environment):**
 - (a) Objectives of the proposal
 - (b) Impact on land-use.
 - (c) Adverse impact on the environment impact on human life, and population pressure,
 - (d) Damage to be suffered by local goods or objects,
 - (e) Other necessary matters.
3. **The following matters must be explicitly mentioned in respect to the proposal:**
 - (a) Type of proposal, (i) Processing, (ii) Manufacturing, (iii) Installation, (iv) Service delivery, (v) Others
 - (b) If related to delivery, the nature and type of goods to be delivered.
 - (c) Proposal's: (i) Installed capacity, (ii) Number of hours to be operated per day or year,
 - (d) Materials to be used (quantity and year to be mentioned),
 - (e) Emission resulting from the implementation of the proposal (the time of operation and the consequent volume of emission to be specified): (i) Solid (ii) Liquid (iii) Air, (iv) Gas, (v) Noise (vi) Dust, (vii) Others
 - (f) Energy to be used: (i) Type, (ii) Sources (iii) Volume of consumption (per day and year)
 - (g) Human Resource requirements
 - (h) Resources required for the implementation of the proposal:
 - (i) Total (Gross) capital (ii) Working capital (iii) Land area, (iv) Building and their types, (v) Machinery and tools (vi) Others.
 - (i) Detailed particulars of the area where the project is to be implemented;
 - (i) Maps, (ii) Population and condition relating to settlements in the area as well as in the nearby areas, (iii) Particulars of any sensitive things or objects, if any, located close to the area where the proposal is to be implemented (iv) Current situation (v) Sources of water (vi) Arrangement made for disposing or processing the waste (vii) Paths for movement in the area where the proposal is to be implemented
 - (j) Manufacturing processes
 - (k) Details of the technology
 - (l) Other necessary matters.



ToR for IEE of Sunkoshi Panchkhal WSSP

- 4. Impact of the implementation of the proposal on the environment:**
 - (a) Impact on the social, economic cultural spheres:
 - (i) Impact on human health, (ii) Degradation of cultivable land, (iii) Destruction of forests, (iv) Changes in social, cultural and religious norms and value, (v) Others.
 - (b) Biological Impact: (i) Population, (ii) Flora and fauna. (iii) 'Natural habitat and communities
 - (c) Physical Impact: (i) Land, (ii) Atmosphere, (iii) Water, (iv) Noise, (v) Man-made objects, (vi) Others
- 5. Alternatives for the implementation of the proposal:**
 - (a) Design (b) Project site (c) Processes, time-schedule, (d) Raw materials to be used, (e) Others
- 6. Alternatives to reduce or control the impact of the implementation of the proposal on the environment**
- 7. Matters to be monitored while implementing the proposal. 8. Other necessary matters.**

Note: - Data, maps, Photographs, tables, charts graphs etc. shall be enclosed, as required,

[Signature]
[Stamp]
Commission of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage
Urban Water Supply and Sewerage
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

11 OTHER NECESSARY MATTERS

Other necessary matters to be included in the IEE report will be Relevant Information, Literature Reviewed and Annexes that shall include Approved Terms of Reference, Checklists, Maps, Minutes of meetings, Tables & Charts, Questionnaires and Photographs to be used at the time of carrying out the baseline survey. The report will clearly recommend whether an Environmental Impact Assessment (EIA) is required or whether an Initial Environmental Examination (IEE) is sufficient for the proposed project.

[Signature]
Engineer
[Circular Stamp]

ToR for IEE of Sunkoshi Panchkhal WSSP

12 LITERATURE REVIEWED

ADB, 2003. *Environmental Assessment Guidelines*.

Constitution of Nepal (2015). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

District Development profile of Nepal 2010/11 with VDC Profile. A Socio-Economic Development

District Health Office, Kavrepalanchowk, 2062/63

Environmental Assessment and Review Framework, (2017). Regional Urban Development Project (RUDP), Ministry of Urban Development (MoUD), Government of Nepal for ADB

Environmental Assessment and Review Framework, (2018). Urban Water Supply & Sanitation (Sector) Project, Ministry of Water Supply, Government of Nepal for ADB

Environment Protection Act, (1997). Ministry of Science, Technology and Environment Kathmandu

Environment Protection Rules, (1997 with latest amendments 2007 & 2017), Ministry of Science, Technology and Environment, Kathmandu

Environment Statistics of Nepal, CBS, 2011

Environmental Impact Assessment Guidelines, (1993). National Conservation Strategy Implementation Project, National Planning Commission, His Majesty's Government, Nepal

Feasibility Study of Sunkoshi Panchkhal Water Supply and Sanitation Project, 2015

Draft Detailed Engineering Design Report of Sunkoshi Panchkhal Water Supply & Sanitation Project, 2018

Draft Socio-Economic Profile of Sunkoshi Panchkhal Water Supply & Sanitation Project, 2018

National Urban Policy (2007). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

Proximity Report Generated by the Integrated Biodiversity Assessment Tool (Panchkhal Town), (2018), ADB

Shrestha K 1998. Dictionary of Nepalese Plant names. Mandala Book Point, Kathmandu, Nepal.

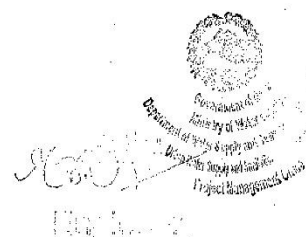
Solid Waste Management Act (2011). Ministry of Science and Technology and Environment, Kathmandu

The Updated Fifteen-Year Development Plan for Small Towns' Water Supply and Sanitation Sector, 2009

Uprety, B.K (2003). Safeguard the Resources Environmental Impact Assessment Process and Practice, Kathmandu

Water Resource Act (1992). Ministry of Law, Justice and Parliamentary Affairs, Law Books Management Board, Kathmandu

https://en.wikipedia.org/wiki/List_of_butterflies_of_Nepal



ToR for IEE of Sunkoshi Panchkhal WSSP

ANNEXES

[Signature]
EMPLOYEE



ToR for IEE of Sunkoshi Panchkhal WSSP

ANNEX I

ADB's REA Checklist & Preliminary Climate Risk Screening Checklist

[Signature]
Project Manager


Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sanitary Management
Water Supply and Sanitation Sub-Project
Project Management Office

ToR for IEE of Sunkoshi Panchkhal WSSP

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

Country/Project

NEP: Urban Water Supply and Sanitation (Sector) Project

Title: Subproject:

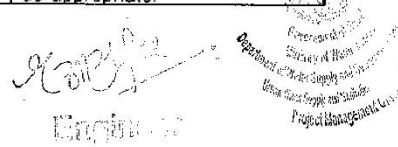
Sunkoshi Panchkhal Water Supply and Sanitation Project

Screening Questions	Yes	No	Remarks
A. Project Siting: Is the project area			
Densely populated?		√	Panchkhal Municipality has a moderate population density.
Heavy with development activities?		√	
Adjacent to or within any environmentally sensitive areas?			
Cultural heritage site		√	
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	
B. Potential Environmental Impacts Will the Project cause...			
pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and		√	

K. K. S. S.
Engineer
Department of Water Supply and Sanitation
Ministry of Water Supply and Sanitation
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

Screening Questions	Yes	No	Remarks
Soil erosion runoff?			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	
Hazard of land subsidence caused by excessive ground water pumping?		√	The proposed project shall be using surface water source only.
Social conflicts arising from displacement of communities		√	
Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	
Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	√		Water Treatment proposed in detailed design and water quality monitoring in EMP will ensure the water supply as prescribed in the NDWQS & its Directives.
Delivery of unsafe water to distribution system?	√		Water Treatment proposed in detailed design, water quality monitoring and continuous trainings to WUSC as stated in EMP will ensure the water supply as prescribed in the NDWQS & its Directives.
Inadequate protection of intake works or wells, leading to pollution of water supply?	√		Provision of retaining wall and gabion protection wall for the proposed sump well at the
Over pumping of ground water, leading to salinization and ground subsidence?		√	There is no use of groundwater source.
Excessive algal growth in storage reservoir?	√		EMP provides mitigation measures.
Increase in production of sewage beyond the capabilities of community facilities?			EMP provides mitigation measures.
Inadequate disposal of sludge from water treatment plants?	√		EMP provides mitigation measures.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	
Impairments associated with transmission lines and access roads?			Transmission lines and access roads will not be affected. As stated in EMP, Impaired access roads will be repaired as appropriate.


 Engineer

ToR for IEE of Sunkoshi Panchkhal WSSP

Screening Questions	Yes	No	Remarks
Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	√		EMP provides measures to mitigate health and safety impacts from improper handling, potential accidents or human error in dosing.
Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?	√		EMP provides measures to mitigate health and safety impacts from improper handling, potential accidents or human error in dosing.
Dislocation or involuntary resettlement of people?		√	
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
Noise and dust from construction activities?	√		EMP provides
Increased road traffic due to interference of construction activities?	√		EMP provides mitigation measures.
Continuing soil erosion/silt runoff from construction operations?		√	
Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	√		EMP incorporates monitoring of distributed water according to the Directives for the NDWQS.
Delivery of water to distribution system, which is corrosive due to inadequate attention to the feeding of corrective chemicals?	√		EMP provides mitigation measures.
Accidental leakage of chlorine gas?		√	
Excessive abstraction of water affecting downstream water users?		√	Water irrigation in the vicinity comes from existing wells near
Competing uses of water?		√	
Increased sewage flow due to increased water supply	√		EMP provides mitigation measures.
Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		Sullage is currently led to drains or to the backyard to percolate/seep through the ground. There is no provision of wastewater collection & treatment system. EMP provides mitigation
Large population influx during project construction and operation that causes an increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	
Social conflicts if workers from other regions or countries are hired?	√		Expected as low concern. Priority will be given to local workers.



EMEP

ToR for IEE of Sunkoshi Panchkhal WSSP

Screening Questions	Yes	No	Remarks
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?	✓		EMP provides mitigation measures.
Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and	✓		EMP provides mitigation measures.

[Signature]
Engineer


Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage Services
Office of the Project Manager
Project Management Office

ToR for IEE of Sunkoshi Panchkhal WSSP

Preliminary Climate Risk Screening Checklist for Sample Sub Project Towns

Screening Questions	Score	Remarks
Location and design of project Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides	0	Investments in the sample sub project will not likely be affected by climate change and extreme weather events due to the siting of project. For example all pipes will be constructed below ground no investments will be sited in flood plains etc.
Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g. sea-level, peak river flow, reliable water level, peak wind speed etc.)	0	
Materials and maintenance Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity, and hydro metrological parameters) affect the selection of project inputs over the life of project outputs (i.e. construction materials)	0	
Performance of Project Outputs Would climate/weather conditions and related extreme events likely to affect the performance throughout their design life time?	0	Climate conditions will unlikely affect water quantity and quality of water supply system. The water supply schemes will be designed to meet the current and future demand. Further water supply system will be operated and maintained efficiently to reduce system losses. Water safety plans will be implemented to ensure water supplied is safe and potable at all times.

Options for answers and corresponding scores are given below.

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned as medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low Other comments: None



ToR for IEE of Sunkoshi Panchkhal WSSP

Annex II

Checklists for Baseline Information Collection & Sample Questionnaire for Socio-economic Survey

[Signature]
Engineer


Government of Nepal
Ministry of Water Supply and Sewerage
Koshi State Supply and Sewerage
Project Management Office

ToR for IEE of Sunkoshi Panchkhal WSSP

Simple Checklists for Baseline Information Collection

A. Physical Environment

Parameters	Description
Topography	
Geology (Rock and Soil Types)	
Erosion and Sedimentation	
Climate	
Quarry Sites (If any)	
Sites for Labor Camp	
Site for Storage and Stockpiling	
Land Use	
Air Quality	
Water Quality	
Noise Level	
Spoil disposal sites	
Drainage Network	



ToR for IEE of Sunkoshi Panchkhal WSSP

B. Vegetation and Wildlife
Vegetation in the project area

SN	Local Name	Botanical Name	Location	Vegetation Type	Local Status	Local Use	Protection Status			
							IUCN	CITES	GoN	IBAT

Mammals in the project area

SN	Common Name	Scientific Name	Habitat	Local Status	Crop/Livestock Ralder	Local Use	Protection Status			
							IUCN	CITES	GoN	IBAT

Birds Sighted in the project area

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT

Herpeto-fauna in the Project Area

S.N.	Local Name	Scientific Name	Habitat	Local Status	Protection Status			
					IUCN	CITES	GoN	IBAT

Fish in the Project Area

S.N.	Local Name	Scientific Name	Status Occurrence	of	Migratory Status/Season	Observed Location

[Handwritten signature]
Engineer

[Circular stamp]
Department of Environment
Ministry of Environment
Government of Nepal
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

C. Socio-Economic and Cultural Environment

D. Landslides and Erosion Prone Areas

Parameter	Description
Demography	
a) Population (Male, Female) b) Caste Ethnicity c) Language d) Religion and Culture e) Literacy	
Occupation	
Migration Patten	
Public Health and Sanitation	
Drinking Water Supply	
Education Facilities	
Communication	
Fuel and Energy	
Road and Transportation	
Land Holding	
Food Sufficiency	
Irrigation	
Health Care System	
Market	
Business and Industries	
Religious and Cultural Sites	
Non governmental activities	
Development Potential	
Detail of Project Affected Structures	

SN	Locations or (Left/Right)	Size of Failure	Cause of Failure	Protection Structure

Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage
Project Management Office

ToR for IEE of Sunkoshi Panchkhal WSSP

E. Settlements and Population

SN	Settlement	VDC & Ward	HH	Population			Caste/Ethnicity
				Male	Female	Total	



 National Drinking Water Agency

 Nepal

ToR for IEE of Sunkoshi Panchkhal WSSP

CHECKLISTS FOR FOCUS GROUP DISCUSSION

Date:

Project:

Venue:

Number of Participants:

Purpose Statement:

Discussion, Responses & Outcomes:

No.	Questions/Issues by the Consultant	Responses or Findings
1		
2		
3		
4		
5		
6		

Signature
English


Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sanitation
Water Supply and Sanitation Sector Project
Project Management Office

ToR for IEE of Sunkoshi Panchkhal WSSP

तेश्रो साना शहरी खानेपानी तथा सरसफाइ आयोजना
घरघुरी सर्वेक्षण वृत्तित प्रश्नावली
(आयोजना प्रयोजनको लागि मात्र तथ्यांकको प्रयोग गरिनेछ)

नगर आयोजना:	घर नं.
जिल्ला:	नगरपालिका/गा.वि.स. वडा नं.
अन्तरवार्ता लिनेको नाम:	अन्तरवार्ता मिति:
सुपरिभाषकको नाम:	मोड नं.

१. सामाजिक-आर्थिक तथा अन्य विवरण
(बैयक्तिक कोठा (१) यो चिन्ह लगाउनुस् वा आवश्यक विवरणहरू प्रस्तुत गर्नुहोस्)

१.१ अन्तरवार्ता दिनेको नाम:

१.२ घरमुखिको नाम: लिंग: पुरुष ☐ महिला ☐ तेश्रो व्यक्ति ☐ पेशा: ☐

परिवार सदस्य: पुरुष: ☐ महिला: ☐ जम्मा: ☐ एकल महिला घरमुख भए ☐

१.३ यस परिवारमा शारिरिक रूपमा अशक्तता भएका परिवार सदस्य संख्या: ☐

१.४ जाति/जनजातिमध्ये कुन हो: का. ब्राह्मण/क्षत्री ☐ ख. जनजाति ☐ ग. दलित ☐ घ. अन्य ☐

परिवारको स्वरूप: एकल ☐ समुदाय ☐

१.५ घर परिवारको सदस्यहरूको विवरण दिनुहोस्

क्र.सं.	घरपरिवारका सदस्यको नाम	उमेर	लिंग	शिक्षा स्तर	पेशा
१					
२					
३					
४					
५					
६					
७					
८					
९					
१०					

नोट: पेशा: १. कृषि २. व्यापार ३. तालिम ४. उद्योग/उद्योग ५. दैनिकीय (अतिथि सेवा) ६. न्याया ७. अन्य ८. कुनै पेशा तथ्यांकमा आश्रित जस्तै: विद्यार्थी, मुहान्ना, अजान्त बुलाइएको, ५ वर्ष भन्दा कम उमेरका आदि नोट गर्ने।

१.६ शिक्षा: १. निरक्षर २. साक्षर ३. प्राथमिक ४. माध्यमिक ५. एस.एल.सी. उल्लेख

१.७ आई.ए. ६. वि.ए. ७. एम.ए. ८. अन्य

१.८ यस परिवारमा कसोचस गर्ने अन्य सदस्यहरूको विवरण: सहयोगी ☐ डेरावाल ☐ कुल संख्या ☐

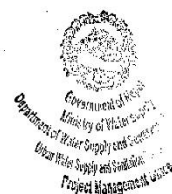
१.९ यस नगर/शहरमा कहिले देखि बस्ने आउनु भएको छ? ☐ वर्ष

स्वदेशी ☐ जयाउ सरेको ☐ बसाई सरी आएको भए कुन जिल्लाबाट ☐

१.१० बसाई भर्नुको कारण: प्राकृतिक प्रकोप ☐ व्यापार/व्यवसाय ☐ शिक्षा ☐ अन्य ☐ जिविकोपार्जन ☐

१.१० यो घर आफ्नै हो? हो ☐ भाडामा कसको ☐ अन्य ☐ भाडामा बस्नेको भए मासिक कति तिर्नुहुन्छ ☐

१.११ यस घरमा भान्सा कोठा बाहेक अन्य कुनै बढा कोठाहरू छन्? ☐



ToR for IEE of Sunkoshi Panchkhal WSSP

१ कोठा ☐ २ कोठा ☐ ३ कोठा ☐ कोठा वा सो भन्दा बढी ☐
 १.१२ घरको अवलोकन गरी घरको किम्वदन्त लेख्ने। पक्की ☐ पक्की ☐ कच्ची ☐
 (पक्की : छत ढलान बर्त पक्की : हुडा हुडाको गान्ने, दीपको छाना, हुडा, प्लेट, सिमारी ढाक्ने आदि, कच्ची : माटा गान्ने घर/ढाक्ने खण्डाले छाएको)
 १.१३ बस परिवारको जग्गा जमीन छ ? छ ☐ छैन ☐ छैन भने सुकुम्बासीको रूपमा गणना गर्ने।
 जग्गा कति छ ?

१.१४ यहाँले गाई/बैसी पाल्नु भएकोछ ? छ ☐ छैन ☐ छ भने कतिवटा ? एउटा ☐ दुवटा वा बढी ☐

१.१५ तपाईंको परिवारको तल उल्लेखित कुन कुन सामान छन् ? (भएको सामानको संख्या लेख्ने)

क्र.सं.	सामान	संख्या	कैफियत	क्र.सं.	सामान	संख्या	कैफियत
१	साइकल/रिक्सा			१०	स्टोभ/ग्यास कुला		
२	मोटरसाइकल			११	रेडिओ		
३	बैलगाडा			१२	बासिडा मेसिन		
४	कार/जिप			१३	वाटर फिल्टर		
५	मिशीन/धम			१४	पम्प/टर्न		
६	ट्याक्टर/ट्रक			१५	इन्धन/इन्धनको पाईप		
७	रेडियो/क्यामेरा			१६	अन्य भन्ने उल्लेख गर्ने।		
८	मोबाइल/मिडियालेट						

१.१६ यदि मुले पढाई भए भने कति महिना खान सुन्छ ? ३ महिना ☐ ६ महिना ☐ ९ महिना ☐ १२ महिना ☐

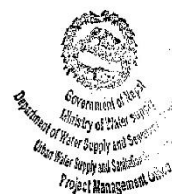
यदि तपाईं भोग्नु भएमा कसरी आन्नु हुन्छ ? १. व/पर २. ☐ कृषि ३. उ/उपभन्दा ४. र/रिमटेन्स (वेदशक) ५. कमावा ६. अन्य

१.१७ तपाईंको परिवारको औसत वार्षिक खर्च कति छ उल्लेख गर्नुहोस्। ☐

क्र.सं.	वर्षको शीर्षक र किसिम	मासिक खर्च रु.	कैफियत
१	का खर्च/कच्चा		
१.१	ग्यास/ग्यास/वि.पु. किराना/आदी खर्च गर्ने		
१.२	मादोको/नेपासी/रातो/गोबर/चाउ/काटने/मिठाउ/ते/बुवा/र/वि.पु. ग्यास/दुध खर्च		
१.३	अन्य/आदि उल्लेख गर्नुहोस्		
२	(को को जम्मा)		
२.१	खाने/पिने/कृषि/गर्भ		
२.२	खाने/पिने/अन्न र दैनिक उपयोग/सुत्त		
२.३	कपडा		
२.४	शिक्षा		
२.५	घर भाडा/घर मर्मत		
२.६	गाला/वात/संचार		
२.७	विद्युत		
२.८	पानी पीने/मर्मत सम्भार		
२.९	औषधि/उपकरण/पानीबाट हुने रोग		वार्षिक खर्च
२.१०	औषधि/उपकरण/अन्य रोग		वार्षिक खर्च
२.११	अन्य/चाडपर्व/धर्म/आज/संस्कार आदि उल्लेख गर्ने		वार्षिक खर्च
	(को को जम्मा)		
	कम्प्युटर/को कुल जम्मा		

१.१८ तपाईंको परिवारको औसत मासिक आय कति छ ? उल्लेख गर्नुहोस्।

क्र.सं.	आयस्रोत	समान परिवार		प्राप्त हुने आय (रु. मासिक)	कैफियत
		पुरुष	महिला		
१	(क) श्रमिक				



ToR for IEE of Sunkoshi Panchkhal WSSP

१.१	कृषि उत्पादनको विपरीतबाट आउने (पके, गहुँ, धान, तरकारी, फलफूल)				
१.२	पशुपक्षी उत्पादन (दुध, दही, घ्यू, बाख्रा, कुखुरा आदि)				
(क) को जम्मा					
२	ख: रोजी तर्फ				
२.१	नोकरी / जर्गनर				
२.२	गणाला सज्जदारी				
२.३	पम्पन/उत्पन्न आदी				
२.४	दैनिकीक रोजगार (रोमडेन्स)				
२.५	पसल/ब्यापार				
२.६	उद्योग				
२.७	पसल/घर भाडा				
२.८	गाडी/इयानी व्यवसाय				
२.९	अन्य भए उल्लेख गर्ने				
(ख) को जम्मा					
कम्मा कुल जम्मा					

१.१९ यहाँको परिवारले कुनै सपन लिएको छ: छ ☐ छैन ☐ छ भने रकम रु.

२. खानेपानी तथा सरसफाइ व्यवस्थापन

२.१ तपाईंको परिवारले पिउन, खाना पकाउनको लागि प्रयोग गर्ने पानीको स्रोत कुन हो? दैनिक कति लिटर पानी खर्चनु हुन्छ?

कृपया गलतको कोठाहरूमा ☒ चिन्ह लगाउनुहोस्।

क्र.सं.	वर्णयाममा	✓	लिटर/दैनिक	मुख्य याममा	✓	लिटर/दैनिक
१	डुनार/क्या	☐		डुनार/क्या	☐	
२	टपुकेल/ह्याण्डपम्प/डिप टपुकेल	☐		टपुकेल/ह्याण्डपम्प/डिप टपुकेल	☐	
३	सावजनिक धारा	☐		सावजनिक धारा	☐	
४	निजी धारा	☐		निजी धारा	☐	
५	भुण्ड, खोला, नदी, पोखरी	☐		भुण्ड, खोला, नदी, पोखरी	☐	
६	पिकेतासँग पानी किनेर	☐		पिकेतासँग पानी किनेर	☐	
१०	बपानीको पानी सकेलन गरेर	☐		बपानीको पानी सकेलन गरेर	☐	
११	अन्य	☐		अन्य	☐	

२.२ दैनिक आवश्यक पानी आपूर्ति गर्नका लागि पानी नकलनबारे निम्न विवरण विवरण दिनुहोस्।

क्र.सं.	विवरण	वर्णयाममा					मुख्य याममा				
		पुरुष	महिला	बालक	बालक	जम्मा	पुरुष	महिला	बालक	बालक	जम्मा
१	कति खपेट/घटक										
२	लिटर/खप										
३	कुल परिमाण										
४	पानी व्यापक लाग्ने समय (मिनेट)/खप										
	• पानीको बहाव सम्म पुग्न										
	• मुहानमा पुग्नु पर्ने समय										
	• फर्केको पानीको समय										
५	प्रति खप लाग्ने समय										

नोट: अन्तरगतको विवरण पानीको भाँडो हेरी सोको समयमा पानीको परिमाण उल्लेख गर्ने।

३. निजी धारा जडान

३.१ के तपाईंले घरमा पाइप धारा जडान गर्नु भएको छ: छ ☐ छैन ☐ यदि छ भने कस्तो प्रकारको छ?

क) घरभित्र निजी धारा ☐ ख) कम्प्युटराइज्ड निजी धारा ☐ ग) सामुदायिक धारा ☐

३.२ तपाईंको घरमा प्रयोग हुने पानीको गुणस्तर कस्तो छ: १) राम्रो २) ठिकै ३) खराब

Signature



ToR for IEE of Sunkoshi Panchkhal WSSP

- ३.३ के तपाई आफ्नो घरमा धारा जोड्न चाहनु हुन्छ ? चाहन्छ ☐ चाहन्न ☐
- ३.४ यदि तपाईको घरमा निजी धारा जडान भएको छैन भने, कति जडान नगरेको ?
- क) खर्च गर्ने क्षमता नभएकोले ☐ ख) जडान शुल्क धेरै पर्ने भएकोले ☐
- ग) मासिक पानी बिल धेरै आउने भएकोले ☐ घ) पानीको मात्रा पर्याप्त नभएकोले ☐
- ङ) पानीको आपूर्ति नियमित नभएकोले ☐ च) यस क्षेत्रमा पाइपलाइन जडान गर्ने व्यक्तिसँग उपलब्ध नभएकोले ☐
- छ) पानीको गुणस्तर राम्रो नभएकोले ☐ ज) अन्य कारण उल्लेख गर्ने ☐ फ) बाह्य छैन ☐
- ३.५ हाल तपाईले पानीधारा बापत महिनामा पानीको महशुल तिर्दै हुनुहुन्छ ? छ ☐ छैन ☐

सह-लगानि अवधारणा सम्बन्धी प्राथमिकता

- ४.१ यदि तपाईको नगरपालिका/गा.वि.स. मा विभिन्न योजना सञ्चालन गर्न रकम उपलब्ध छ भने निम्नलिखित मध्ये कुन कुन योजनालाई पहिलो प्राथमिकता दिनुहुन्छ ?

क) सडक बत्ती	☐	छ) विद्युत	☐
ख) कारोपने सडक	☐	ज) संचार	☐
ग) विद्यालय	☐	झ) सरसफाई/सुविधा	☐
घ) ग्रन्थालय	☐	ञ) गिर्याई	☐
ङ) व्यवस्थित खानेपानी प्रणाली	☐	ट) पाटीपोखी उमेशाला	☐
च) पैदलयात्री सडक	☐	ड) अन्य	☐

- ४.२ यदि तपाईको घरमा धारा छैन र निजी धारा राख्न इच्छुक हुनुहुन्छ भने, कति रकम सह-लगानी गर्न सक्नुहुन्छ ? कृपया तल दिइएको तालिकामा निजि धारा राख्न कति रकम सम्म लगानी गर्नुहुन्छ लगानीको रकमको सीमामा ☒ चिन्ह लगाउनुहोस ।

क्र.सं.	लगानीको विवरण	☒ चिन्ह लगाउने	क्र.सं.	लगानीको विवरण	☒ चिन्ह लगाउने
१.	रु १२००० भन्दा माथि	☐	४.	रु ३००१ देखि ६००० सम्म	☐
२.	रु १००१ देखि १२००० सम्म	☐	५.	रु १२०१ देखि ३००० सम्म	☐
३.	रु ६००१ देखि ९००० सम्म	☐	६.	रु १२०० भन्दा कम	☐

- ४.३ निजी धारा जडान बापत लाग्ने शुल्क व्यहोर्नु पर्नेछ ? मन्जूर छ ☐ मन्जूर छैन ☐

- ४.४ नयाँ खानेपानी योजना शुरु भएमा आफ्नो घरमा धारा जडान गर्ने नयाँ निबन्धानुसार मासिक पानी महशुल नियमित बुझाउनु तयार हुनुहुन्छ ? ☐
- छ ☐ छैन ☐ यदि इच्छुक हुनु हुन्छ भने तल दिइएको तालिकामा पानी महशुलको सीमामा ☒ चिन्ह लगाएर आफ्नो इच्छा व्यक्त गर्नुहोस ।

क्र.सं.	मासिक पानी महशुल	☒ चिन्ह लगाउने
१.	रु ५०० भन्दा माथि	☐
२.	रु ४५१ देखि ५००	☐
३.	रु ४०१ देखि ४५०	☐
४.	रु ३५१ देखि ४००	☐
५.	रु ३०१ देखि ३५०	☐
६.	रु २५१ देखि ३००	☐
७.	रु २०१ देखि २५०	☐
८.	रु १५१ देखि २००	☐

Handwritten signature

Project Manager

Consentment Officer
Ministry of Water Supply
Department of Water Supply and Sanitation Management
Water Supply and Sanitation Sector Project
Project Management Office

५. लैङ्गिक दृष्टिकोणबाट महिला सहभागी नभएको

क) महिलाहरुको उपस्थिति र सहभागीता

- ख) लैङ्गिकताका आधारमा कार्य विभाजन

- | क्र.स | घरपरिसर कियत्कायानुसार | पुरुष | मि.रकम स. कुल समय |
|-------|-----------------------------------|-------|-------------------|
| १ | छानपाानी भरने, बोकेने, भण्डारण | | |
| २ | मानुष्य तयार गर्ने, भाडा माफक | | |
| ३ | वालवालिका र बुद्धबुद्धाको स्याहार | | ४. ३ |
| ४ | लुगा धुने घर सफा गर्ने | | ५. १ |
| ५ | साधारण भण्डारण तथा तयारी | | ६. १ |
| ६ | अन्य | | १. मान्जु ले |

- ग) पारिवारिक व्यवस्थापन, जाय ओत र अन्य विषयमा महिलाहरुको नियगी नयाँ तिर

- ४.४ तलको तालिकामा उल्लेखित पारिवारिक विषय वा क्षेत्रहरूमा निर्णय गर्दा **मनाई सुनुवाई हुन्छ ? उपयुक्त कोठामा (५)पिठ लगाउनुस्** **परिवारमा महिलाको** **इएको तालिका**

क्र.सं	विषय वा कार्यक्षेत्रहरू	हुन	हुन (V)
१	अधिक सरोकारका कुराहरु	☒	
२	कटाकेटीको शिक्षा दिना	☐	
३	कटाकेटी र वृद्धवृद्धाको स्वास्थ्य र स्थाहार	☐	
४	अचल सम्पति किनबेच (घर जग्गा)	☐	
५	दैनिक क्रियाकलापहरू	☐	
६	सामाजिक शिक्षा व्यवहार, विवाह, बतबन्ध, चाडपर्व तथा सामाजिक/पारिवारीक सुसम्बन्धन आदि	☐	
७	अन्य	☐	



Government of Nepal
Ministry of Water Supply
Department of Water Supply and Sewerage
Urban Water Supply and Sanitation
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

५.६ यहाँको परिवारमा पारिवारिक सम्पत्तिका निम्न बिषयमा महिलाको पहुँच र स्वामित्व रहेको छ छैन भन्ने तालिकामा उपयुक्त कोठामा (१) चिन्ह लगाउनुस्

क्र.सं.	विवरण	पहुँच	स्वामित्व
१	जग्गा जमिन		
२	घर तथा अन्य सन्चालनहरू		
३	चलन सम्पत्ति/साँचत पैसा		
४	दैनिक क्रियाकलापहरू		
५	अन्य		

घ) जा.पा.उ.स.स. तथा समुदायमा महिलाको स्तर (हसियत) (निम्न बुँदाहरू फोफस गृप छलफलको आधारमा जानकारी लिएर टिपोट गर्नुपर्नेछ)

क्र.सं.	विषय	उच्च	मध्यम	निम्न
१	आत्मसम्मानबोध			
२	आत्मविश्वास नेतृत्व शीप			
३	दायित्वबोध र क्षमता			
४	लयाकत, तर्क संगत, धैर्य र मेहनत			
५	अन्य			

६. सम विकासमा पहुँचका आधारमा सामाजिक समावेशी सहभागिता

क) आयोजना क्रियाकलापमा गैरलामान्वित बिपन्न वर्गहरू, पिछडिएका वर्ग, जातजाति, दलित, अपाङ्गता भएको व्यक्तिको उपस्थिति

६.१ आयोजनाकोबारेमा छलफल गर्ने कुनै भेला/ बैठकमा समावेशी तवरले बोलाइएको थियो ?
थियो ☐ थिएन ☐

६.२ के आयोजनाको छनौट गर्ने बैठकमा समावेशीतर्फको आधारमा सहभागीहरूको उपस्थिति थियो ?
थियो ☐ थिएन ☐

६.३ के जा.पा.उ.स.स.को गठनमा समावेशीता अंगीकार भएको थियो? थियो ☐ थिएन ☐

ख) निर्णय प्रक्रियामा समावेशी प्रकृया अपनाईएको थियो ?

६.४ आयोजना छनौट गर्ने जातजातिहरूको कस्तो भूमिका कस्तो थियो ?
उच्च ☐ मध्यम ☐ निम्न ☐

६.५ मान्छा सहरी खानेपानी आयोजना कार्यान्वयन गर्ने सामाजिक समावेशी आधारमा उपभोक्ताहरूको परिचालन गर्न भएको प्रयास कस्तो थियो? राम्रो ☐ मध्यम ☐ निम्न ☐

७. स्वास्थ्य र सरसफाई

क. खानेपानी

१ तपाईंको विचारमा पानीको गुणस्तर तराई (खराब) भएमा के समस्याहरूदेखि सञ्छ ?
(एक भन्दा बढी उत्तर आउन सक्ने)

१.१) दुर्गन्ध आउने / तमिलो स्वाद ☐ १.२) दाँत बिग्रिने/रंगिने ☐

१.३) बिरामी बनावुने ☐ १.४) अन्य (उल्लेख गर्ने)

२ के तपाईंलाई पानी भर्ने र राख्ने बाँडो पानी भर्नु र भण्डार गर्नु पूर्व सफा गर्नुपर्छ भन्ने थाहा छ ?
छ ☐ छैन ☐

यदि छ भने, पानी राख्ने बाँडो कसरी सफा गर्नु हुन्छ ?

२.१) खाली पानी मात्रले ☐ २.२) खरोनी पानीले ☐ २.३) मुस/पिठो र पानीले ☐

२.४) साबुन पानीले ☐ २.५) अन्य (उल्लेख गर्नुस्)

३ तपाईं घरमा पानी कसरी राख्नु हुन्छ ?

[Signature]
Engineer



ToR for IEE of Sunkoshi Panchkhal WSSP

(एक भन्दा बढी उत्तर आउन सक्ने)

- ३.५) पानी भन्ने पत्रले भाडा सफा गर्ने ☐ ३.२) बाथी पानी फर्काउने ☐
३.६) पानी राख्ने भाडा राखेर राखेर राख्ने ☐ ३.४) अन्य (उल्लेख गर्ने) ☐

४) तपाईं गाउँ वा पेट्रोबाट पानी कसरी निकाल्नुहुन्छ ?

- ४.१) पानी सार्नु आँध्र अम्बोरा, लोटा, कुरुवा, मग धोएर ☐
४.२) गिरास, मग, कप गाजीमा डुबाएर ☐
४.३) गागोबाट लोटा, अम्बोरा, कुरुवा, गिरासमा पानी सारेर ☐
४.४) अन्य (उल्लेख गर्ने) ☐

ब. चर्पी

१) के तपाईंको घरमा चर्पी छ ? ☐ छ ☐ छैन (खेन भने १.३ जाने)

१.१) यदि छ भने, कस्तो प्रकारको चर्पी छ ? ☐

- १) खाल्डो चर्पी ☐ १.२) मिस्टन फलस ☐
२) भेन्टिलेटेड खाल्डो चर्पी ☐ १.३) अन्य ☐
३) वाटर मिल/धोर फलस ☐

१.२) यदि छ भने, तपाईंको घरमा चर्पी कसकसले प्रयोग गर्नुहुन्छ ? ☐

१) सबैले, २) बच्चा बाहेक सबैले ३) बयस्क र प्रौढले मात्र ४) बिरामी मात्रले

१.३) यदि छैन भने, दिसा गर्ने कहाँ जान्नुहुन्छ ? ☐ ☐

क) खोला/जङ्गल/किनार छ ☐ खुल्ला मैदान/ठाउँ ग घर सडक छेउ छ जहाँ सजिमा हुन्छ

१.४) के तपाईंको समुदाय खुल्ला/सामुदायिक क्षेत्र घोषणा भएको छ ? ☐ छ ☐ छैन ☐

ग. खानेकुराको सरसफाइ

१) खाद्यपदार्थ छुपान हुनबाट कसरी बचाउनुहुन्छ ? (एक भन्दा बढी उत्तर आउन सक्ने)

- १.१) पकाएको खाना छोपेर/ढाकेर राख्ने ☐ १.२) सफा हातले खाना पस्कने गर्नाले ☐
१.३) कति खाईन खानेकुरा गफोसँग पकाएर धोएर ☐ १.४) हात गोडा सफा गरेर मात्र खाना पस्ने ☐
१.५) छै बासी वा सड गलेका खाना फालफाल विमर्जने गर्ने ☐
१.६) डाढु पत्तु, धाल/बाडाकुडा भफा गरेर मात्र खाना पस्कने खाने ☐
१.७) चुलो चौकी पकाउने भाडा, ढकनहरू सफा राख्ने ☐

२) के तपाईं खानेकुरा छोपेर/ढाकेर राख्नुहुन्छ ? ☐ राख्नु ☐ राख्दैन ☐

घ. व्यक्तिगत सरसफाइ (घरपरवारको संख्या अनुसार कृयाकलापमा टीक चिन्ह लगाएर संख्या राख्ने । जस्तो चारजनाको परिवार भए हरेक कृयाकलापमा टीक सहित चारको संख्या लागु गर्ने ।)

१) तपाईं र परिवारका अन्य सदस्यले कहिले र के गरेपछि हात धुनुहुन्छ ? धुने भए यस्तो (✓) चिन्ह लगाउनुहोस् र नधुने भए यस्तो (✗) चिन्ह लगाउनुहोस् । (एक भन्दा बढी उत्तर आउन सक्ने)

क्र.सं.	विवरण	प्रत्येक व्यक्तिगत		विवरण		प्रत्येक	
		हो (✓)	नहो (✗)	हो (✓)	नहो (✗)	हो (✓)	नहो (✗)
१	खाना सार्नु आँध्र						
२	खाना खाएपछि						
३	दिसा गएपछि						
४	कोहोर मैला खाएपछि						

Engineer



ToR for IEE of Sunkoshi Panchkhal WSSP

५	कामबाट फर्केपछि						
६	केटाकटीलाई दिने						
७	पिसाब गराइ सकेपछि						
८	अन्य (उल्लेख गर्ने)						

२. तपाईं र परिवारका अन्य सदस्यले के ले हात धुनुहुन्छ ? धुनेमा यस्तो (✓) चिन्ह लगाउनुहोस् र तथुनेमा यस्तो (✗) चिन्ह लगाउनुहोस् ।

क्र.सं.	विवरण	५ वर्ष भन्दा कम आयुका बालबालिका		महिला		पुरुष	
		हो (✓)	नो (✗)	हो (✓)	नो (✗)	हो (✓)	नो (✗)
१.	पानी माने						
२.	खानी पानी						
३.	भस/पिठो पानी						
४.	साबुन पानी						
५.	अन्य (उल्लेख गर्ने)						
जम्मा							

३. तपाईं र परिवारका अन्य सदस्यले कहिले कहिले नुहाउनुहुन्छ ? नुहाउने भए यस्तो (✓) चिन्ह लगाउनुहोस् र ननुहाउने भए यस्तो (✗) चिन्ह लगाउनुहोस् ।

क्र.सं.	विवरण	बालबालिका		महिला		पुरुष	
		(✓) (✗)	(✓) (✗)	(✓) (✗)	(✓) (✗)	(✓) (✗)	(✓) (✗)
१.	प्रत्येक दिन						
२.	एक दिन बिराएर						
३.	हप्तामा २ पटक						
४.	हप्तामा १ पटक						
५.	२ हप्तामा १ पटक						
६.	महिनामा एक पटक						
जम्मा							

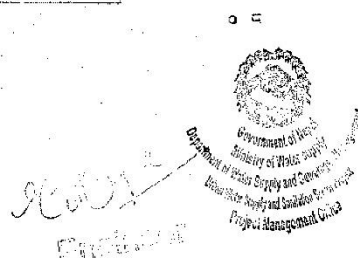
ड. फोहर मैला व्यवस्थापन

१. तपाईंको घरबाट निस्कने ठोस फोहर मैसा कहाँ बिसर्जन गर्नुहुन्छ ?
- १.१ घर नजिक खान्डीमा ☐ १.२ निजी फोहर संकलनकर्तालाई दिने ☐
- १.३ गा.वि.स. नगरपालिकाले व्यवस्था गरेको खान्डी वा क्यानमा ☐ १.४ अन्य (उल्लेख गर्ने) ☐
२. ठोस तथा तरल फोहर वस्तुलाई अव्यवस्थित तरिकाले बिसर्जन गर्नाले हुने नराम्रा असरहरू के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
- २.१ फोहर आवावरणमा बढि ☐ २.२ लामखुट्टे, फिंगा, किराहरूको बढि ☐
- २.३ रोग सन्नेमा बढि ☐ २.४ अन्य (उल्लेख गर्ने) ☐
३. तपाईंको घरबाट निस्कने फोहर पानी कहाँ बिसर्जन गर्नुहुन्छ ?
- ३.१ खान्डीमा (Soak pit) ☐ ३.२ तरकारी बारीमा/कुरेमा बारीमा ☐
- ३.३ सार्वजनिक ढलमा ☐ ३.४ अन्य (उल्लेख गर्ने) ☐

घ. वस्तुभाउको फोहर व्यवस्थापन

१. के तपाईंले वस्तुभाउ पाल्नु भएको छ ? छ ☐ छैन ☐ छैन भने पानी जम्प सल्का रोक्नमा जाने। यदि छ भने कुन कुन प्रकारका छन् र तिनीहरूलाई कहाँ राख्नु हुन्छ ?

क्र.सं.	वस्तुभाउको प्रकार	वर्गीकृत गर्ने	फोहर कोठामा राख्ने
१.	गाई भैँसी		
२.	बंगुर/खंगुर		
३.	वाख्रा		




 Engineer

 Government of Karnataka
 Department of Public Works
 Bangalore
 Under the supervision of the Director
 Project Management

ToR for IEE of Sunkoshi Panchkhal WSSP

- २.१ धरापसी उपचार गर्ने ☐ २.२ धामी, काँची, पुजारी कहाँ जाने ☐
 २.३ औषधि पसलमा जाने ☐ २.४ स्वस्थ चौकी वा स्वास्थ्यालमा जाने ☐
 २.५ अन्य (उल्लेख गर्ने)

३. यदि परिवारमा कुनैलाई भन्दापछाला लागेमा के गर्नुहुन्छ ? (प्रार्थमिकता अनुसार तम्बर लेख्ने)

- ३.१ जीवनजल खुद्याउने ☐ ३.२ धरापसी उपचार गर्ने ☐
 ३.३ धामी, काँची वा पुजारी कहाँ जाने ☐ ३.४ औषधि पसलमा जाने ☐
 ३.५ स्वास्थ्य चौकी वा अस्पतालमा जाने ☐ ३.६ अन्य (उल्लेख गर्ने)

४. यत एक सालभित्रमा तपाईंका परिवारका सदस्यहरू भन्दापछाला तथा पातीजन्य अन्य सरुवा रोगहरूबाट प्रभावित थिए ? प्रभावित भएका भए कति जना थिए तलको तालिकामा सच्याउनु पर्नेछ ।

क्र.सं.	रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष	राष्ट्रिय जनसङ्ख्या
१	भन्दापछाला				
२	आउ				
३	ज्वर				
४	टाइफाइड				
५	हिन				
६	छोला सम्बन्धी रोग				
७	कोलीरोस (मलेरिया)				
८	कमसङ्घित (ज्वरो)				
९	अन्य				
	जम्मा				

५. यत एक वर्षभित्र तपाईंका परिवारका भन्दापछाला तथा पातीजन्य अन्य सरुवा रोगहरूबाट कुनैको मृत्यु भएको छ ? (मृत्यु अवस्था)

रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष
भन्दापछाला			
आउ			
पातीजन्य अन्य सरुवा रोगहरू			
जम्मा			

६. यत एक वर्षभित्र तपाईंको परिवारका सदस्यलाई भन्दापछाला र पातीजन्य अन्य सरुवा रोगहरूको उपचारमा कति रकम खर्च गर्नु परेको छ ?

रोग	वर्ष रकम (रु.मा)
भन्दापछाला	
पातीजन्य अन्य सरुवा रोगहरू	
जम्मा	

धन्यवाद!

ToR for IEE of Sunkoshi Panchkhal WSSP

ANNEX III
Sample of EMP Matrix

K. B. P. P.
Engineer


Government of Nepal
Ministry of Water Supply and
Urban Development
Water Supply and Sewerage
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

EMP Matrix

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
A. Types of Impacts					
a) Project Phase (Design/Construction/Operation)					

Copy
Engineer
Government of Nepal
Ministry of Water Supply and Sewerage
Urban Water Supply and Sanitation
Project Management Unit

ToR for IEE of Sunkoshi Panchkhal WSSP

ANNEX IV PHOTOGRAPHS

Handwritten signature
Engineer
Department of Water Supply and Sewerage
Municipality of Sunkoshi
Project Management

ToR for IEE of Sunkoshi Panchkhal WSSP



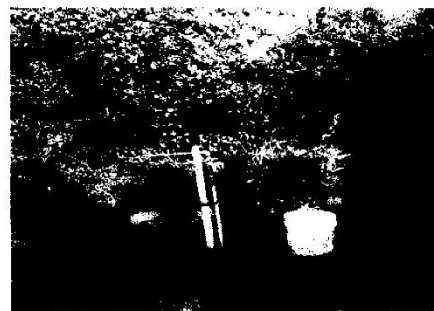
1. Field Visit at the Proposed Sump Well Site



2. Proposed Sump well Site from left bank



3. Proposed RVT-10 (Palanchowk Bhagawati) Area



4. Existing Tap Connection



5. Existing RVT at the proposed RVT1 (US Municipality Area)



6. Scattered Settlements

[Handwritten signature]
Project Management Office
Department of Water Supply and Sanitation
Ministry of Water Supply and Sanitation
Government of Nepal

ANNEX 2: SAMPLE FORMS, FORMATS AND REPORT TEMPLATE

ANNEX 2A:RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST FOR PANCHKHAL PROJECT AND PRELIMINARY CLIMATE RISK SCREENING CHECKLIST FOR SAMPLE PROJECT TOWNS

Instructions:

This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **NEP: Urban Water Supply and Sanitation (Sector) Project**

Project: **Panchkhal Water Supply and Sanitation project**

Screening Questions	Yes	No	Remarks
A.Project Siting : Is the project area			
Densely populated?		√	Panchkhal Municipality has moderate population density.
Heavy with development activities?		√	.
Adjacent to or within any environmentally sensitive areas?			
Cultural heritage site		√	
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	

Screening Questions	Yes	No	Remarks
B. Potential Environmental Impacts Will the Project cause...			
Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and		√	
Soil erosion runoff?			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	
Hazard of land subsidence caused by excessive ground water pumping?		√	
Social conflicts arising from displacement of communities ?		√	
Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	
Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	√		Basic water treatment is proposed under the proposed project. EMP recommends water quality monitoring as prescribed in the NDWQS & its Directives.
Delivery of unsafe water to distribution system?	√		Design proposes office building that also comprises water quality laboratory to deliver safe water. EMP recommends continuing training of WUSC in water quality monitoring, as prescribed in the NDWQS Directives.
Inadequate protection of intake works or wells, leading to pollution of water supply?	√		Design has considered the safest site for intake regarding environmental pollution and proposes enough measures to mitigate contamination. There is also provision of protection works for intakes/sump wells.
Over pumping of ground water, leading to salinization and ground subsidence?		√	
Excessive algal growth in storage reservoir?		√	EMP provides mitigation measures.
Increase in production of sewage beyond the capabilities of community facilities?		√	EMP provides mitigation measures.
Inadequate disposal of sludge from water treatment plants?		√	Minimal sludge expected. EMP provides mitigation measures.

Screening Questions	Yes	No	Remarks
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities.		√	
Impairments associated with transmission lines and access roads.	√		EMP provides mitigation measures.
Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	√		EMP provides mitigation measures.
Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		√	EMP provides mitigation measures
Dislocation or involuntary resettlement of people?		√	
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
Noise and dust from construction activities?	√		EMP provides mitigation measures.
Increased road traffic due to interference of construction activities?	√		EMP provides mitigation measures.
Continuing soil erosion/silt runoff from construction operations?	√		EMP provides mitigation measures.
Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	√		EMP incorporates monitoring of distributed water according to the Directives for the NDWQS.

Screening Questions	Yes	No	Remarks
Accidental leakage of chlorine gas?		√	EMP provides mitigation measures.
Excessive abstraction of water affecting downstream water users?		√	EMP provides mitigation measures
Competing uses of water?		√	
Increased sewage flow due to increased water supply		√	
Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		√	This is not under the scope of the project.
Large population influx during project construction and operation that causes an increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	
Social conflicts if workers from other regions or countries are hired?	√		Expected as low concern. Priority will be given to local workers.
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?	√		EMP provides mitigation measures.
Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project	√		EMP provides mitigation measures.

Preliminary Climate Risk Screening Checklist for Sample Project Towns

Screening Questions		Score	Remarks
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	Investments in the proposed project will not likely be affected by climate change and extreme weather events due to the siting of project.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters? (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity, and hydro-meteorological parameters) affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	Regular operation and maintenance will not allow this effect to occur

Alternatives for answers and corresponding scores are given below.

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned as medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low
Other comments: None

ANNEX 2B:RELEVANT ENVIRONMENTAL QUALITY STANDARDS

B.1 Ambient Air Quality Standards

Parameter	Averaging Period	Nepal's Ambient Air Quality Standard ($\mu\text{g}/\text{m}^3$) *	WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$) **	
			Global Update 2005	Second Edition [^] 2000
TSP	Annual	-	-	-
	24-hour	230	-	-
PM ₁₀	Annual	-	20	-
	24-hour	120	50	-
PM _{2.5}	1-year	-	10	-
	24-hour	-	25	-
SO ₂	Annual	50	-	-
	24-hour	70	20	-
	10-minute	-	500	-
NO ₂	1-year	40	40	-
	24-hour	80	-	-
	1-hour	-	200	-
CO	8-hour	10,000	-	10,000
	15-minute	100,000	-	100,000
Pb	1-year	0.5	-	0.5
Benzene	1-year	20	-	-

* National Ambient Air Quality Standards for Nepal, 2003. Obtained from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

** Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

[^] Air Quality Guidelines for Europe, Second Edition, 2000. WHO Regional Office for Europe, Copenhagen.

Parameter that either has no national standard value for 24-hour observation or with WHO guideline value for 24-hour observation as more stringent than that specified in the national standards.

B.2 Noise Level Standards

Receptor / Source	National Noise Standard Guidelines, 2012 (dB)		WHO Guideline Values for Noise Levels Measured Out of Doors * (One Hour L _{Aeq} in dBA)	
	Day	Night	07:00 - 22:00	22:00 - 07:00
Industrial area	75	70	70	70
Commercial area	65	55		
Rural residential area	45	40	55	45
Urban residential area	55	50		
Mixed residential area	63	55		
Quiet area	50	40	-	-
Water pump	65		-	
Diesel generator	90		-	

* Guidelines for Community Noise, WHO, 1999.

Source: Environmental, Health and Safety General Guidelines, 2007.
International Finance Corporation, World Bank Group.

B.3 National Drinking Water Quality Standards, 2006

Group	National Drinking Water Quality Standards, 2006			WHO Guidelines for Drinking-water Quality, 4th Edition, 2011*
	Parameter	Unit	Max. Concentration Limits	
Physical	Turbidity	NTU	5 (10) **	-
	pH		6.5 - 8.5	none
	Color	TCU	5 (15)	none
	Taste & Odor		Would not be objectionable	-
	TDS	mg/l	1000	-
	Electrical Conductivity	µc/cm	1500	-
	Iron	mg/l	0.3 (3)	-
	Manganese	mg/l	0.2	-
	Arsenic	mg/l	0.05	0.01
	Cadmium	mg/l	0.003	0.003
	Chromium	mg/l	0.05	0.05
	Cyanide	mg/l	0.07	none
	Fluoride	mg/l	0.5 - 1.5 ^	1.5
	Lead	mg/l	0.01	0.01
	Ammonia	mg/l	1.5	none established
Chemical	Chloride	mg/l	250	none established
	Sulphate	mg/l	250	none
	Nitrate	mg/l	50	50
	Copper	mg/l	1	2
	Total Hardness	mg/l	500	-
	Calcium	mg/l	200	-
	Zinc	mg/l	3	none established
	Mercury	mg/l	0.001	0.006
	Aluminum	mg/l	0.2	none established
	Residual Chlorine	mg/l	0.1 - 0.2	5 ^^
Micro Germs	E-coli	MPN/100ml	0	must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml	0 in 95% of samples taken	

* Health-based guideline values

** Figures in parenthesis are upper range of the standards recommended.

^ These standards indicate the maximum and minimum limits.

^^ From WHO (2003) Chlorine in Drinking-water, which states that this value is conservative.

Parameter with WHO guideline value as more stringent than national standard value.

National Drinking Water Quality Standards was obtained from the Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

ANNEX 2C: SAMPLE GRIEVANCE REDRESS FORM

(To be available in Nepalese and English)

The _____ Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information remain confidential, please inform us by writing/typing* (CONFIDENTIAL)* above your name. Thank you.

Date		Place of registration	
Contact Information/personal details			
Name	Gender	*Male *Female	Age
Home Address			
Place			
Phone No.			
E-mail			
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If includes as attachment/note/letter, please tick here:			
How do you want us to reach you for feedback or update on your comment/grievance?			

FOR OFFICIAL USE ONLY

Registered by: (Names of official registering grievance)	
Mode of communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/positions of official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

ANNEX 2D: SAMPLE TRAFFIC MANAGEMENT PLAN

SAMPLE: TRAFFIC MANAGEMENT PLAN (TMP)

A. Principles

One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

- (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
- (ii) protection of work crews from hazards associated with moving traffic;
- (iii) mitigation of the adverse impact on road capacity and delays to the road users;
- (iv) maintenance of access to adjoining properties
- (v) Avoid hazards in
- (vi) Addressing issues that may delay the project.

B. Operating Policies for TMP

The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

- (i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
- (ii) Inhibit traffic movement as little as possible.
- (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
- (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
- (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
- (vi) Train all persons that select, place, and maintain temporary traffic control devices.
- (vii) Keep the public well informed.
- (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

C. Analyze the impact due to street closure

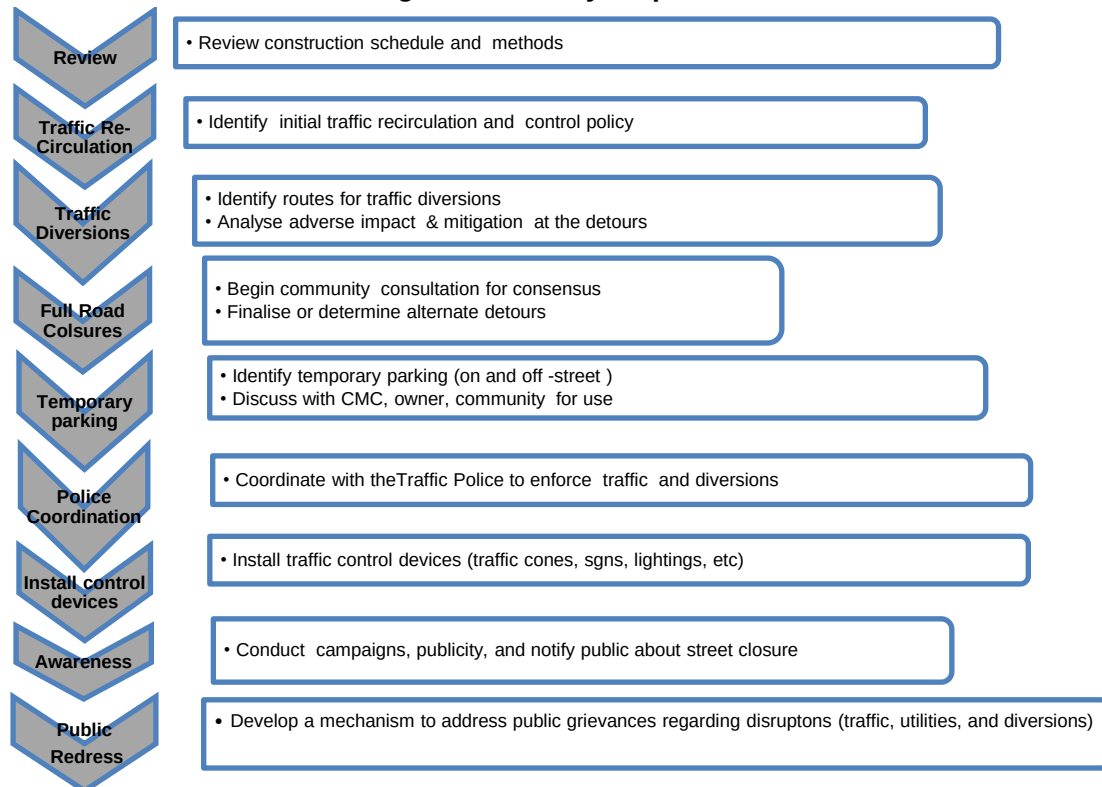
Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

- (i) approval from the ICG, local administration to use the local streets as detours;
- (ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
- (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
- (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
- (v) considering how access will be provided to the worksite;
- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and

- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A1: Policy Steps for the TMP



D. Public awareness and notifications

As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

The ICG will also conduct an awareness campaign to educate the public about the following issues:

- (i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) defensive driving behavior along the work zones; and

- (iii) reduced speeds enforced at the work zones and traffic diversions.

It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the ICG, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) Explain why the brochure was prepared, along with a brief description of the project;
- (ii) Advise the public to expect the unexpected;
- (iii) Educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) Educate the public about the safe road user behavior to emulate at the work zones;
- (v) Tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) Indicate the office hours of relevant offices.

E. Vehicle Maintenance and Safety

A vehicle maintenance and safety program shall be implemented by the construction contractor. The contractor should ensure that all the vehicles are in proper running condition and it comply with roadworthy and meet certification standards of GoN. All vehicles to be used at STWSSP shall be in perfect condition meeting pollution standards of GoN. The vehicle operator requires a pre state of shift checklist. Additional safety precautions will include the requirement for:

- Driver will follow the special code of conduct and road safety rules of Government of Nepal.
- Drivers to ensure that all loads are covered and secured drivers to ensure operation equipment can't leak materials hauled
- Vehicles will be cleaned and maintained in designed places.

F. Install traffic control devices at the work zones and traffic diversion routes

The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary "STOP" and "GO").

The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

The ICG and contractor will coordinate with the local administration and traffic police regarding the traffic signs, detour, and any other matters related to traffic. The contractor will prepare the traffic management plan in detail and submit it along with the EMP for the final approval.

ANNEX 2E:SPOIL MANAGEMENT PLAN

Spoil Management Plan (SMP)

Purpose and application: SMP is to describe how STWSSP will manage the spoil generated and reuse related to design and construction works. This is an integral part of EMP. The objective of SMP is to reuse of spoil from works in accordance with the spoil management hierarchy outlined in this document.

Objectives of SMP: The objectives of SMP are:

- To minimize spoil generation where possible
- Maximize beneficial reuse of spoil from construction works in accordance with spoil management hierarchy
- Manage onsite spoil handling to minimize environmental impacts on resident and other receivers
- Minimize any further site contamination of land, water, soil
- Manage the transportation of spoil with consideration of traffic impacts and transport related emissions

Structure of SMP:

Section 1: Introduction of SMP

Section 2: Legal and other requirements

Section 3: Roles and responsibilities

Section 4: Identification and assessment of spoil aspects and impacts

Section 5: Spoil volumes, characteristics and minimization

Section 6: Spoil reuses opportunities, identification and assessment

Section 7: On site spoil management approach

Section 8: Spoil transportation methodology

Section 9: Monitoring, Reporting, Review, and Improvements

Aspects and Potential Impacts

The key aspects of potential impacts in relation to SMP are listed in table below

Aspects	Potential Impacts
Air Quality	Potential for high winds generating airborne dust from the stock piles
Sedimentation	Potential for sediment laden site runoff from spoil stockpiles and potential for spillage of spoil from truck on roads
Surface and Groundwater	Contamination of water (surface and ground water)
Noise	Associated with spoil handling and haulage and storage
Traffic	Impacts associated with spoil haulage
Land Use	Potential for spoil to be transported to a receivable site that doesn't have permission for storage/disposal
Design specifications	Limitations on opportunities to minimize spoil generation
Sustainability	Limited sites for storage, reuse opportunities

Spoil volumes, Characteristics and Minimization

Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.

Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, MWSS mix materials, reusable materials)

Adopt Spoil Reduce, Reuse Opportunities

An overview of the assessment methodology to be used is mentioned below.

- Consideration of likely spoil characteristics
- Identification of possible reuse sites
- Screening of possible reuse opportunities
-

Identification of possible safe disposal sites for spoil: Those spoils which can't be reuse shall be properly disposed in designated areas, such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects and there should be any legal and resettlement related issues. Such areas need to be identified and prior client approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

Storage and stock piling

Transportation and haulage route

Based on the above, the contractor will prepare a SMP as an integral part of EMP and submit it to the DSMC for their review and approval.

SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection Report
- Others

ANNEX 2F: SAMPLE SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

This template must be included as an appendix in the EIA/IEE that will be prepared for the project. It can be adapted to the specific project as necessary.

INTRODUCTION

- Overall project description and objectives
- Description of projects
- Environmental category of the projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and project progress and status

No.	Project Name	Status of Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational		
		☐	☐	☐	☐		
		☐	☐	☐	☐		
		☐	☐	☐	☐		

COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS

No.	Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be Reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual Report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
 - What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;
 - If MWSS water was escaping site boundaries or MWSS tracks were seen on adjacent roads;
 - adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
 - Are their designated areas for concrete works, and refueling;
 - Are their spill kits on site and if there are site procedure for handling emergencies;

- Is there any chemical stored on site and what is the storage condition?
- Is there any dewatering activities if yes, where is the water being discharged;
- How are the stockpiles being managed;
- How is solid and liquid waste being handled on site;
- Review of the complaint management system;
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

Overall Compliance with CEMP/EMP

No.	Project Name	EMP/CEMP Part of Contract Documents (Y/N)	CEMP/EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed & Additional Measures Required

APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each project

MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used

- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity (µS/cm)	BOD (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity (µS/cm)	BOD (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)

Noise Quality Results

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Government Standard)	
			Day Time	Night Time

ANNEX 2G:SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name

Contract Number

NAME: _____

DATE: _____

TITLE: _____

DMA: _____

LOCATION: _____

GROUP: _____

WEATHER CONDITION:

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

INCIDENT:

Nature of incident:

Intervention Steps:

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization			
Air Quality	Reuse and Recycling			
Noise pollution	Dust and Litter Control			
Hazardous Substances	Trees and Vegetation			
Site Restored to Original Condition	Yes		No	

Signature

Sign off

Name

Position

Name

Position

ANNEX 3:

**PUBLIC NOTICE, DEED OF INQUIRY (MUCHULKA), RECOMMENDATION LETTERS &
MINUTES OF MEETINGS**

PUBLIC NOTICE

वर्ष १५ | अंक ५८ | काठमाडौं | बुधवार, ४ मंसिर २०७६ | Wednesday, 20 November 2019 | पृष्ठ ८+४ | मूल्य रु. १०

आर्थिक **अभियान** हरेक दृष्टि, आर्थिक कोण

www.abhiyandaily.com

राष्ट्रिय दैनिक

अतिक्रम विकसित मुलुक ऋणको दुरुचक्रमा फस्दै ३

सेवाक्षेत्रमा व्यावसायिक नैतिकता ४

निर्माण व्यवसायीले चाहेर मात्र योजना समयमै सकिँदैन : महासंघ ११

हुवावेईलाई थप ९० दिनको छुट १

समृद्ध नेपाल सुखी नेपाली, सामाजिक सेवा सबैको जिम्मेवारी

नेपाल सरकार सञ्चार तथा सूचना प्रविधि मन्त्रालय सूचना तथा प्रसारण विभाग

नेपाल सरकार
खानेपानी मन्त्रालय
खानेपानी तथा ढल व्यवस्थापन विभाग
शहरी खानेपानी तथा सरसफाई आयोजना

पाँचखाल खानेपानी तथा सरसफाई आयोजना
प्रारम्भिक वातावरणीय परीक्षणको लागि राय सुझाव पेश गर्ने सम्बन्धमा

सार्वजनिक सूचना

प्रकाशित मिति : २०७६/०८/०४ गते

एसियाली विकास बैंकको आर्थिक सहयोगमा काभ्रे जिल्लाको पाँचखाल नगरपालिका अर्न्तगत वडा नं २, ३, ४, ६, ७, ८, ९, १०, ११ र १२ का आशिक क्षेत्रहरूलाई लक्षित गरी निर्माण हुन गइरहेको पाँचखाल खानेपानी तथा सरसफाई आयोजनाको प्रारम्भिक वातावरणीय परीक्षण (Initial Environmental Examination) को प्रतिवेदन तयार गर्नुपर्ने भएकोले सो आयोजनाबाट भौतिक, जैविक, सामाजिक, आर्थिक एवं सांस्कृतिक प्रणालीहरूमा के-कस्ता असरहरू पर्न सक्छन् सो बारे लिखित राय सुझाव सहित १५ (पन्ध्र) दिनभित्र आइपुग्ने गरी निम्न ठेगानामा पठाइदिनु हुन, वातावरण संरक्षण नियमावली २०७३ को नियम ७ (२) अनुसार सम्बन्धित सबैको जानकारीको लागि यो सूचना प्रकाशित गरिएको छ। साथै, लिखित राय सुझावको प्रतिलिपि खानेपानी मन्त्रालय, सिंहदरबार, काठमाडौं र खानेपानी तथा ढल व्यवस्थापन विभाग, पानीपोखरी, काठमाडौंमा उपलब्ध गराइदिनु हुन समेत अनुरोध गरिन्छ।

राय सुझाव पठाउने ठेगाना

पाँचखाल नगरपालिका, काभ्रे नगर प्रमुख : महेश खरेल सम्पर्क नं.: ९८४३०४१७८८ सुनकोशी पाँचखाल खानेपानी तथा सरसफाई उपभोक्ता संस्था अध्यक्ष : कुमार प्रसाद लामिछाने सम्पर्क नं.: ९८४९७९४९६२	टेक कन्सल्ट प्रा. लि./इन्टिग्रेटेड कन्सल्टेण्ट नेपाल प्रा.लि. जेभी शंखमुल, काठमाडौं, नेपाल फोन नं.: ०१-५२४२८४६, ०१-५२४२९४० Email: taec@mos.com.np	शहरी खानेपानी तथा सरसफाई आयोजना आयोजना व्यवस्थापन कार्यालय, पानीपोखरी, काठमाडौं फोन नं.: ०१-४४२३२८६, फ्याक्स: ०१-४४१३२८० Email: info@sstwssp.gov.np क्षेत्रीय आयोजना व्यवस्थापन कार्यालय, इटहरी, सुनसरी फोन नं.: ०२५-५८८१४१ फ्याक्स: ०२५-५८८१४२ Email: rpmoithari@gmail.com
---	---	---

MUCHULKA (DEED OF INQUIRY)



“पाँचखाल नगर-कृषि सहर” पाँचखाल नगरपालिका नगर कार्यपालिकाको कार्यालय

प.सं. : ०६६१६६

च.नं. : ११६२

पाँचखाल, काभ्रेपलाञ्चोक

३ नं. प्रवेश, नेपाल



फोन नं. ०११-४९९४५१

फ्याक्स नं. ०११-४९९२६७

मिति: २०७६/०८/३

श्री जो जस संग सम्बन्धमा ।

विषय: मुचुल्का सम्बन्धमा

एशियाली विकास बैंकको आर्थिक सहयोगमा काभ्रेपलाञ्चोक जिल्लाको पाँचखाल नगरपालिका अन्तर्गत निर्माण हुन गइरहेको सहरी खानेपानी तथा सरसफाई आयोजनाको प्रारम्भिक वातावरणीय परिक्षणको सार्वजनिक सुचना हामी तपशिलको व्यक्तिहरुको रोहवरमा टाँस भएकोले यो मुचुल्का आजको मिति २०७६/०८/०३ गतेमा तयार गरि सही छाप गरि दियौं ।

तपशिल:

१. महेश खरेल
२. कुमार लामिछाने
३. उज्वल अधिकारी
४. कल्याण प्र.सुवेदी

२०७६/०८/३
लोक बहादुर भण्डारी

प्रमुख प्रशासकीय अधिकृत

प्रमुख प्रशासकीय अधिकृत

RECOMMENDATION LETTERS



प.सं. : ०६६१६६

च.नं. : १८१२

“पाँचखाल नगर-कृषि सहर” पाँचखाल नगरपालिका

नगर कार्यपालिकाको कार्यालय

पाँचखाल, नयाँपल्लेज्चोक



फोन नं. ०११-४९९४५१

फ्याक्स नं. ०११-४९९२६७

मिति: २०७६/०९/२२

विषय: सिफारिस गरिएको बारे ।

यस पाँचखाल नगरपालिकामा सञ्चालन हुने शहरी खानेपानी आयोजना सम्बन्धि राय सुझाव संकलन गर्न अभियान राष्ट्रिय दैनिकमा मिति २०७६/०८/०४ मा सार्वजनिक सूचना प्रकाशित गरिसकेको छ । यहीँ प्रकाशन मितिको पन्ध्र दिन भित्र स्थानीय स्तरका जानकारीहरुबाट आयोजनाद्वारा वातावरणमा कुनै प्रकारको नकरात्मक असर नपर्ने भनि राय सुझाव प्राप्त भएकोले र सरोकारवालाहरुको माझमा प्रारम्भिक अध्ययनमा आधारित रहेर परामर्शदाताद्वारा गरिएको प्रस्तुतिकरण अनुसार पनि प्रस्तावित आयोजनाले आयोजना क्षेत्रको भौतिक, जैविक, सामाजिक, आर्थिक एवं साँस्कृतिक वातावरणमा कुनै नकरात्मक असर नपर्ने देखिएकोले आयोजना सञ्चालनको लागि यस नगरपालिकाबाट सिफारिस गरि पठाइएको व्यहोरा गर्दछौं ।

राजेश बन्जारा

शाखा अधिकृत
शाखा अधिकृत



नौले सामुदायिक वन उपभोक्ता समूह

दर्ता नं.: १०

दोलालघाट-३, नौलेगाउँ, काभ्रे



पत्र संख्या: ०६६/६६

चलानी नं.: ५

मिति: २०६६/०५/२६

श्री सुनकोशी पाँचरबाल
स्वानेपानी उपभोक्ता समिति
पाँचरबाल-३

विषय: सिफारिस सम्बन्धमा।

महोदय

प्रस्तुत विषयमा सुनकोशी पाँचरबाल स्वानेपानी
योजनाको विभिन्न संरचना निर्माण प्रथम पाँचरबाल
ले.पा वडा नं. ५ को डाँडागाउँमा निर्माण हुने पानी
प्रशोधन इकाई देखाउँदै देखाउँदै भुम्लु गाउँपालिका वडा नं. १०
नौले सामुदायिक वन समूह हुँदै सम्पन्न गर्ने स्थान
विभिन्न सम्पत्ति आने खुड्क निर्माणका लागि खुड्क
निर्माण गर्ने २०६६ भाद्र २८ गतेका दिनको यस
नौले सामुदायिक वन समूहको बैठकको निर्णय
अनुसार सहभागी दिने निर्णयको जानकारी
गर्नाउँछु।

(Signature)

तिर्थ ब. तमाङ

अध्यक्ष

नौले वन सामुदायिक वन
उपभोक्ता समूह दोलालघाट
-३ नौलेगाउँ काभ्रे जिला
भुम्लु-१०



भुम्लु गाउँपालिका Bhumlu Rural Municipality

१० नं. वडा कार्यालय, दोलालघाट, काभ्रेपलाञ्चोक
10 No. Ward Office, Dolalghat, Kavrepalanchok

पत्र संख्या (Letter No.): २०७६-७७-३ नं. प्रदेश, नेपाल
चलानी नं. (Ref No.): ३६-३ No. Province, Nepal

मिति (Date): २०७६-४-११-

श्रीमान नगर प्रमुख वरिष्ठ
पाँचखाल नगर पालिका कार्यालय
तामघाट काठमाडौं।

विषय: जग्गाको सिमादीप्त सम्बन्धमा।

प्रस्तुत सम्बन्धमा सुनकोशी पाँचखाल खानेपानी उपग्राम
समिती पाँचखालको प.स. २०७६-७७-च.नं. १५१-मिति-
२०७६-४-९-को पत्र प्राप्त भई व्यहोरा अखण्ड भयो सो सम्बन्ध
मा भुम्लु गा.पा. वडा नं. १०-भित्र पर्ने सुनकोशी नदिको किनार
विमोह भन्ने स्थानमा साविक दोलालघाट गा.वि.स. वडा नं. १
द्वारा हाल भुम्लु गा.पा. १०-भित्र पर्ने कि.नं. २४६-को साविक
निक जग्गामा खानेपानी व्याङ्गी निर्माण गर्न अनुमती दिएको
व्यहोरा सिमादीप्त साथ अनुरोध गर्दछु।

सौदार्थ

श्री सुनकोशी पाँचखाल खानेपानी,
उपग्राम समिती पाँचखाल
काठमाडौं।

२०७६-४-११
चित्र बहादुर लामा
वडा अध्यक्ष



कर्कटार सामुदायिक वन उपभोक्ता समिति
पाँचखाल न.पा. वडा नं. १२

कर्कटार

०६६/६६
१०४

मिति: २०६६/५/८ गते

विषय: सुन कोसी खानेपानी ज्याङ्की निर्माण गर्ने

उपरोक्त सम्बन्धमा आज मिति २०६६/५/८ गते —
कर्कटार सामुदायिक वन समुहको बैठक बसी सुनकोसी
खानेपानी ज्याङ्की निर्माण गर्ने गर्ने अर्का अर्का निवेदन
निवेदन आएको हुदा सो निवेदन अनुसार पाँचखाल
न.पा. १२ अन्तर्गत कर्कटार सामुदायिक वन समुह निम्न
गर्ने डोल्पाङ्ग माथी कुमरीछाती जंगलको डाँडागा सुनकोसी
खानेपानीको ज्याङ्की निर्माण गर्ने दिने अर्को बैठक
बसी निर्णय गरेको हो।

सुपु व. खत्री
कायस्थ
— x —



भैसेखोला सामुदायिक वन उपभोक्ता समूह

पाँचखाल न.पा.-२, काभ्रे

स्थापना: २०५३

दर्ता नं.: ३६-०५२/५३

पत्र संख्या: ०६६/६६

चलानी नं.: ४९

मिति: २०६६/०५/१९

श्री सुनवोशी पाँचखाल खोलेपनि उपभोक्ता समिति
पाँचखाल, काभ्रे पलाञ्चोक ।

विषय: जग्गा उपलब्ध गराउने सम्बन्धमा ।

प्रस्तुत विषयमा, सुनवोशी पाँचखाल खोलेपनि योजनाको
क्षेत्रमा दयारि निर्माण गर्नका लागि भैसेखोला सामुदायिक
वन उपभोक्ता समितिको मिति २०६६ भाद्र ११ गतेको बैठकको
निर्णयानुसार वि.नं. १३६ को यस सामुदायिक वन क्षेत्र भित्रको
आवश्यक जग्गा दयारि निर्माणको लागि उपलब्ध गराउने
निर्णय गरिएको ब्यबस्था अनुषंग ।

श्री.

प्रकाश विमलसिन्हा

अध्यक्ष



“पाँचखाल नगर-कृषि सहर”
पाँचखाल नगरपालिका

...०४... नं. ४ वडा कार्यालय

पाँचखाल, काभ्रेपलाञ्चोक

३ नं. प्रदेश, नेपाल

प.सं. : ०६६/६६

च.नं. : २००

मिति : २०७६/०५/१९

श्री सुनकोशी पाँचखाल खानेपानी उपभोक्ता समिति,

पाँचखाल, काभ्रे

विषय : सिफारीस सम्बन्धमा ।

प्रस्तुत विषयमा पाँचखाल नगरपालिकाको गौरवको योजना सुनकोशी पाँचखाल खानेपानी योजनाको विभिन्न संरचना निर्माण अर्न्तगत सार्वजनिक शौचालय निर्माण पनि एक भएकाले पाँचखाल नगरको महत्वपूर्ण बजार पाँचखाल न पा वडा नं ४ अर्न्तगत तामाघाट बजारमा शौचालय निर्माण गर्न साविक पाँचखाल गा. वि. स. वडा नं. ६, हाल पाँचखाल न पा वडा न. ४, को कित्ता नं. २५७ को २-१३-०-० क्षेत्रफल भएको जग्गा दिने निर्णय गरीएको व्यहोरा सिफारीसका साथ अनुरोध गरिन्छ ।

सुन्दर तामाङ
सुन्दर तामाङ
वडा अध्यक्ष



प.सं. : २०७६/२०७७

च.नं. : ८३

“पाँचखाल नगर-कृषि सहर”
पाँचखाल नगरपालिका

.....१०... नं. वडा कार्यालय

पाँचखाल-कृषिपलाञ्चोक

३ नं. प्रदेश, नेपाल

पाँचखाल नगरपालिका
१० नं. वडा कार्यालय
देवभूमी वालुवा, काभ्रेपलाञ्चोक
३ नम्बर प्रदेश, नेपाल

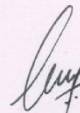
मिति २०७६/५/३

श्रीमान अध्यक्ष ज्यू

सुनकोशी पाँचखाल वृहत खानेपानी आयोजना

विषय : जग्गा उपलब्ध गराइएको सम्बन्धमा ।

उपरोक्त विषयमा पाँचखाल न.पा. वडा नं. १० (साविक देवभूमी वालुवा -८) अन्तर्गत सुनकोशी पाँचखाल खानेपानी आयोजनाको प्रारम्भिक घरधुरी सर्वेक्षण भए अनुशारका उपभोक्ताहरुको घरघरमा खानेपानीको धारा व्यवस्थापन गर्न सो आयोजना द्वारा सम्पन्न गरिने खानेपानी ट्याङ्की निर्माण गर्न साविक देवभूमी वालुवा -८ को कि.नं. १०५६ को सार्वजनिक जग्गा उपलब्ध गराइएको व्यहोरा अनुरोध छ ।


२०७६/०५/१०
नारायण प्रसाद सापकोटा
वडा अध्यक्ष
नारायण प्रसाद सापकोटा
वडा अध्यक्ष

MINUTES OF MEETING-1

PAGE: / /
DATE: / /

PAGE: / /
DATE: / /

मिति :- 2065/10/20

आज मिति 2065 साल आश्विन 20 गते का दिन
पाँचखाल नगरको गौरवका योजना सुनकोशी पाँचखाल
स्वासेधानी योजना कार्यन्वयनको लागि आयोजित
बृहत् उपभोक्ता भेल्ला सुनकोशी पाँचखाल स्वासेधानी
उपभोक्ता समितिको अध्यक्ष कुमार प्र. लामिछानेको
अध्यक्षतामा र सूचना तथा संचार माननीय
श्री जोकुल प्रसाद चौलाकोटीको प्रमुख आतिथ्यतामा
तथा अन्य विशेष अतिथी र आतिथीहरूको
आतिथ्यतामा यस पाँचखाल नगरपालिका बृहत् उपभोक्ता
मा सम्पन्न भयो । जानकारी उपभोक्ता मान्यका
ह ।

उपस्थिति :

1. संभाषात्मक श्री कुमार प्र. लामिछाने
2. प्रमुख अतिथी सूचना तथा संचार माननीय श्री जोकुल प्र. चौलाकोटी
3. विशेष अतिथी कार्य क्षेत्र रक का सुदेवा लामा
संसाधन माननीय श्री लक्ष्मण लामाल
4. विशेष अतिथी पाँचखाल नगर पालिका का नगर प्रमुख श्री महेश खरेल
5. अतिथी जिल्ला समन्वय समितिको कार्यका उप संचालक श्री अजय गौतम (पौडेल)
6. अतिथी पाँचखाल नगर पालिका उपप्रमुख श्री लक्ष्मी
कुमार
7. अतिथी तेस्रो स्थाना सहरी स्वासेधानी तथा सलफाई
परियोजना कार्यक्षेत्रका श्री राजेन्द्र सापकोटा
8. नगर विकास कोष अध्यक्ष धुव रिजाल
9. प्राविधिक अध्यक्ष सवाल राज पन्त
10. कन्सल्टान्ट विनोद चन्द्र देवकोटा
11. गेडाडन इन्जिनियर भुजना अर्याल
12. शिपि अधिकारी

- | क्र.सं. | नाम | पद | संकेत |
|---------|--|-----------------------|-------|
| १३. | लोचरवाल नगरपालिका कार्यकारी अधिकृत | श्री लाल प्र. थापागाई | |
| १४. | पूर्व लम्जाखुवा रेजि. व. न. म. नगर | श्री १०३१ | |
| १५. | पूर्व गृह लाघेव श्री जनार्दन नेपाल | | |
| १६. | सन्तलाहाकार श्री डा. सुधार अधिकारी | | |
| १७. | वाल्हेपनका श्री श्री नरेन्द्र जंग पौडेल | | |
| १८. | सन्तलाहाकार श्री राम अधिकारी | | |
| १९. | " श्री कामोद अधिकारी | गोमिठ | |
| २०. | " श्री डा. भरत लामोहार | | |
| २१. | " श्री अर्जुन प. थापाकोटा | २५५५५५५५ | |
| २२. | " श्री अमर प्रसाद लामोहार | | |
| २३. | " श्री सरस्वती त्रिभोदिया | | |
| २४. | " श्री रामशरण रेग्मी | १०००० | |
| २५. | आलेची श्री कञ्चन अधिकारी | १०००० | |
| २६. | " श्री राजकुमार श्रेष्ठ | १०००० | |
| २७. | उष्माका श्री रावेन्द्र विष्ट | | |
| २८. | साचेव श्री चेतन प्र. गौतम | १००००००० | |
| २९. | कोषाधिकारी श्री कल क. दुलाल | १०००० | |
| ३०. | वडा अध्यक्ष वडा नं. १. अठ्ठ वडापुर तामाङ | १००००००० | |
| ३१. | " २. हारी खालिका | १०००० | |
| ३२. | " ३. सुन्दर अधिकारी | १००००० | |
| ३३. | " ४. सुन्दर लामा | १०००० | |
| ३४. | " ५. काल कृष्ण थापाकोटा | १००००० | |
| ३५. | " ६. रामशरण दुलाल | १००००० | |
| ३६. | " ७. पुष्कर ठकाल | १०००० | |
| ३७. | " ८. संजय तामाङ | १०००० | |
| ३८. | " ९. किरण श्रेष्ठ | १०००० | |
| ३९. | " १०. नारायण प्र. थापाकोटा | १०००० | |
| ४०. | " ११. त्रिवेन्द्र तामाङ | १००००००० | |
| ४१. | " १२. जोषाल दुनुवा | १०००० | |
| ४२. | " १३. सुकनोर तामाङ | १०००० | |
| ४३. | मान्य श्री सादनी दुनुवा | १०००० | |

PAGE : DATE : / /		PAGE : DATE : / /	
82	भोलो प्रसाद चापागाई, उ.प.क. पांचखाल न.पा.क., पांचखाल गाँव		
83	इन्दिरा शर्मा रिपवान - उपाध्यक्ष - सु.पा.का.का. - पांचखाल - 3		
86	अशोक राई तामाडो	11	9
87	मेरुजु गौतम जि.स.क. उपप्रमुख	पांचखाल	
85	सुन्दरी विमल शिखरपुर 6	मा.परा	
80	संजीता कुँवर तामाधार - 8		
89	नारायण कोइराला पांचखाल - 2		
82	राम प्रसाद पन्त पांचखाल - 6		
83	विजय प्रताप अधिकारी पांचखाल - 3		
88	हाकुर नाथ अधिकारी पांचखाल - 2		
84	सुन्दरी कुँवर पांचखाल 6, कामपात्रिका सदस्य	सु.पा.	
85	राजना शर्मा पांचखाल सु.पा.का.का. (पा.का.का.)		
86	प्रमिला आचार्य शिखर 8/6/2011 - 8		
85	सु.पा.		
85	मा.परा		
80	राम प्रसाद कोइराला पांचखाल - 2		
यशप्रसाद मल्ल		यशप्रसाद	
84	जीवनाथ दाहाल	सिखर	
82	पद्म प्रसाद खत्री पांचखाल 6	पद्मप्रसाद	
83	विनोद प्रसाद खत्री पांचखाल 7	विनोद	
84	धर्म प्रसाद खत्री - पांचखाल - 7 खत्री	धर्म	
85	सुष्म अग्रवाल (Design Engineer)	सुष्म	
86	सुष्म राजा गिरी (सिखर) पांचखाल - 3		
86	मालि बलराम आचार्य	मालि	
87	पुनः अरु कुँवर		
80	जगन्नाथ तामाडो	8	
89	दिलीपा अधिकारी पांचखाल - 3		
82	हरिहर अधिकारी पांचखाल - 3		
83	जमुना विक्रम	जमुना	
84	शरद खत्री पांचखाल 7	शरद खत्री	

PAGE : DATE : / /		PAGE : DATE : / /	
62	हुगाई मागाई पांचखाल ५०	हुगाई	
63	हिलिध अन्वूर्य वन्य जाल - १२	हुगाई	
64	पञ्च व. दण्ड ॥ ११ ६	हुगाई	
65	हारे वसुध (दण्ड) १२	हुगाई	
66	मदन प्रसाद (नाथवा) ॥ ११ २	हुगाई	
67	अच्युतम खतिवडा पांचखाल - ३	हुगाई	
68	गोठ कुमारी (डाचिकारी) ॥ ४	हुगाई	
69	बाबू प्रसाद हुगाई - ६	हुगाई	
70	मुम्बोला धिपारे होले २ वासि योमा	हुगाई	
71	होले प्रसाद धिपारे पांचखाल ३	हुगाई	
72	प्रसाद प्र. तिमील्लेना पांचखाल १२ वालुवा	हुगाई	
73	हारे नरद पन् पांचखाल - ३	हुगाई	
74	हिक वहाडा (नाथवा) कालि ॥ ३	हुगाई	
75	हारे (साधु) नाथवा २	हुगाई	
76	नाथवा बाल पांचखाल - २	हुगाई	
77	मकश बालि पांचखाल - ३	हुगाई	
78	सुर्मा व. गेवाले पांचखाल - ३	हुगाई	
79	सुर्मा हुवाले ॥ ११ ६	हुगाई	
80	मेखन प्रसाद कोलखे ॥ ११ ४	हुगाई	
81	सुकास लुडले ॥ ११ ३	हुगाई	
82	गणेश प्रसाद तिमील्लेना ॥ २	हुगाई	
83	सुकास अर्पल पांचखाल - ३	हुगाई	
84	सिध प्रसाद पौड्याल ३	हुगाई	
85	हिक प्रसाद कोलखे (लुडले) ६	हुगाई	
86	मकराज कोलखे (कोली) लुडले ६	हुगाई	
87	श्वरग प्रसाद कोलखे ६	हुगाई	
88	माली रङ्गे विमलसीना ३	हुगाई	
89	गणेश प्रसाद हुगाई १	हुगाई	
90	कोली पाल ३	हुगाई	
909	प्रसाद योमागाई पांचखाल - ४	हुगाई	
902	अन्वूर्य वन्य जाल १ १ ६	हुगाई	
903	श्याम वहाडा (विमलसीना) १ १ ३	हुगाई	

PAGE : DATE : / /		PAGE : DATE : / /	
908	सैम शाय भैवाल पांचखाल - 3		पुनः 21/11
909	श्याम कुमाल इकुल 11 - 3		21/11
910	कुलराज शम्भु पांचखाल 5 -		कुलराज
106	रेवराज कोलरा पांचखाल 6		रेवराज
907	सुनीता वि.क. पांचखाल - 4		सुनीता
905	सुनीता वि.क. पांचखाल - 4		सुनीता
990	मगत के लामा पांचखाल - 6 लामा पिडाई		मगत
999	निश के लामा पांचखाल 8		निश
992	नित प्रसाद झाईझाई पांचखाल 6		नित
993	हर्षनाथ खेक पांचखाल 8		हर्षनाथ
994	नन्द प्रसाद लामा पांचखाल 3		नन्द
995	कुलराज शम्भु 11 3		कुलराज
996	कुलराज शम्भु 11 3		कुलराज
996	मनोज वि.क. पांचखाल - 4		मनोज
997	राज कुमाल सापकोटा पांचखाल 4		राज
998	राम प्रसाद सापकोटा पांचखाल - 1		राम
120	शेराफ कोपले - 00		शेराफ
999	Pragusa Timalsing Panchkhal-3		प्रगुसा
222	सुभाष लामा पांचखाल 3		सुभाष
223	Agusha Timalsing Panchkhal-3		अगुशा
224	वर्षा प्रसाद सापकोटा 1		वर्षा
225	हेलक हठ गौतम		हेलक
226	नित प्रसाद झाईझाई		नित
227	नित प्रसाद झाईझाई		नित
228	नित प्रसाद झाईझाई पांचखाल - 1		नित
229	नित प्रसाद झाईझाई 11 4		नित
230	कालु प्रसाद झाईझाई 11 4		कालु
231	लक्ष्मण सापकोटा 11 4		लक्ष्मण
232	गोबिन्द गौतम 11 4		गोबिन्द
233	गोबिन्द गौतम 11 4		गोबिन्द
234	गोबिन्द गौतम 11 4		गोबिन्द
235	गोबिन्द गौतम 11 4		गोबिन्द
236	गोबिन्द गौतम 11 4		गोबिन्द
237	गोबिन्द गौतम 11 4		गोबिन्द

PAGE : DATE :		PAGE : DATE : / /
३६-	गंगा व पाल - बनेपा ह.	
३७	योगेश्वर सत्याल पाँचवाल-६ लत्यालवेनी	
३८	रामशरण रेग्मी - पाँचवाल-६ पलाचौक बगवती	
३९	रामकृष्ण बान्त	६ शिवपुर
४०	गुणम काफ्ले	" "
४१	जगन्नाथ न्युपनाथ	
४२	अर्जुन तिमलिपना	हले डोल
४३	बसिन्दा १० काचाप	डोल
४४	सन्तोष रिपवान	१३ नं ३
४५	बिष्णु वडादर हाटेल - ५ ६	

प्रस्तावः :-

- १) यस पुनर्कोशी पाँचवाल नगर खानेपानी आयोजनाको बलुव डिजाईन प्रतिवेदन प्रस्तुत सम्बन्धमा ।
- २) आयोजनालाई आवश्यक पर्ने जग्गाको सम्बन्धमा ।
- ३) आयोजना निर्माण गर्दा हुने वातावरण सम्बन्धी प्रभाव अनुमान र व्यवस्थापन सम्बन्धमा ।
- ४) उपभोक्ताहरूबाट ५% अग्रिम रकम उठाउने सम्बन्धमा ।
- ५) आन्तरिक प्रतिवेदन तयार सम्बन्धमा ।

निर्णयः :-

प्रस्ताव नं १ माथी हलफल गर्दा यस नगर आयोजना जुन ADB को सहयोग नेपाल सरकारको अनुदान सहयोगमा संचालन हुने सहरी खानेपानी आयोजनाको डिजाईन कन्सल्टेन्ट TAEC-ICON जव ले गरेको बलुव-प्रतिवेदनको सर्वे डिजाईन सामाजिक लर्ने सामाजिक सुरक्षण लर्ने लर्ने वातावरण सम्बन्धी गरेको अध्ययन प्रतिवेदन पाँचवाल नगरपालिकाको लमहलमा डिजाईन कन्सल्टेन्ट ले उपभोक्ता तथा सरोकार लिखकहरूको माझमा प्रस्तुत हलफल साथ निर्णय गरियो ।

PAGE :
DATE : / /

PAGE :
DATE : / /

प्रस्ताव नं. २ माथी हलफल गर्दा निर्माण कार्य गर्नु पर्ने जस्तै
RWT लाई प्रशोधन केन्द्र, पाइपलाईन फल्टर गर्दा आवश्यक पर्ने
जग्गा यस आयोजनाको सामेलिको लक्ष्मीवाट स्वागतेष्ट हल्लातण
साहित हालैवाले विकास बैंक को सामाजिक (लेफ्ट गार्ड) सुनधार-
नीले अनुसार उपलब्ध गराउनु पर्ने हुन्छ। यस आयोजनालाई
आवश्यक जग्गाजमिन को कागजात उपलब्ध गराउने निर्णय गरियो।
प्रस्ताव नं. ३ माथी हलफल गर्दा, यस आयोजनाको निर्माण गर्दा
बढीने पर्ने वा हुन आउने सामाजिक कालाकारण प्रभाव सम्बन्धमा
यति अध्ययन गरिएको जसको लागि IEE प्रतिवेदन बनाई अगाडी
बढ्ने कुरामाथी पनि हलफल गरियो र यस आयोजनामा IEE
प्रतिवेदन अनुसार कालाकारण मा पर्ने प्रभावहरूलाई म्यानजर
गर्दै कालाकारणमा असर पर्ने नबिने कालाकारण विषयमा
प्रतिवेदन भई अगाडी बढ्ने निर्णय गरियो।

प्रस्ताव नं. ४ माथी हलफल गर्दा आयोजनाको अवधारणा
अनुसार अग्रिम उठाउनु पर्ने ५५ रुकम स्थानीय स्तरबाट उठाउनु
पर्ने हुन्छ। उक्त रुकम प्रत्येक घरधुरीबाट उठाउने निर्णय गरियो
र आयोजनालाई आवश्यक कागजात उपलब्ध गराउने समेत
निर्णय गरियो।

प्रस्ताव नं. ५ माथी हलफल गर्दा आयोजनाको कालाकारण
कार्यलयमा भएका हलफल र आज भएका हलफल २०७५/०७६
को दररेट अनुसार अन्तिम प्रतिवेदन तयार गवने जानकारी
को समेत निर्णय गरियो।

(Signatures and stamps)

आज मिति २०७२/०२/२८ गते शनिबार को दिन भुम्लु गाउँपालिका वडा नं. १० स्थित बिमिरेमा नौबे सामुदायिक वन उपभोक्ता समितिको अध्यक्ष श्री तिर्थ बहादुर तमाङको उपस्थितमा छलफल बसी निम्न निर्णय समेत गरियो।

- १) अध्यक्ष :- श्री तिर्थ बहादुर तमाङ
- २) उपअध्यक्ष :- श्री प्रबलप्रसाद घाँगी
- ३) कोषाध्यक्ष :- श्री कृष्ण प्रसाद कान्छा
- ४) सचिव :- श्री भक्त बहादुर ठकुरी
- ५) सदस्य :- श्री कृष्ण बहादुर बस्नेत
- ६) सदस्य :- श्री सुमारी प्रसाद कुमारी
- ७) सदस्य :- श्री बालकृष्ण ठकुरी
- ८) सदस्य :- श्री प्रेम बहादुर प्रसाद
- ९) सदस्य :- श्री हेम सुमारी प्रसाद

अन्य उपस्थितहरू

- १) जित बहादुर तमाङ
- २) दल बहादुर प्रसाद
- ३) डल बहादुर प्रसाद

प्रस्तावहरू

- १) सडक बनाउन सहमती दिने सम्बन्धमा
- २) बिमिरे सम्बन्धमा

प्रस्ताव नं. १ प्रसाद उपर छलफल गर्दा सुनकोसी नदीपारी योजना सहज संचालन गर्न पाँचरवाले नं. पा. ३ डाँडागाउँमा निर्माण हुने पानी प्रवाह गर्न सक्ने निर्माण, स्थल देवी भुम्लु गा.पा वडा नं. १० नौबे सामुदायिक वन भएर सम्पन्न गर्न स्थल सुनकोसी बढी बिमिरे सम्पन्न पुग्ने सडक निर्माण गर्न यस वन उपभोक्ता समितिले सहमती दिने निर्णय गरियो।

कान्छा प्रेम कुमारी डल

आज मिली २०६६/२१७ गरी कैकिला सामुदायक वन समुहको बैठक अध्यक्षतामा बैठक वसी निर्णय गरियो।

तपसीला			
१. अध्यक्ष	सुपे व. बरि		
२. उपा - १८	राम व. ढुवा	राम बरि	
३. कोषा - १८	वि. व. १ - ११	वि. व. २	
४. सचिव -	जोपाल कं. २३	११	
५. सदस्य	नारायण	११	
६. - १८	जोपी	११	
७. - ११	का. २३	१८	
८. - ११	सरस्वती	१८	
९. - १८	सर्मिला	११	
प्रमुख सल्लाहकार जोपी ढुवा			

प्रस्ताव
१. सुन को सी खाने गानी तथा डोकी निर्माण सम्बन्धमा
२. विवेक

प्रस्ताव नं. १ मा दलफल गरी सुनको सी खाने गानी तथा डोकी पाचखाल म.सा १२ वडा अन्तर्गत कैकिला सामुदायक वन समितिले निज पर्ने जोड्नेमा २३ माथी दुम्डीधारी जंगलको डाटाआ सुनको सी खाने गानी तथा डोकी निर्माण गरी पाचखाल म.सा १२ वडाका उपक्रोस्ता हड्ढाई खाने पानी विभाजन गर्न उचित हुने हाउ भएका हुने यस कैकिला सामुदायक वन समुहको उपक्रोस्ता समुह हड्ढाई लो देन्दा अनुसा उपक्रोस्ता पर्ने जंगल उपक्रोस्ता गरी पानी तथा डोकी बनाउन दिन निर्णय गरियो।

जोपी वि. २०
सर्मिला
सरस्वती

DETAILED DESIGN REPORT PRESENTATION AND PUBLIC CONSULTATION

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Supply and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
१	बाबुराज पन्नाजली		
२	बसि मर्याद पन्नाजली		
३	राम दाहाल (१३५॥१०७६००)	उपसम्पन्न K.T.V	
४	कुकुली झाडली		
५	रामनाथ धिमाल		
६	प्रताप प्र० हर्षा पानि		
७	रामकृष्ण प्र० पन्नाजली	प्र.क्ष.उपनामिक	
८	SANTOSH SARKOTA		
९	रिला केन सिउदेन		
१०	सरोज धिमाल		
११	मिनेडि पन्नाजली	का.सदस्य	
१२	राम पन्नाजली		
१३	राम वरुण प्र.क्ष.		
१४	बालकृष्ण धोरसाले	प्र.क्ष.उपनामिक	
१५	राम लुईदेन	प्र.क्ष.उपनामिक	
१६	सीता बालियाँ	प्र.क्ष.उपनामिक	
१७	राम मो. झाडली	प्र.क्ष.उपनामिक	
१८	राम मिना	प्र.क्ष.उपनामिक	
१९	राम मिना	प्र.क्ष.उपनामिक	
२०	रविन्द्र का.का. काफली	पान्चवाल-७	
२१	गिरील प्र.क्ष.	पान्चवाल-६	
२२	सोताराम अधिकारी	पान्चवाल-६	

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Supply and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

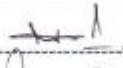
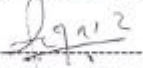
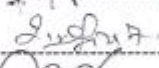
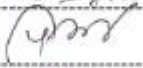
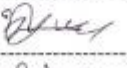
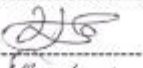
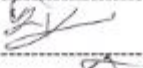
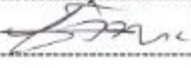
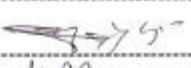
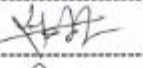
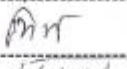
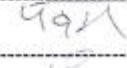
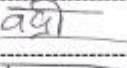
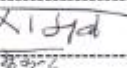
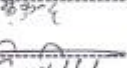
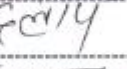
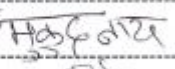
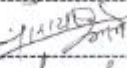
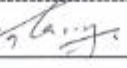
S.N.	Name	Designation	Signature
०३	लेज प्रमुख मिश्र	पाँचखाल २	
१४	शिव गौपाल श्रेष्ठ	पाँचखाल	
१५	लालबिहारी मिश्रा	- - ८	
२५	सन्देश कायस्थ	पाँचखाल ६	
२६	राजबहादुर श्रेष्ठ	" - ११	
२८	रुचिरा जोशी	पाँचखाल - ११	
२९	रमेश खरेल	" "	
३०	बलमान लामा तामाङ	" "	
३१	राजाराज मिश्र	" २	
३२	आनंद राई	" ४	
३३	पद्म डि. क.	" ६	
३४	अजुन वामन	पाँचखाल ३	
३५	रामशरण दाहाल	पाँचखाल - २	
३६	राम शरण खरेल	पाँचखाल - ४	
३७	किशोर प्र. कुडुना	पाँचखाल ६	
३८	मिश्र दा. कुडुना	पाँचखाल ६	
३९	पुन्य प्रसाद जोलगाव	पाँचखाल २	
४०	राज कु. श्रेष्ठ	पाँचखाल ६	
४१	विजय प्र. न्यौपाने	पाँचखाल ६	
४२	कुमार राम गिरी	पाँचखाल ३	
४३	विप्रेक्ष गिरी	" "	
४४	पुका अ. लामा	" "	

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Supply and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
१.	मि. उ. अधिकारी	पौवावाला-२	
२.	NARA HARI SHAH	" 12	
३.	रामचन्द्र नेपाल	पायवाला-२	
४.	विश्वराम पौडेल	" 1	
५.	केदार नाथ दाहाल	" 1	
६.	मिम प्रसाद कार्की	" 1	
७.	सुदर्शन आचार्य	पौवावाला-१	
८.	शिव प्रसाद बस्नेत	पौवावाला-२	
९.	दिनेश उ. खोले	पायवाला-२	
१०.	शुक्र उ. कार्की	पौवावाला-६	
११.	सुबोधन लामा	" २	
१२.	मिम लामा	" २	
१३.	विकास ख. पौडेल	६	
१४.	निरञ्जन खोले	" २	
१५.	बन्दी प्रसाद दाहाल	२	
१६.	रामचन्द्र शोकाशी	" ६	
१७.	मुकुन्द प्र. कोइराला	२	
१८.	दिलीप शिरी	४	
१९.	मुकुन्द नाथ सापका	२	
२०.	रामायण प्रसाद कार्की	६	
२१.	दिलीप दाउ कार्की	६	
२२.	विश्वराम सापका	पौवावाला-२	

Presentation of Detailed Engineering Design Report of Sunkoshi Panchkhal Town Water Supply and Sanitation Project

Venue: Panchkhal, Kavre

Attendance:

Date: 6 oct, 2018

S.N.	Name	Designation	Signature
२३	खिल व. लुइटेला	पञ्चावत - ५	खिल
२४	अर्जुन शहाल	पञ्चावत - २	अर्जुन
२५	रामनाथ दत्त	पञ्चावत - ४	रामनाथ
२६	रामप्रसाद पौडेल	" २	रामप्रसाद
२७	वलराम भुजेल	" २	वलराम
२८	देवराज बज्रा	" १०	देवराज
२९	विष्णु का. फाजल (सगर)	पञ्चावत - १०	विष्णु
३०	पद्मेश मिश्रा	" २	पद्मेश
३१	धुर्ज व. नगरकली	" ३	धुर्ज
३२	गिरीनारायण श्रेष्ठ	" ६	गिरीनारायण
३३	Deepak Bha	" ६	Deepak
३४	सुविल आदिकारी	" ३	सुविल
३५	चमेली कामी	" ६	चमेली
३६	कविता शर्मा	" ६	कविता
३७	कविता गिरी	" ६	कविता
३८	उमा श्रेष्ठ	" ६	उमा
३९	विष्णु श्रेष्ठ	" ८	विष्णु
४०	रश्मा श्रेष्ठ	" ८	रश्मा
४१	गता	" ८	गता
४२	विमल	" ८	विमल

ANNEX 4:
SAMPLE SURVEY QUESTIONNAIRE AND CHECKLISTS

**तेश्रो साना शहरी खानेपानी तथा सरसफाइ आयोजना
घरघुरी सर्वेक्षण वृत्तित् प्रश्नावली**

(आयोजना प्रयोजनको लागिमात्र तथ्यांकको प्रयोग गरिनेछ)

नगर आयोजना: देउराली हुस्केकोट घर नं. १४
जिल्ला नवलपरासी नगरपालिका/गा.वि.स. हुस्केकोट गाउँपालिका वडा नं. १
अन्तरवार्ता लिनेको नाम : अन्तरवार्ता मिति : २०७५/०८/०५
सुपरिवेक्षकको नाम : नोड नं. १५५३-१११४

१. सामाजिक-आर्थिक तथा अन्य विवरण

(उपयुक्त कोठामा (✓) यो चिन्ह लगाउनुस् वा आवश्यक विवरणहरु भर्नुहोस्)

- १.१ अन्तरवार्ता दिनेको नाम : चन्द्र बहादुर सीमि
१.२ घरमुलिको नाम : सीमि लिंग : पुरुष ☒ महिला ☐ तेश्रो लिङ्ग ☐ पेशा ☐
परिवार सदस्य: पुरुष: ३ महिला: ४ तेश्रो लिङ्ग: ५ जम्मा: ७ एकल महिला घरमुलि भए ☒
१.३ यस परिवारमा शारिरिक रुपमा अशक्तता भएका परिवार सदस्य संख्या:
१.४ जाति/जनजातिमध्ये कुन हो? क) ब्राह्मण/क्षेत्री ☐ ख) जनजाति ☒ ग) दलित ☐ घ) अन्य ☐
परिवारको स्वरुप : एकल ☐ संयुक्त ☒
१.५ घर परिवारका सदस्यहरुको विवरण दिनुहोस्

क्र.सं.	घरपरिवारका सदस्यको नाम	उमेर	लिंग	शिक्षा स्तर	पेशा
१					
२					
३					
४					
५					
६					
७					
८					
९					
१०					

नोट: पेशा : १. कृषि २. व्यापार ३. नोकरी ४. उद्योगधन्दा ५. रेमिटेन्स (बैदेशिक रोजगार)
६. ज्याला ७. अन्य ८. कुनै पेशा नभएका आश्रित जस्तै: विद्यार्थी, गृहिणी, अशक्त
बूढाबूढी, ५ वर्ष मुनिका बालबालिका आदि नोट गर्ने)

१.६ शिक्षा : १. निरक्षर २. साक्षर ३. प्राथमिकसम्म ४. माध्यमिकसम्म ५. एस.एल.सी. उत्तिर्ण
६. आई.ए. ७. वि.ए. ८. एम.ए. ९. अन्य

१.७ यस परिवारमा बसोबास गर्ने अन्य सदस्यहरुको विवरण: सहयोगी ☐ डेरावाल ☒ कुल संख्या

१.८ यस नगर/शहरमा कहिले देखि बस्दै आउनु भएको छ? वर्ष
स्वबासी ☒ बसाइ सरेको ☐ बसाइ सरी आएको भए कुन जिल्लाबाट

१.९ बसाइ सर्नुको कारण: प्राकृतिक प्रकोप ☐ व्यापार/व्यवसाय ☐ शिक्षा ☐ द्वन्द ☐ जिविकोपार्जन ☐

१.१० यो घर आफ्नै हो? हो ☒ भाडामा बसेको ☐ अन्य ☐ भाडामा बसेको भए मासिक कति तिर्नुहुन्छ

१.११ यस घरमा भान्सा कोठा बाहेक अन्य कति वटा कोठाहरु छन्?

१ कोठा ☐ २ कोठा ☒ ३ कोठा ☐ कोठा वा सो भन्दा बढी ☐
 १.१२ घरको अवलोकन गरी घरको किसिम लेख्ने। पक्की ☐ पक्की ☒ कच्ची ☐
 (पक्की : छत ढलान, अर्ध पक्की : ढुङ्गा/इँटाको गाढो, टीनको छाना/ढुङ्गा/स्लेट/फिगटी/टायल आदि, कच्ची : माटो गाढो र खर/टायल/खपडाले छाएको)

१.१३ यस परिवारसंग जग्गा जमीन छ ? छ ☒ छैन ☐ छैन भने सुकुम्बासीको रूपमा गणना गर्ने)

जग्गा कति छ ? ०-१८-०

१.१४ यहाँले गाई/भैसी पाल्नु भएकोछ ? छ ☒ छैन ☐ छ भने कतिवटा ? एउटा ☐ ईवटा वा बढी ☒

१.१५ तपाईंको परिवारमा तल उल्लेखित कुन कुन सामान छन् ? (भएको सामानको संख्या लेख्ने)

क्र.सं.	सम्पत्ती	संख्या	कैफियत	क्र.सं.	सम्पत्ती	संख्या	कैफियत
१	साइकल/रिक्सा	१		९	स्टोभ/ग्यास चुलो	१	
२	मोटरसाइकल			१०	रेफ्रिजेटर		
३	बैलगाडा			११	वासिङ्ग मेसिन		
४	कार/जिप			१२	वाटर फिल्टर		
५	मिनीबस/बस			१३	कम्प्युटर		
६	ट्रयाक्टर/ट्रक			१४	इमेल/इन्टरनेटको पहुँच	३	मोबाइल
७	रेडियो/क्यासेट	१		१५	अन्य भए उल्लेख गर्ने।		
८	टेलिभिजन/भिडियोसेट	१		१६			

१.१६ यदि मुल पेशा कृषि भए कति महिना खान पुग्छ ? ३ महिना ☐ ६ महिना ☐ ९ महिना ☒ १२ महिना ☐

यदि नपुग भएमा कसरी धान्नु हुन्छ ? १. व ☐ पार २. ☐ करी ३. उ ☐ गधन्दा ४. रेमिटेन्स (बैदेशिक रोजगार) ☒ ५. ज्याला ६. अन्य ☐

१.१७ तपाईंको परिवारको औसत वार्षिक खर्च कति छ उल्लेख गर्नुहोस। ☐

क्र.सं.	खर्चको शिर्षक र किसिम	मासिक खर्च रु.	कैफियत
१	(क) कृषि तर्फ		
१.१	रसायनिक मल, विउ, किटनाशक आदी खरिद गर्न		
१.२	माटोको तैयारी, रोप्ने, गोड्ने, बाली काट्ने, भित्राउने, ढुवानी र बिक्री गर्दा हुने खर्च		
१.३	अन्य भए (उल्लेख गर्नुहोस)		
	(क) को जम्मा		
२	(ख) गैर कृषि तर्फ		
२.१	खाद्यान्न (अन्न र दैनिक उपभोग्य वस्तु)		
२.२	कपडा		
२.३	शिक्षा		
२.४	घर भाडा/घर मर्मत		
२.५	यातायात/संचार		
२.६	विद्युत		
२.७	पानी पोत /मर्मत सम्भार		
२.८	औषधि/उपचार (पानीबाट हुने रोग)		 वार्षिक खर्च
२.९	औषधि/उपचार (अन्य रोग)		 वार्षिक खर्च
२.१०	अन्य: चाडपर्व कर्मकाण्ड संस्कार आदि उल्लेख गर्ने		 वार्षिक खर्च
	(ख) को जम्मा		
	क+ख को कुल जम्मा	१५,०००/-	

१.१८ तपाईंको परिवारको औसत मासिक आय कति छ ? उल्लेख गर्नुहोस।

क्र.सं.	आयस्रोत	संलग्न परिवार	प्राप्त हुने आय (रु. मासिक)	कैफियत
		पुरुष	महिला	
१	(क) कृषि तर्फ			१

१.१	कृषि उत्पादनको विक्रीबाट आय (मकै, गहुँ, धान, तरकारी, फलफूल)				
१.२	पशुजन्य उत्पादन (दुध, दही, घ्यू, बाख्रा, कुखुरा आदि)				
	(क) को जम्मा				
२	(ख) गैह्र कृषि तर्फ				
२.१	नोकरी / जागिर				
२.२	ज्याला मजदुरी				
२.३	पेन्सन/उपदान आदी				
२.४	वैदेशीक रोजगार (रेमिटेन्स)				
२.५	पसल/व्यापार				
२.६	उद्योग				
२.७	पसल/घर भाडा				
२.८	गाडी/दुवानी व्यवसाय				
२.९	अन्य भए उल्लेख गर्ने				
	(ख) को जम्मा				
	क+ख कुल जम्मा			२५,०००/-	

१.१९ यहाँको परिवारले कुनै ऋण लिएको छ ? छ ☐ छैन ☒ (छ भने रकम रु.)

२. खानेपानी तथा सरसफाइ व्यवस्थापन

२.१ तपाईंको परिवारले पिउन, खाना पकाउनको लागि प्रयोग गर्ने पानीको स्रोत कुन हो ? दैनिक कति लिटर पानी खर्चनु हुन्छ ? कृपया तलको कोठामा(✓) चिन्ह लगाउनुहोस् ।

क्र.सं.	वर्षायाममा	✓	लिटर/ दैनिक	सुख्खा याममा	✓	लिटर/ दैनिक
१.	ईनार/कुवा	A		ईनार/कुवा	A	
३.	ट्यूबेल/ह्याण्डपम्प/डिप ट्यूबेल	A		ट्यूबेल/ह्याण्डपम्प/डिप ट्यूबेल	A	
६.	सार्वजनिक धारा	A		सार्वजनिक धारा	A	
७.	निजी धारा	A	४०	निजी धारा	A	
८.	मूल, खोला, नदी, पोखरी	A		मूल खोला, नदी, पोखरी	A	
९.	विक्रेतासँग पानी किनेर	A		विक्रेतासँग पानी किनेर	A	
१०.	वर्षातको पानी संकलन गरेर	A		वर्षातको पानी संकलन गरेर	A	
११.	अन्य	A		अन्य	A	

२.३ दैनिक आवश्यक पानी आपूर्ति गर्नका लागि पानी संकलनबारे निम्न विस्तृत विवरण दिनुहोस् ।

क्र.सं.	विवरण	वर्षा याममा					सुख्खा याममा				
		पुरुष	महिला	बालिका	बालक	जम्मा	पुरुष	महिला	बालिका	बालक	जम्मा
१.	कति खेप/पटक					५/५					
२.	लिटर/खेप										
३.	कुल परिमाण										
४.	पानी ल्याउन लाग्ने समय (मिनेट)/खेप)										
	• पानीको मुहान सम्म पुग्न										
	• मुहानमा पर्खनु पर्ने समय										
	• फर्कदा लाग्ने समय										
५.	प्रति खेप लाग्ने समय					२५ मि.					

नोट : अन्तरवार्ता बिने व्यक्तिले पानीको भाँडो हेरी सोको क्षमता यकिन गरि परिमाणउल्लेख गर्ने ।

३. निजी धारा जडान

३.१ के तपाईंले घरमा पाइप धारा जडान गर्नु भएको छ ? छ ☒ छैन ☐ यदि छ भने कस्तो प्रकारको छ ?

क) घरभित्र निजी धारा ☒ ख) कम्पाउण्डभित्र निजी धारा ☐ ग) सामुदायिक धारा ☐

३.२ तपाईंको घरमा प्रयोग हुने पानीको गुणस्तर कस्तो छ ? १) राम्रो २) ठिकै ३) खराब

३.३ के तपाई आफ्नो घरमा धारा जोड्न चाहनु हुन्छ ? चाहन्छु ☒ चाहन्न ☐

३.४ यदि तपाईको घरमा निजी धारा जडान भएको छैन भने, किन जडान नगरेको ?

क) खर्च गर्ने क्षमता नभएकोले

☐ ख) जडान शुल्क धेरै पर्ने भएकोले

ग) मासिक पानी बिल धेरै आउने भएकोले

☐ घ) पानीको मात्रा पर्याप्त नभएकोले

ङ) पानीको आपूर्ति नियमित नभएकोले

☐ च) यस क्षेत्रमा पाइपलाइन जडान गर्ने व्यवस्था उपलब्ध नभएकोले

छ) पानीको गुणस्तर राम्रो नभएकोले

☐ ज) अन्य कारण उल्लेख गर्ने

☐ झ) थाहा छैन

३.५ हाल तपाईले पानीधारा बापत महिनामा पानीको महशुल तिर्दै हुनुहुन्छ ? छ ☒ छैन ☐

सह-लगानि अवधारणा सम्बन्धी प्राथमिकता

४.१ यदि तपाईको नगरपालिका/गा.वि.स. मा विभिन्न योजना सञ्चालन गर्न रकम उपलब्ध छ भने निम्नलिखित मध्ये कुन कुन २ योजनालाई पहिलो प्राथमिकता दिनुहुन्छ ?

क) सडक बत्ती

ख) विद्युत

ख) कालोपत्रे सडक

ज) संचार

ग) विद्यालय

झ) सरसफाइ/सुविधा

घ) अस्पताल

ञ) सिचाई

ङ) व्यवस्थित खानेपानी प्रणाली

ट) पाटीपौवा धर्मशाला

च) पैदलयात्री सडक

ठ) अन्य

४.२ यदि तपाईको घरमा धारा छैन र निजी धारा राख्न इच्छुक हुनुहुन्छ भने, कति रकम सह-लगानी गर्न सक्नुहुन्छ ? कृपया तल दिईएको तालिकामा निजी धारा राख्न कति रकम सम्म लगानी गर्नुहुन्छ लगानीको रकमको सीमामा ☒ चिन्ह लगाउनुहोस ।

क्र.सं.	लगानीको विवरण	☒ चिन्ह लगाउने	क्र.सं.	लगानीको विवरण	☒ चिन्ह लगाउने
१.	१५००० भन्दा माथि	☐	४.	३००१ देखि ६००० सम्म	☐
२.	९००१ देखि १५००० सम्म	☐	५.	१५०१ देखि ३००० सम्म	☐
३.	६००१ देखि ९००० सम्म	☐	६.	१५०० भन्दा कम	☐

४.३ निजी धारा जडान बापत लाग्ने शुल्क व्यहोर्नु पर्नेछ? मन्जुर छ ☐ मन्जुर छैन ☐

४.४ नयाँ खानेपानी योजना शुरु भएमा आफ्नो घरमा धारा जडान गरी नयाँ नियमानुसार मासिक पानी महशुल नियमित बुझाउनु तयार हुनुहुन्छ?

छु ☒

छैन ☐

यदि इच्छुक हुनु हुन्छ भने तल दिईएको तालिकामा पानी महशुलको सीमामा ☒ चिन्ह लगाएर आफ्नो इच्छा व्यक्त गर्नुहोस ।

क्र.सं.	मासिक पानी महशुल	☒ चिन्ह लगाउने
१.	रु ५०० भन्दा माथि	☐
२.	रु ४५१ देखि ५००	☐
३.	रु ४०१ देखि ४५०	☐
४.	रु ३५१ देखि ४००	☐
५.	रु ३०१ देखि ३५०	☐
६.	रु २५१ देखि ३००	☐
६.	रु २०१ देखि २५०	☐
७.	रु १५१ देखि २००	☒

- ४.५ नयाँ खानेपानी वितरण प्रणालीको व्यवस्था हुँदा तपाईंको परिवारबाट प्रतिबद्धता स्वरूप अग्रिम लागतको ५% रकम दिन तयार हुनु हुन्छ ? छु ☒ छैन ☐
- ४.६ नयाँ सरसफाई सुविधा (सामुदायिक शौचालय तथा सतही ढल) निर्माणको लागि सह लगानी स्वरूप १५% स्थानीय निकाय र उपभोक्ताले सहलगानी गर्न इच्छुक हुनुहुन्छ ? छु ☒ छैन ☐

५. लैङ्गिक दृष्टिकोणबाट महिला सहभागिता

(आयोजनाको विभिन्न चरणमा महिला सहभागिता सम्बन्धि, गैरलाभान्वित विपन्न वर्गको, आदिवासी जनजाति, दलित तथा पिछडि एका वर्गको समावेशी सहभागिता सम्बन्धि जानकारी संकलन गर्न प्रत्येक घरदैलोमा सोधिने प्रश्नहरू तल प्रस्तुत गरिएको छ।)

क) महिलाहरूको उपस्थिति र सहभागिता

- ५.१ आयोजनाकोबारेमा छलफल गर्न कुनै बैठक बोलाईएको थियो ?
थियो ☐ थिएन ☐ थाहा भएन
- ५.२ के आयोजनाको छनौट गर्न बैठकमा महिला उपभोक्ताहरूको उपस्थिती थियो ?
थियो ☐ थिएन ☐ थाहा भएन
यदि थियो भने महिला उपभोक्ताहरूको भुमिका कस्तो थियो ?
सुन्ने मात्र ☐ अन्तर्क्रियात्मक ☐ निर्णायक ☐
- ५.३ आयोजनाको क्रियाकलापहरूको रेखदेख गर्न के खानेपानी उपभोक्ता तथा सरसफाई समिति/संस्था गठन भएको छ ? छ ☐ छैन थाहा छैन ☒

ख) लैङ्गिकताका आधारमा कार्य विभाजन

५.४ तलको तालिकामा दिइएको कामहरूअक्सर कस्ले गर्ने गर्दछ ? (✓) चिन्ह लगाउनुस् (दैनिक घण्टामा)

क्र.सं	घरायसी क्रियाकलापहरू	पुरुष	महिला	कुल समय
१	खानेपानी भर्ने, बोक्ने, भण्डारण	✓	✓	
२	भान्सा तयार गर्ने, भाडाँ माफ्न		✓	
३	बालबालिका र वृद्धवृद्धाको स्याहार		✓	
४	लुगा धुने घर सफा गर्ने		✓	
५	खाद्यान्न भण्डारण तथा तयारी	✓	✓	
६	अन्य		✓	

ग) पारिवारिक व्यवस्थापन, आय श्रोत र अन्य विषयमा महिलाहरूको नियन्त्रण र पहुँच

५.५ तलको तालिकामा उल्लेखित पारिवारीक विषय वा क्षेत्रहरूमा निर्णय गर्दा यहाँको घर परिवारमा महिलाको भनाई सुनुवाई हुन्छ ? उपयुक्त कोठामा (✓) चिन्ह लगाउनुस्

क्र.सं	विषय वा कार्यक्षेत्रहरू	हुन्छ (✓)	हुदैन (✓)
१	आर्थिक सरोकारका कुराहरू	✓	
२	केटाकेटीको शिक्षा दिक्षा	✓	
३	केटाकेटी र वृद्धवृद्धाको स्वास्थ्य र स्याहार	✓	
४	अचल सम्पति किनबेच (घर जग्गा)		✓
५	दैनिक क्रियाकलापहरू	✓	
६	सामाजिक विधि व्यवहार, विवाह, बर्तव्य, चाडपर्व तथा सामाजिक/पारिवारीक सुसम्बन्धन आदि	✓	
७	अन्य		

५.६ यहाँको परिवारमा पारिवारिक सम्पतिका निम्न विषयमा महिलाको पहुँच र स्वामित्व रहेको छैन तलको तालिकामा उपयुक्त कोठामा (✓) चिन्ह लगाउनुस्

क्र सं	विवरण	पहुँच	स्वामित्व
१	जग्गा जमिन	✓	
२	घर तथा अन्य संरचनाहरू	✓	
३	चल सम्पति/संचित पैसा	✓	
४	दैनिक क्रियाकलापहरू	✓	
५	अन्य		

घ) खा.पा.उ.स.स. तथा समुदायमा महिलाको स्तर (हैसियत) (निम्न बुँदाहरू फोकस ग्रुप छलफलको आधारमा जानकारी लिएर टिपोट गर्नुपर्नेछ)

क्रसं	विषय	उच्च	मध्यम	निम्न
१	आत्मसम्मानबोध		✓	
२	आत्मविश्वास नेतृत्व शीप		✓	
३	दायित्वबोध र क्षमता		✓	
४	ल्याकत, तर्क संगत, धैर्य र मेहनत		✓	
५	अन्य			

६. सम विकासमा पहुँचका आधारमा सामाजिक समावेशी सहभागिता

क) आयोजना क्रियाकलापमा गैरलाभान्वित विपन्न वर्गहरू, पिछडिएका वर्ग, जातजाति, दलित, अपाङ्गता भएको व्यक्तिको उपस्थिति

६.१ आयोजनाकोबारेमा छलफल गर्ने कुनै भेला/बैठकमा समावेशी तवरले बोलाईएको थियो ?
थियो ☐ थिएन ☐ थाहा छैन

६.२ के आयोजनाको छनौट गर्न बैठकमा समावेशीताको आधारमा सहभागीहरूको उपस्थिति थियो?
थियो ☐ थिएन ☐

६.३ के खा.पा.उ.स.स.को गठनमा समावेशीता अंगीकार भएको थियो? थियो ☐ थिएन ☐

ख) निर्णय प्रक्रियामा समावेशी प्रकृया अपनाईएको थियो ?

६.४ आयोजना छनौट गर्न जातजातिहरूको कस्तो भूमिका कस्तो थियो ?
उच्च ☐ मध्यम ☐ निम्न ☐

६.५ साना सहरि खानेपानी आयोजना कार्यान्वयन गर्न सामाजिक समावेशी आधारमा उपभोक्ताहरूको परिचालन गर्न भएको प्रयास कस्तो थियो? राम्रो ☐ मध्यम ☐ निम्न ☐

७. स्वास्थ्य र सरसफाइ

क. खानेपानी

१ तपाईंको विचारमा पानीको गुणस्तर नराम्रो (खराब) भएमा के समस्याहरूदेखिन सक्छ ?
(एक भन्दा बढी उत्तर आउन सक्ने)

१.१ दुर्गन्ध आउने / नमिठो स्वाद ☒ १.२ दाँत विग्रिने/रंगीने ☐
१.३ बिरामी बनाउने ☒ १.४ अन्य (उल्लेख गर्ने) _____

२. के तपाईंलाई पानी भर्ने र राख्ने भाँडो पानी भर्नु र भण्डार गर्नु पूर्व सफा गर्नुपर्छ भन्ने थाहा छ ? ☒ छैन ☐

यदि छ भने, पानी राख्ने भाँडो कसरी सफा गर्नु हुन्छ ?

२.१ खाली पानी मात्रले ☒ २.२ खरानी पानीले ☐ २.३ मुस/पिठो र पानीले ☐
२.४ साबुन पानीले ☐ २.५ अन्य (उल्लेख गर्नुस्) _____

३. तपाईं घरमा पानी कसरी राख्नु हुन्छ ?

(एक भन्दा बढी उत्तर आउन सक्ने)

३.१) पानी भर्नु पहिले भाँडा सफा गर्ने ☒३.२) बासी पानी फ्याँक्ने ☐३.३) पानी राख्ने भाँडो राम्रोसँग ढाकेर/छोपेर राख्ने गर्ने)..... ☒

३.४) अन्य (उल्लेख

४. तपाईं गाग्रो वा घैटोबाट पानी कसरी निकाल्नुहुन्छ ?

४.१) पानी सार्नु अघि अम्बोरा, लौटा, करुवा, मग घोएर ☐४.२) गिलास, मग, कप गाग्रीमा डुबाएर ☐४.३) गाग्रोबाट लोटा, अम्बोरा, करुवा, गिलासमा पानी सारेर ☒४.४) अन्य (उल्लेख गर्ने) ☐

ख. चर्पी

१. के तपाईंको घरमा चर्पी छ ? छ ☒ छैन ☐ (छैन भने १.३ जाने)१.१ यदि छ भने, कस्तो प्रकारको चर्पी छ ? ☐१) खाल्डे चर्पी ☐४) सिस्टर्न फलस ☐२) मेन्टिलेटेड खाल्डे चर्पी ☐५) अन्य ☐३) वाटर सिल/पोर फलस ☒१.२ यदि छ भने, तपाईंको घरमा चर्पी कसकसले प्रयोग गर्नुहुन्छ ? ☐

(१) सबैले, २. बच्चा बाहेक सबैले ३. वयस्क र प्रौढले मात्रै ४. विरामी मात्रैले)

१.३ यदि छैन भने, दिसा गर्न कहाँ जानुहुन्छ ? ☐ ☐

(क. खोला/जङ्गल/किनार ख. खुल्ला मैदान/ठाउँ ग. घर/सडक छेउ घ. जहाँ सजिलो हुन्छ)

१.४ के तपाईंको समुदाय खुल्लदिसामुक्त क्षेत्र घोषणा भएको छ ? छ ☐ छैन ☐ थाहा भएन

ग. खानेकुराको सरसफाइ

१. खाद्यपदार्थ दूषित हुनबाट कसरी बचाउनुहुन्छ ? (एक भन्दा बढी उत्तर आउन सक्ने)

१.१) पकाएको खाना छोपेर/ढाकेर राख्ने ☒१.२) सफा हातले खाना पस्कने गर्नाले ☐१.३) काँचै खाइने खानेकुरा राम्रोसँग पखालेर घोएर ☒ १.४) हात गोडा सफा गरेर मात्र भान्सापमा पसेर ☒१.५) धेरै बासी वा सडे गलेका खाना, फलफुल विसर्जन गर्ने ☒१.६) डाडु पन्यु, थाल/भाँडाकुँडा सफा गरेर मात्र खाना पस्कने/खाने ☐१.७) चुलो चौकी पकाउने भाडा, ढकनहरू सफा राख्ने ☒२. के तपाईं खानेकुरा छोपेर/ढाकेर राख्नुहुन्छ ? राख्छु ☒ राख्दिन ☐

घ. व्यक्तिगत सरसफाइ (घरपरवारको संख्या अनुसार कृयाकलापमा टीक चिन्ह लगाएर संख्या राख्ने । जस्तो चारजनाको परिवार भए हरेक कृयाकलापमा टीक सहित चारको संख्या आउनुपर्ने)

१. तपाईं र परिवारका अन्य सदस्यले कहिले र के गरेपछि हात धुनुहुन्छ ? धुने भए यस्तो (✓) चिन्ह लगाउनुहोस् र नधुने भए यस्तो (x) चिन्ह लगाउनुहोस् । (एक भन्दा बढी उत्तर आउन सक्ने)

क्र.सं.	विवरण	५ वर्ष मुनिका बालबालिका		महिला		पुरुष	
		धुने (✓)	नधुने (x)	धुने (✓)	नधुने (x)	धुने (✓)	नधुने (x)
१	खाना खानु अघि			✓		✓	
२	खाना खाएपछि			✓		✓	
३	दिसा गएपछि			✓		✓	
४	फोहर मैला छोएपछि			✓		✓	

५	कामबाट फर्केपछि			✓		✓
६	केटाकेटीलाई दिसा पिसाब गराइ सकेपछि			✓		✓
७	अन्य (उल्लेख गर्ने)			✓		✓

२. तपाईं र परिवारका अन्य सदस्यले के ले हात धुनुहुन्छ ? धुनेमा यस्तो (✓) चिन्ह लगाउनुहोस् र नधुनेमा यस्तो (✗) चिन्ह लगाउनुहोस् ।

क्र.सं.	विवरण	५ वर्ष मुनिका बालबालिका		महिला		पुरुष	
		धुने (✓)	नधुने (✗)	धुने (✓)	नधुने (✗)	धुने (✓)	नधुने (✗)
१.	पानी मात्रै						
२.	खरानी पानी						
३.	भुस/पिठो पानी						
४.	साबुन पानी	✓		✓		✓	
५.	अन्य (उल्लेख गर्ने)						
जम्मा							

३. तपाईं र परिवारका अन्य सदस्यले कहिले कहिले नुहाउनुहुन्छ ?
नुहाउने भए यस्तो (✓) चिन्ह लगाउनुहोस् र ननुहाउने भए यस्तो (✗) चिन्ह लगाउनुहोस् ।

क्र.सं.	विवरण	बालबालिका		महिला		पुरुष	
		(✓)	(✗)	(✓)	(✗)	(✓)	(✗)
१.	प्रत्येक दिन						
२.	एक दिन बिराएर						
३.	हप्तामा २ पटक						
४.	हप्तामा १ पटक		✓	✓		✓	
५.	२ हप्तामा १ पटक						
६.	महिनामा एक पटक						
जम्मा							

ड. फोहर मैला व्यवस्थापन

१. तपाईंको घरबाट निस्कने ठोस फोहर मैला कहाँ विसर्जन गर्नुहुन्छ ?
१.१ घर नजिक खाल्डोमा ☒ १.२ निजी फोहर संकलनकर्तालाई दिने ☐
१.३ गा.वि.स./नगरपालिकाले व्यवस्था गरेको खाल्डो वा क्यानमा ☐ १.४ अन्य (उल्लेख गर्ने).....
२. ठोस तथा तरल फोहर वस्तुलाई अव्यवस्थित तरिकाले विसर्जन गर्नाले हुने नराम्रा असरहरू के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)
२.१ फोहोर वातावरणमा वृद्धि ☒ २.२ लामखुट्टे, फिंगा, किराहरूको वृद्धि ☒
२.३ रोग सन्नेमा वृद्धि ☒ २.४ अन्य (उल्लेख गर्ने) ...
३. तपाईंको घरबाट निस्कने फोहोर पानी कहाँ विसर्जन गर्नुहुन्छ ?
३.१ खाल्डोमा (Soak pit) ☐ ३.२ तरकारी बारीमा/करेसा बारीमा ☒
३.३ सार्वजनिक ढलमा ☐ ३.४ अन्य (उल्लेख गर्ने)

च. बस्तुभाउको फोहर व्यवस्थापन

१. के तपाईंले बस्तुभाउ पाल्नु भएको छ ? छ ☒ छैन ☐ छैन भने पानी जन्य सरुवा रोगमा जाने)
यदि छ भने कुन कुन प्रकारका छन् र तिनीहरूलाई कहाँ राख्नु हुन्छ ?

क्र.सं.	बस्तुभाउको प्रकार	घरभित्रै राख्ने	बाहिर छुट्टै गोठमा राख्ने
१	गाई/भैसी		
२	बंगुर/संगुर		✓
३	बाख्रा		

४	कुखुरा/होस		
५	अन्य		

२. वस्तुभाउबाट निस्कने फोहोर कहाँ र कसरी विसर्जन गर्नुहुन्छ ?

- २.१ मलखादमा ☒ २.२ आगो बाल्ने/गुईठा बनाउने ☐
 २.३ गोबर ग्यास प्लान्टमा प्रयोग गर्ने ☐ २.४ अन्य (उल्लेख गर्ने)

३. वस्तुभाउको फोहोर मैलाको जथाभावि अव्यवस्थित तवरले विसर्जन गर्दा हुने खराब असरहरूके के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)

- ३.१ वातावरणीय फोहोरमा वृद्धि हुने ☒ ३.२ लामखुट्टे, भिगा, किराहरूको वृद्धि हुने ☒
 ३.३ रोगब्याधि बढ्ने तथा सर्ने ☒ ३.४ गाँउ, छरछिमेक तथा नगर अशोभनिय देखिने ☒
 ३.५ अन्य (उल्लेख गर्ने)

छ. सेफ्टेज (फोहोरलेदो) व्यवस्थापन (चर्पिबाट सेफ्टीट्यांकमा जम्मा भएको फोहोरलेदो थप प्रश्नहरू सहित)

१) चर्पिबाट विसर्जित मलमुत्र व्यवस्थापन (जम्मा) कहाँ गर्ने गरेको छ ?

खाल्डो ☐ रिङ्ग खाल्डो ☐ सेफ्टी ट्यांक ☒ अन्य ☐

२) सो सेफ्टी ट्यांक/खाल्डोको क्षमता कति (ठुलो सानो साइज) छ ? ठिक खालको

३) हालसम्म कहिल्यै सफा गर्नु भएको छ ? छ ☐ छैन ☒ छ भने कति वर्षमा भरियो ? ☐
 सफा गर्न कति रकम तिर्नु भयो ? रु: —

४) सेफ्टी ट्यांकबाट निस्कने फोहोर प्रशोधन पछि मलका रुपमा प्रयोग गर्न तयार हुनुहुन्छ ? छ ☐ छैन ☐

५) सेफ्टी ट्यांकबाट निस्कने फोहोर सफा गर्न कतिसम्म रकम तिर्न तयार हुनुहुन्छ ? छ ☒ छैन ☐

५.१ तिर्न तयार भए कतिसम्म तिर्नुहुन्छ ? रु २००० सम्म ☒ रु २००० माथि ☐

६. तपाईंको घरबाट सेफ्टीट्यांकमा जम्मा भएको फोहोर लेदो (सेफ्टेज) कसरी थान्ने गर्नुहुन्छ ?

१. आफै सफा गर्ने ☐ २. सफा गर्ने मान्छे प्रयोग गर्ने ☒ ३. व्यवस्थित कम्पनीको सेवालिन ☐ ४. अन्य

७. सेफ्टेज (फोहोर लेदो) कहाँ व्यवस्थान गर्ने गरेको छ ?

१. खेतबारीमा ☒ २. खोलानाला, खोल्साखोल्सीमा ☐ ३. वनजंगल सार्वजनिक स्थानमा ☐ ४. सडक बाटो छेउछाउ ☐
 ५. अनुकुल अनुसार ☐ ६. अन्य ☐

८. सेफ्टेज (फोहोर लेदो) व्यवस्थान सुधार गर्न चाहनुहुन्छ ? चाहान्छु ☒ चाहन्न ☐

९. सेफ्टेज (फोहोरलेदो) व्यवस्थान सुधार गर्दा के गर्न चाहानु हुन्छ ?

१. सेफ्टीट्यांक बनाउने ☐ २. भएको सेफ्टीट्यांक/चर्पीको खाल्डो सुधार गर्ने ☒
 ३. तपाईंको चर्पिबाट ढल जोडी सामुहिक रुपमा सेफ्टेज प्रशोधन प्रणाली व्यवस्थापन गरे सेवालिन तयार हुनुहुन्छ ?
 ४. अन्य (उल्लेख गर्ने) ☐

१०. सुधार गर्न कति रकम सम्म लगानी गर्न ईच्छा छ ? सोधेर नोट गर्ने रु:

ज. पानीजन्य सरुवा रोगहरू

१. पानीजन्य सरुवा रोगको कारणहरूके के हुन् ? (एक भन्दा बढी उत्तर आउन सक्ने)

- १.१ दूषित पानी प्रयोग गर्दा ☒ १.२ दूषित खाना खाँदा ☐
 १.३ घर तथा सार्वजनिक स्थलमा फोहोर बढ्नाले ☒ १.४ मानिसको मलमूत्र जथाभावी विसर्जन गर्नाले ☐
 १.५ फोहोर मैला जथाभावी फ्याँक्ने गर्दा ☐ १.६ स्वास्थ्य शिक्षा तथा स्वस्थ बानीको अभाव ☒
 १.७ सरसफाई र स्वास्थ्य सम्बन्धी ज्ञान र चेतनाको अभावले ☒ १.८ अन्य

२. तपाईंको परिवारमा कोही बिरामी परेमा के गर्नुहुन्छ ? (प्राथमिकता अनुसार नम्बर लेख्ने)

- २.१ घरायसी उपचार गर्ने ☒ १ २.२ घामी, भौकी, पुजारी कहाँ लाने ☐
 २.३ औषधि पसलमा जाने ☒ २ २.४ स्वस्थ चौकि वा अस्पतालमा जाने ☒ २
 २.५ अन्य (उल्लेख गर्ने)

३. यदि परिवारमा कसैलाई भ्रडापखाला लागेमा के गर्नुहुन्छ ? (प्राथमिकता अनुसार नम्बर लेख्ने)

- ३.१ जीवनजल खुवाउने ☒ १ ३.२ घरायसी उपचार गर्ने ☐
 ३.३ घामी, भौकी वा पुजारी कहाँ जाने ☐ ३.४ औषधि पसलमा जाने ☒ २
 ३.५ स्वास्थ्य चौकि वा अस्पतालमा जाने ☒ ३ ३.६ अन्य (उल्लेख गर्ने).....

४. गत एक सालभित्रमा तपाईंका परिवारका सदस्यहरु भ्रडा पखाला तथा पानीजन्य अन्य सरुवा रोगहरुबाट प्रभावित थिए ? प्रभावित भएका भए कति जना थिए तलको तालिकामा सख्या नोट गर्ने ।

क्र. सं.	रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष	वार्षिक खर्च रु.
१	भ्रडापखाला				
२	आउँ				
३	जुका				
४	टाईफाइड				
५	हैजा				
६	छाला सम्बन्धी रोग				
७	औलोरोग (मलेरिया)				
८	कमलपित्त (जण्डीस)				
९	अन्य				
	जम्मा				

६. गत एक वर्षभित्र तपाईंका परिवारमा भ्रडा पखाला तथा पानीजन्य अन्य सरुवा रोगहरुबाट कसैको मृत्यु भएको छ ? (मृत्यु अवस्था)

रोग	५ वर्ष मुनिका बालबालिका	महिला	पुरुष
भ्रडा पखाला			
आउँ			
पानीजन्य अन्य सरुवा रोगहरु			
जम्मा			

७. गत एक वर्षभित्र तपाईंको परिवारका सदस्यलाई भ्रडापखाला र पानीजन्य अन्य सरुवा रोगहरुको उपचारमा कति रकम खर्च गर्नु भयो ?

रोग	खर्च रकम (रु.मा)
भ्रडापखाला	
पानीजन्य अन्य सरुवा रोगहरु	
जम्मा	

धन्यवाद!

A. Checklist for Physico-Chemical Environment

Parameters	Description
Topography	Latitude 26°33' N to 26°55' N and longitude 86°06' E to 86°26' E. Hilly Region with average elevation (110 to 120) m
Geology (Rock and Soil Types)	Sand, Silt & Clay are the main sediments of soil
Erosion and Sedimentation	No such events recorded and observed
Climate	Sub-tropical Climate Monsoon- June to September Average Rainfall: 1442mm
Quarry Sites (If any)	No
Land Use	Agricultural land is the dominant followed by forests and residential areas.
Air Quality	Medium
Noise Level	Medium
Drainage Network	Existing Drains at few locations

B. Floras & Fauna**Floras (Plant Life Forms)**

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses	Protection Status			
							IUCN	CITES	GoN	IBAT
1	Aasuro	<i>Adhotoda vasica</i>	Nearby Forest	Shrub		Medicinal Use	LC	LC	LC	
2	Aiselu	<i>Rubus ellipticus</i>	Nearby Forest	Shrub		Medicinal Use, Fuel Wood, Fruits, Agroforestry	LC	LC	LC	
3	Amliso	<i>Thysanolaena maxima</i>	Human Habitations	Grass		Agroforestry and Making light & dust brooms	LC	LC	LC	
4	Bakaino	<i>Melia azedarach</i>	Along road and forest edges	Medium Sized Shrub or Tree		Edible Fruits, Agroforestry	LC	LC	LC	
5	Bans	<i>BabusaVulgaris</i>	Near Human Habitations as well as Open forests	Grass		Edible Shoots, Medicinal Uses, Agroforestry, Stems for making roof tiles, brooms & baskets, Handicrafts	LC	LC	LC	
6	Bar	<i>Ficus benghalensis</i>	Human Habitations	Tree		Medicinal Use, Edible Fruits & Agroforestry	LC	LC	LC	
7	Bot Dhaiyanro	<i>Lagerstroemia parviflora Roxb.</i>	Open grasslands	Tree		Edible Gum, Carpentry, Black Dye	LC	LC	LC	
8	Champ	<i>Magnolia champaca</i>	Nearby Forest	Tree		Edible fruits, Medicinal Uses, Agroforestry Uses, Making Perfumes, Dyeing and Oil Production	LC	LC	LC	

IEE for Panchkhal WSSP

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses	Protection Status			
							IUCN	CITES	GoN	IBAT
9	Chilaune	<i>Schima wallichii</i>	Nearby Forest	Tree		Medicinal Use, Agroforestry and Dyeing	LC	LC	LC	
10	Dhale Katus	<i>Castanopsis indica</i>	Forest Areas	Tree		Edible Seeds, Used as Bed logs in mushroom cultivation, Fuelwood, Making Charcoal	LC	LC	LC	
11	Dudhe Jhaar	<i>Euphorbia hirta</i>	Waste Places & Cultivated Fields near Human Habitations	Herb	Commonly Found	Edible leaves and Medicinal Uses	LC	LC	LC	
12	Dudhilo	<i>Ficus neriifolia</i>	Forest Areas	Tree		Medicinal Uses and Fodder	LC	LC	LC	
13	Gulaf	<i>Rosa rubiginosa</i>	Human Habitations (Urban and Rural Gardens)	Shrub	Commonly Found	Ornamental Uses, Commercial Perfumery, also used as landscape plants for hedging, slope stabilization etc.	LC	LC	LC	
14	Kafal	<i>Myrica esculenta</i>	Forests near human habitations	Large Shrub/Tree		Medicinal Use, Edible Fruits & Agroforestry				
15	Kalimunte	<i>Ageratina adenophora</i>	Nearby Forest	Shrub		Ornamental Uses, Medicinal uses				
16	Kamle	<i>Boehmeria platyphylla</i>	Nearby Forest	Grass		Edible Leaves & Roots, Medicinal Uses and Making ropes & cloths.				
17	Lajjavati	<i>Mimosa pudica L.</i>	Gardens, Croplands,	Weed		Medicinal Uses, and Agroforestry Uses				

IEE for Panchkhal WSSP

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses	Protection Status			
							IUCN	CITES	GoN	IBAT
			Pastureland, Roadside near human habitations							
18	Lapsi	<i>Choerospondias axillaries</i>	Forest Areas near Human Habitations	Tree		Edible fruits, Medicinal Uses, Agroforestry Uses, Bark used for making ropes, Light construction works, Seed shells used as fuel for brick kiln	LC	LC	LC	
19	Paiyun	<i>Prunus ceratoides</i>	Forest Areas	Tree		Medicinal Use, Agroforestry Uses, Fuel Wood, Light Furniture and Household Utensils	LC	LC	LC	
20	Peepal	<i>Ficus religiosa</i>	Human Habitations	Tree		Medicinal Use, Fuel Wood and Religious	LC	LC	LC	
21	Sal	<i>Shorea robusta</i>	Nearby Forests	Trees		Medicinal, Making plates, cups (Tapari), Fuelwood, Edible Seeds	LC	LC	LC	
22	Sallo	<i>Pinus roxburghii</i>	Forest Areas	Tree		Ornamental Trees, Fuel Wood,	LC	LC	LC	
23	Sajivan/Kadam	<i>Origanum vulgare L.</i>	Ground Cover, Meadows and Cultivated Beds	Herb		Medicinal Uses, Edible leaves, Food Flavoring, making perfumes & soaps, Oil production to kill lice	LC	LC	LC	
24	Simali	<i>Vitex negundo</i>	Forest Areas	Shrub		Fuel Wood, Medicinal Use, Edible Seeds, Agroforestry	LC	LC	LC	
25	Sisno	<i>Urtica dioica</i>	Forest Areas & Vegetated areas near	Herb/Flowering		Culinary Use, Beverage Uses,	LC	LC	LC	

IEE for Panchkhal WSSP

SN	Local Name	Botanical Name	Location	Vegetation Type/Life Forms	Local Status	Local Uses	Protection Status			
							IUCN	CITES	GoN	IBAT
			Human Habitations, Roadsides	Plant		Medicinal Uses and Gardening				
26	Paulownia	<i>Paulownia Tomentos</i>	Roadsides, Stream Banks and Disturbed Habitat	Tree		As Ornamental Trees in parks & gardens, Making Musical Instruments and Seeds for making packaging material				
27	Titepati	<i>Attermesia vulgaris</i>	Waste Places (Uncultivated Places) and Roadsides	Herb		Medicinal Uses, Culinary Uses and Traditionally used for flavoring				
28	Uttis	<i>Alnus nepalensis</i>	Nearby Forests	Tree		Fuel Wood, Medicinal Use, Agroforestry, Dyeing, Tanning and Paper Manufacture				

Mammals in the project area

SN	Common Name	Scientific Name	Habitat	Local Status	Crop/Livestock Raider	Protection Status			
						IUCN	CITES	GoN	IBAT
1	Bengal Fox	<i>Vulpes Bengalensis</i>	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
2	Common Leopard	<i>Panthera pardus</i>	Forests		Livestock Raider	VU	VU	VU	VU
3	Five Stripped palm Squirrel	<i>Funambulus Pennantii</i>	Forests	Commonly Found	Crop Raider	LC	LC	LC	LC
4	Gray Wolf	<i>Canis lupus</i>	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
5	Golden Jackal	<i>Canis aureus</i>	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
6	Greater Short Nosed Fruit Bat	<i>Cynopterus sphinx</i>	Forests	Commonly found in forest areas	Crop Raider	LC	LC	LC	LC
7	Hare	<i>Lepus nigrcollis</i>	Forests	Commonly found	No	LC	LC	LC	LC

IEE for Panchkhal WSSP

SN	Common Name	Scientific Name	Habitat	Local Status	Crop/Livestock Raider	Protection Status			
						IUCN	CITES	GoN	IBAT
				in forest areas					
8	House Rat	<i>Rattus Rattus</i>	Human Habitations	Commonly Found	Crop Raider	LC	LC	LC	LC
9	Jungle Cat	<i>Felis Chaus</i>	Forests	Commonly found in forest areas	Livestock Raider	LC	LC	LC	LC
10	Jungle Rat	<i>Bandicota indica</i>	Forests & Agricultural Field	Commonly found in forest areas	Crop Raider	LC	LC	LC	LC
11	Long-winged Tomb Bat	<i>Taphozous longimanus</i>	Forests	Commonly found in forest areas	No	LC	LC	LC	LC
12	Masked Palm Civet	<i>Paguma Larvata</i>	Forests	Commonly found in forest areas		LC	LC	LC	LC
13	Nepal Gray Langur	<i>Semnopithecus schistaceus</i>	Forests	Commonly found in forest areas		LC	LC	LC	LC
14	Rhesus Monkey	<i>Macaca mulatta</i>	Forests	Commonly found in forest areas and in human habitations also	Crop Raider	LC	LC	LC	LC
15	Small Indian Mongoose	<i>Herpetes auropunctatus</i>	Forests and Agricultural Field	Commonly Found	No	LC	LC	LC	LC
16	Squirrel	<i>Funambulus sp.</i>	Forests	Commonly Found	Crop Raider	LC	LC	LC	LC
17	Wild Boar	<i>Sus Scrofa</i>	Forests		Crop Raider	LC	LC	LC	LC
18	Yellow Throated Marten	<i>Martes flavigula</i>	Forests		No	LC	LC	LC	LC

Birds Sighted in the project area

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
1	Barn Swallow	<i>Hirundo Rustica</i>	Swallow	Farmland & Settlement Areas	Commonly Found/LC	LC	LC	LC	LC

IEE for Panchkhal WSSP

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
2	Black Drongo	<i>Dicrurus Macrocerus</i>	Passerine Bird	Farmland, Open Forests	Commonly Found/LC	LC	LC	LC	LC
3	Black Francolin	<i>Francolinus Francolinus</i>	Game Bird	Thick vegetation near water	Commonly Found/LC	LC	LC	LC	LC
4	Brown Headed Barbet	<i>Megalaima zeylanica</i>	Asian Barbet	Moist Broadleaf forests		LC	LC	LC	LC
5	Black Kite	<i>Milvus Migrans</i>	Diurnal Raptors	Settlement Areas with high human population		LC	LC	LC	LC
6	Cattle Egret	<i>Bubulcus Ibis</i>	Stocky Heron	Grasslands, Rice Paddy Fields, Wetlands, Farmlands		LC	LC	LC	LC
7	Chestnut Headed Bee Eater	<i>Merops Leschenaulti</i>	Near Passerine Bird	Highland Areas		LC	LC	LC	LC
8	Common Cuckoo	<i>Cuculus Canorus</i>	Cuckoo	Deciduous & Coniferous Forests, Woodland Areas, Meadows, Lowlands	Commonly Found	LC	LC	LC	LC
9	Common Hoopoe	<i>Upupa epops</i>	Coraciiform (Colorful Birds)	Farmlands		LC	LC	LC	LC
10	Common Myna	<i>Acridotheres tristis</i>	Tropical Bird	Human Habitations (Parks, Roadsides, Gardens) and Farmlands	Commonly Found	LC	LC	LC	LC
11	Common Stonechat	<i>Saxicola torquatus</i>	Saxicola (Small Passerine Birds)	Grasslands	Commonly Found	LC	LC	LC	LC
12	Crimson Sun Bird	<i>Aethopyga Siparaja</i>	Sunbird	Forest & Cultivated Areas	Commonly Found	LC	LC	LC	LC
13	Eurasian Tree Sparrow	<i>Passer Montanus</i>	Passerine Bird	Human Habitations	Commonly Found	LC	LC	LC	LC
14	Fulvous breasted Woodpecker	<i>Dendrocopus Macei</i>	Woodpeckers	Subtropical or Tropical Dry Forests and Lowland Forest		LC	LC	LC	LC
15	Great Tit	<i>Parus Major</i>	Passerine Bird	Forest Areas		LC	LC	LC	LC
16	Grey-headed Lapwing	<i>Vanellus cinereus</i>	Lapwing	Wet Grasslands and Rice Fields		LC	LC	LC	LC
17	House Crow	<i>Corvus Splendens</i>	Crow	Urban & Rural Habitats including	Commonly Found	LC	LC	LC	LC

IEE for Panchkhal WSSP

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
				towns, cities, farmlands					
18	House Sparrow	<i>Passer Domesticus</i>	Sparrow	Urban & Rural Habitats including towns, cities, farmlands	Commonly Found	LC	LC	LC	LC
19	Indian Cuckoo	<i>Cuculus micropterus</i>	Cuckoo	Deciduous & Evergreen Forests		LC	LC	LC	LC
20	Indian Peafowl	<i>Pavo Cristatus</i>	Peafowl	Moist Forest Areas		LC	LC	LC	LC
21	Indian Pond-Heron	<i>Ardeola Grayii</i>	Heron	Wetlands/Pond		LC	LC	LC	LC
22	Kalij Pheasant	<i>Lophura leucomelanos</i>	Pheasant	Forests		LC	LC	LC	LC
23	Large Billed Crow	<i>Corvus macrorhynchos</i>	Crow	Human Habitations		LC	LC	LC	LC
24	Lineated Barbet	<i>Megalaima lineate</i>	Asian Barbet	Holes at Tree trunks		LC	LC	LC	LC
25	Little Egret	<i>Egretta Garzetta</i>	Heron	Open Wetlands, Rice Fields		LC	LC	LC	LC
26	Oriental Magpie Robin	<i>Copsychus Saularis</i>	Passerine Bird	Urban gardens as well as Forests	Commonly Found	LC	LC	LC	LC
27	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	Dove	Open habitats with good tree cover nearby human habitations	Commonly Found	LC	LC	LC	LC
28	Pied Bushcat	<i>Saxicola caprata</i>	Passerine Bird	Cultivated Lands, Grasslands		LC	LC	LC	LC
29	Plum headed Parakeet	<i>Psittacula cyanocephala</i>	Parrot	Forest Areas, Open Woodlands, City Gardens also		LC	LC	LC	LC
30	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Bulbul (Passerine Birds)	Open Forests, Cultivated Lands		LC	LC	LC	LC
31	Rock Dove	<i>Columba Livia</i>	Dove/Common Pigeon	Open habitats with good tree cover nearby human habitations	Commonly Found and Abundant	LC	LC	LC	LC
32	Spotted Owlet	<i>Athene Brama</i>	Owl	Open habitats including farmlands and human habitations, City Areas	Commonly Found	LC	LC	LC	LC
33	Western (Asian)Koel	<i>Eudynamys Scolopaceus</i>	Cuckoo	Cultivated Lands, Forests		LC	LC	LC	LC
34	White Breasted Water Hen	<i>Amaurornis Phoenicurus</i>	Water Bird	Near Freshwater and Brackish Water		LC	LC	LC	LC
35	White Breasted	<i>Halcyon Smyrnensis</i>	Tree Kingfisher	Trees, Wires or other Perches		LC	LC	LC	LC

IEE for Panchkhal WSSP

SN	Common Name	Scientific Name	Type	Habitat	Local Status	Protection Status			
						IUCN	CITES	GoN	IBAT
	Kingfisher								
36	White Wagtail	<i>Motacilla Alba</i>	Small Passerine Bird	Near Water and even in urban areas, Stone Walls and Man-made structures	Commonly Found and Abundant	LC	LC	LC	LC
37	White Browed Wagtail	<i>Motacilla Mederaspatensis</i>	Wagtail	Open Freshwater Wetland		LC	LC	LC	LC
38	Yellow billed Blue Magpie	<i>Urocissa flavirostris</i>	Passerine Bird	Lowland Forests and Temperate Forests		LC	LC	LC	LC

Herpeto-fauna in the Project Area

S.N.	Local Name	Scientific Name	Habitat	Local Status	Protection Status			
					IUCN	CITES	GoN	IBAT
1	Common Indian Monitor	<i>Varanus Bengalensis</i>	Moist Forest Areas		LC	LC	LC	LC
2	Common toad/Himalayan Toad	<i>Bufo melanostictus/Duttaphrynus Himalayanus</i>	Shrubland near streams, Vicinity of seepage & fields		LC	LC	LC	LC
3	Garden lizard	<i>Calotes versicular</i>	Gardens, Agricultural Fields	Commonly Found	LC	LC	LC	LC
4	Green Pit Viper	<i>T. albolabris</i>	Small Bush Vegetations, Trees, Urban Areas also		LC	LC	LC	LC
5	House Lizard	<i>Hemidactylus Flaviviridis</i>	Human Habitations	Commonly Found	LC	LC	LC	LC
6	Olive Keelback Water Snake	<i>Atretium Schistosum</i>	Water or Surrounding Vegetation		LC	LC	LC	LC
7	Rat snake	<i>Ptyas mucosus</i>	Forest Areas and Vegetations near Human Habitations		LC	LC	LC	LC
8	Stream Frog	<i>Rana cyanophylectis</i>	Agricultural Fields, Roadsides, Freshwater,	Commonly Found	LC	LC	LC	LC

IEE for Panchkhal WSSP

S.N.	Local Name	Scientific Name	Habitat	Local Status	Protection Status			
					IUCN	CITES	GoN	IBAT
			Vegetations near Human Habitations					

Fish in the Project Area

S.N.	Local Name	Scientific Name	Status of Occurrence	Migratory Status/Season	Observed Location
1	Catfish	<i>Glyptothorax indicus</i>		Resident Fish	Sunkoshi River/Jhiku Khola
2	Dinnawah Snowtrout	<i>Schizothorax progastus</i>		January to March	Sunkoshi River
3	Dwarf Sankehead	<i>Channa gachua</i>		Resident Fish	Sunkoshi River
4	Katli	<i>Neolissocheilus hexagonolepis</i>		January to March	Sunkoshi River
5	Spiny Eel	<i>Mastacembelus armatus</i>		Resident Fish	Sunkoshi River
6	Stone Carp	<i>Psilorhynchus pseudecheneis</i>		Resident Fish	Sunkoshi River
7	Stone Roller	<i>Garra annandalei</i>		Resident Fish	Sunkoshi River
8	Stinging Catfish	<i>Heteropneustes fossilis</i>		Resident Fish	Sunkoshi River

Note: All the above-mentioned floral & faunal species are found in various locations of the project town. Due to increasing urbanization, some of the species found within the settlement areas have now been increasingly shifted to the roadside bushes as well as nearby forests areas.

CHECKLISTS FOR FOCUS GROUP DISCUSSION

A. FOCUS GROUP DISCUSSION -1

Date: 29 December, 2017

Project: Panchkhal Water Supply & Sanitation Project

Venue: Panchkhal Municipality Office

Number of Participants: 8

Purpose Statement: Information Dissemination to the participants regarding UWSSSP and preparation of technical & social survey works, Discussions regarding the proposed project and Roles & Responsibilities of various Stakeholders

Question 1: What do you know about Urban Water Supply & Sanitation (Sector) Project? Can you please share the information you know about this project?

Findings: All the participants are found aware about the proposed project.

Question 2: We are very happy to know that you are quite familiar with this proposed project. Now, we are here to carry out technical & survey works of the proposed project. Do you have to say anything regarding this?

Findings: According to the participants, they are happy that their desire for the reliable, safe & potable water supply is being fulfilled sooner. Now, the only thing they want is that the proposed project should cover almost all the areas of Panchkhal municipality. They requested our team to consider this during technical design works.

Question 3: The issue raised regarding service area is not now possible to consider as the service area has already been delineated earlier in consultation with WUSC & local community and for your information, due to budget issues as well as the criteria fixed for UWSSP by ADB, we are not able to cover all the wards of the proposed town. But, we assure you that none of the selected areas of the proposed service area will be missed out during our survey. During survey, we urged all of you to provide full support.

Findings: After giving assurance regarding service area, they showed positive response towards giving full support during survey works.

Question 4: Our design shows that some project components require land of the community forests namely Naule Community Forest, Karketar Community Forest and Bhainse Khola Community Forest. Hence, during survey, we want you to help us to establish coordination with the concerned community forest users group.

Findings: The participants assured us to help to establish coordination with the concerned community forest users group as soon as possible. They also assured us to provide consent letter from the concerned forest groups for our convenience. However, they entail assurance from us regarding the conservation of the community forests.

Question 5: We are happy that you all are very aware of the conservation of the community forests. We are pleased to inform that our design does not involve any kind of destructive works within the community forest areas.

Findings: They are positive towards the use of land of the concerned community forests.

Question 6: We would like to inform you that more or less obviously some environmental issues will be raised during construction of the project; however, those issues will not be either extreme or permanent.

Findings: They still showed concerns regarding the environmental aspects that include Dust Emissions, Water Quality, Noise Pollution, Traffic Congestion, Obstruction to the vendors & passersby, Damage to the existing facilities and Construction Waste & Solid Waste Management during construction period. We assure them about the mitigation of these likely environmental impacts by adopting the proposed mitigation measures.

Question 7: As a stakeholder, how can you contribute from your side to minimize the anticipated environmental issues?

Findings: After assuring about the mitigation measures for the environmental concerns they raised, they committed to contribute to support safeguard implementation of the proposed project.

Question 8: Lastly, what would you say are the most important issues you would like to express about this project?

Findings: Their positive response towards the implementation of the proposed project indicates Willingness to Pay for this project. They committed to provide full support during survey works and construction period. The most important issue they raised about the proposed project is the assurance for the provision of safe, reliable and sufficient water supply system.

B. FOCUS GROUP DISCUSSION -2

Date: 26 August, 2019

Project: Panchkhal Water Supply & Sanitation Project

Venue: Panchkhal Ward No. 11 Office

Number of Participants: 8

Purpose Statement: Discussion about the land required for the project

Question 1: You must be familiar with UWSSSP as we had already discussed about it in our earlier discussion program. Do you have to say anything regarding this?

Findings: According to the participants, they are happy that their desire for the reliable, safe & potable water supply is being fulfilled sooner.

Question 2: In regard to the land requirement for the proposed project, WUSC must have delivered information to all of you. However, for reliable and clearer information, we all are here to carry out discussions regarding this. The proposed project requires 9 ropani of land for the construction of Sump Well at the Sunkoshi River Bank. This land belongs to Bhumlu Municipality. Thus, we need to get approval of Bhumlu Rural Municipality Office. For this, we require your help.

Findings: According to the participants, the approval letter will be provided by the municipality and for this, the participants including Chairman of Wards 9, 6 & 11 and WUSC Chairman assured to extend help to get approval letter through the municipality.

Question 3: Thanks for your concern. We would also like to share you that the proposed project requires some portion of land of Naule Ban, Bhainse Khola & Karketar Community Forests as well as of the public land for the construction of public toilet at Tamaghaat Bazaar. For this also, we would like to request for your help.

Findings: According to the participants, the approval letters for this issue will also be provided by the municipality and for this, the participants including Chairman of Wards 9, 6 & 11 and WUSC Chairman assured to extend help to get approval letter through the municipality.

Question 4: Do you have any objection regarding the construction of public toilet at the core bazaar area ?

Findings: They stated "No Objection" regarding the project activities that will be carried out at core bazaar area. However, they urged to carry out the project activities at this area with proper care and prompt actions.

Question 5: As we have already discussed about the environmental concerns regarding the proposed project in our earlier discussion programs, we would like to request for your coordination during project construction activities.

Findings: They still showed concerns regarding the environmental aspects that include Dust Emissions, Water Quality, Noise Pollution, Traffic Congestion, Obstruction to the vendors & passersby, Damage to the existing facilities and Construction Waste & Solid Waste

Management during construction period as like in the earlier discussion programs. We assure them about the mitigation of these likely environmental impacts by adopting the proposed mitigation measures. After assuring about the mitigation measures for the environmental concerns they raised, they committed to contribute to support safeguard implementation of the proposed project.

Question 6: Lastly, what would you like to say about this project?

Findings: They are happy that their desire for effective water supply & sanitation system is being fulfilled through this project. They are ready to extend help if required, during construction as well as implementation to make the project complete successfully as far as possible.

**ANNEX 5:
CHLORINE USE GUIDELINES**

GUIDELINE VALUE

In humans and animals exposed to chlorine in drinking-water, specific adverse treatment related effects have not been observed.

Chlorine in drinking water is safe for consumption .The small amount of chlorine typically used to disinfect water does not pose risks to human health. The World Health Organization (WHO) has established a guideline value of 5 mg/L for chlorine in drinking water, meaning that such concentrations are considered acceptable for lifelong human consumption. Furthermore, WHO concludes that this value is “conservative,” as no adverse effects from chlorine in drinking water were observed in studies reviewed by WHO.

Guideline values for chlorine WHO Guidelines for drinking water quality (2004)

Chlorine	below 5 milligrams per liter (mg/L)*
-----------------	---

*For effective disinfection, there should be a residual concentration of free chlorine of 0.5 mg/L after at least 30 min contact time at pH<8.0

Chlorination does not harm aquatic environments

Chlorinated drinking water is unlikely to be harmful when discharged into aquatic environments. An extensive risk assessment conducted under European Union guidelines examined potential harm from various processes to make drinking water using sodium hypochlorite. This assessment found no significant environmental risks from chlorine or byproducts formed during drinking water chlorination. The DBPs formed in drinking water depend on the nature and quantity of organic matter present as well as on the disinfectant and other treatments used. In drinking water the principal byproducts are trihalomethanes (THMs; mainly chloroform) and haloacetic acids (HAAs), with smaller amounts of other byproducts. Direct ‘whole effluent’ experiments representing various uses, including drinking water, have shown that no significant amounts of persistent and potentially bioaccumulative substances are formed. Toxicity tests on these mixtures demonstrated that the presence of DBPs did not increase the toxicity.

A major concern from the past was the formation of some highly-chlorinated, high-hazard molecules, such as dioxins, resulting from chlorine used in paper pulp bleaching. However, dioxins were only formed from ‘active chlorine’ under specific conditions: acid pH and in the presence of certain phenols such as those abundant in the lignin component of wood. There is no significant formation of dioxins or other high-hazard molecules at neutral or alkaline pH. All current uses of ‘active chlorine’ for microbial control and cleaning take place at alkaline or neutral pH.

ANNEX 6:
WATER QUALITY TEST REPORTS

NS Lab Accreditation No.: 09-2068/69

Sunkoshi Panchkhal

Regd. No. 53875/064/065

**ASTHA SCIENTIFIC RESEARCH SERVICE PVT. LTD.**P.O. Box No. 4316, Dillibazar, Kathmandu, Nepal
Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com**(Center for complete scientific solution)****Test Report/Certificate**Report No. : 728/2074
Entry No. : AASTHA - 550- 2074
Sample : Water
Client : TAEC-ICON JV
Source : Thumka (Tanki)Date received : 03 - 10 - 2074
Date completed : 11 - 10 - 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H* APHA-AWWA-WEF 2012, 22 nd Edition	8.0	6.5 - 8.5
2.	Electrical Conductivity, (umhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22 nd Edition	443	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22 nd Edition	2.3	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22 nd Edition	0.05	5(15), max.
6.	Total Hardness as CaCO ₃ , (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22 nd Edition	228	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22 nd Edition	309	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22 nd Edition	7.43	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17 th Edition	<0.05	1.5, max.
11.	Nitrate, (mg/l)	4500-NO ₃ -B, APHA-AWWA-WEF 2012, 22 nd Edition	8.04	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22 nd Edition	<0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22 nd Edition	0.19	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO ₄ ²⁻ C, APHA - AWWA - WEF 2012, 22 nd Edition	6.32	250, max.
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF, WPCF, 17 th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22 nd Edition	75.2	200, max.
17.	Iron*, (mg/l)		<0.05	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.02	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.01	0.05, max.

Remarks: Water quality meets NDWQS specified limit.

Analyzed By

Checked By

Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
3. Liability of our institute is limited to the invoiced detrimands and amount only.
4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.

118

NS Lab Accreditation No.: 09-2068/69

Regd. No. 53875/064/065



ASTHA SCIENTIFIC RESEARCH SERVICE PVT. LTD.

P.O. Box No. 4316, Dillibazar, Kathmandu, Nepal
Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com

(Center for complete scientific solution)

Test Report/Certificate

Report No. : 729/2074

Entry No. : AASTHA - 550 - 2074

Sample : Water

Client : TAEC-ICON JV

Source : Lamdi (Tanki)

Date received : 03 - 10 - 2074

Date completed : 11 - 10 - 2074

Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H ⁺ APHA-AWWA-WEF 2012, 22 nd Edition	7.8	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22 nd Edition	261	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22 nd Edition	1.2	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22 nd Edition	0.13	5 (15), max.
6.	Total Hardness as CaCO ₃ , (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22 nd Edition	96	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22 nd Edition	179	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl ₂ B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl ⁻ B, APHA-AWWA-WEF 2012, 22 nd Edition	13.01	250, max.
10.	Ammonia, (mg/l)	4500-NH ₃ D, APHA, AWWA, WPCF, 17th Edition	0.16	1.5, max.
11.	Nitrate, (mg/l)	4500-NO ₃ ⁻ B, APHA-AWWA-WEF 2012, 22 nd Edition	2.55	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22 nd Edition	0.12	0.20, max.
13.	Fluoride, (mg/l)	4500-F ⁻ D, APHA - AWWA - WEF 2012, 22 nd Edition	<0.01	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO ₄ ²⁻ C, APHA - AWWA - WEF 2012, 22 nd Edition	5.48	250, max.
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF, WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA AWWA-WEF 2012, 22 nd Edition	30.4	200, max.
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22 nd Edition	0.11	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)		<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.02	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.01	0.05, max.

Remarks: Water quality meets NDWQS specified limit.

[Signature]
Analyzed By

[Signature]
Checked By

[Signature]
Authorized By

- Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
3. Liability of our institute is limited to the invoiced detrimands and amount only.
4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.

2/5

NS Lab Accreditation No.: 09-2068/69

Regd. No. 53875/064/065

**ASTHA SCIENTIFIC RESEARCH SERVICE PVT. LTD.**P.O. Box No. 4316, Dillibazar, Kathmandu, Nepal
Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com**(Center for complete scientific solution)****Test Report/Certificate**Report No. : 731/2074
Entry No. : AASTHA - 550 - 2074
Sample : Water
Client : TAEC-ICON JV
Source : Sunkoshi RiverDate received : 03 - 10 - 2074
Date completed : 11 - 10 - 2074
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H ⁺ APHA-AWWA-WEF 2012, 22 nd Edition	8.10	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22 nd Edition	106	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22 nd Edition	20.8	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22 nd Edition	0.26	5 (15), max.
6.	Total Hardness as CaCO ₃ , (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22 nd Edition	64	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22 nd Edition	77	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500-Cl B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22 nd Edition	1.85	250, max.
10.	Ammonia, (mg/l)	4500-NH ₃ D, APHA, AWWA, WPCF, 17 th Edition	0.16	1.5, max.
11.	Nitrate, (mg/l)	4500-NO ₃ -B, APHA-AWWA-WEF 2012, 22 nd Edition	0.49	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22 nd Edition	0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22 nd Edition	0.08	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO ₄ ²⁻ C, APHA - AWWA - WEF 2012, 22 nd Edition	11.24	250, max.
15.	Mercury*, (mg/l)	3500-Hg C, APHA-AWWA-WEF, WPCF, 17 th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22 nd Edition	17.6	200, max.
17.	Iron*, (mg/l)		0.79	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)	3131 B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		<0.01	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.01	0.05, max.

Remarks: Observed values of turbidity and iron do not meet NDWQS specified limit.

Analyzed By

Checked By

Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
 2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
 3. Liability of our institute is limited to the invoiced detriments and amount only.
 4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.

S/S

NS Lab Accreditation No.: 09-2068/69

Regd. No. 53875/064/065

**ASTHA SCIENTIFIC RESEARCH SERVICE PVT. LTD.**P.O. Box No. 4316, Dillibazar, Kathmandu, Nepal
Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com*(Center for complete scientific solution)***Test Report/Certificate**

Report No. : 730/2074
 Report No. : 728/2074
 Entry No. : AASTHA - 550- 2074
 Sample : Water
 Client : TAEC-ICON JV
 Source : Palanchowk Thokre Khola

Date received : 03 - 10 - 2074
 Date completed : 11 - 10 - 2074
 Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 16°C	4500-H* APHA-AWWA-WEF 2012, 22 nd Edition	8.3	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22 nd Edition	419	1500, max.
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22 nd Edition	2.9	5 (10), max.
4.	Taste and Odor		N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22 nd Edition	0.09	5(15), max.
6.	Total Hardness as CaCO ₃ , (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22 nd Edition	204	500, max.
7.	Total Dissolved Solid, (mg/l)	2540 C, APHA - AWWA - WEF 2012, 22 nd Edition	289	1000, max.
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl B, APHA-AWWA-WEF 2012, 22 nd Edition	3.72	250, max.
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.07	1.5, max.
11.	Nitrate, (mg/l)	4500-NO ₃ -B, APHA-AWWA-WEF 2012, 22 nd Edition	0.50	50.0, max.
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22 nd Edition	<0.01	0.20, max.
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22 nd Edition	0.31	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO ₄ ²⁻ C, APHA - AWWA - WEF 2012, 22 nd Edition	6.10	250, max.
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF, WPCF, 17th Edition	<0.001	0.001, max.
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22 nd Edition	51.2	200, max.
17.	Iron*, (mg/l)		0.10	0.30(3), max.
18.	Manganese*, (mg/l)		<0.05	0.20, max.
19.	Lead*, (mg/l)		<0.01	0.01, max.
20.	Cadmium*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.003	0.003, max.
21.	Chromium*, (mg/l)		<0.05	0.05, max.
22.	Copper*, (mg/l)		<0.05	1.0, max.
23.	Zinc*, (mg/l)		0.12	3.0, max.
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22 nd Edition	<0.01	0.05, max.

Remarks: Water quality meets NDWQS specified limit.

[Signature]
 Analyzed By

[Signature]
 Checked By

[Signature]
 Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
 2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
 3. Liability of our institute is limited to the invoiced detrimands and amount only.
 4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.

9/5



Nepal Environmental & Scientific Services (P) Ltd.

G.P.O. Box: 7301, Thapathali, Kathmandu, Nepal

Phone : +977-1-4244989, 4241001, Fax No.: +977-1-4226028, Email: ness@mos.com.np

http://www.nesspltd.com

Page 1 of 1

NESS/Lab, M-03/R1.1

QS Test Report / Certificate

NS Accreditation No. Pra. 01/053-54

Entry No. : NCL - 71 (W) (I) - 08 - 2018
 Sample : Sunkoshi River Water
 Client : TAEC/ICON JV
 Sampled By : Client
 Project : Sunkoshi Panchkhal Town Project

Date Received : 09 - 08 - 2018
 Date Completed : 21 - 08 - 2018
 Sampling Date : 08 - 08 - 2018
 Location : Sunkoshi River

S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 23°C	Electrometric, 4500 - H ⁺ B, APHA	7.5	5.5 - 9
2.	Turbidity, (NTU)	Nephelometric, 2130 B, APHA	110	-
3.	Color, (Chromaticity Unit)	Spectrophotometric, 2120 C, APHA	0.67	-
4.	Total Hardness as CaCO ₃ , (mg/L)	EDTA Titrimetric, 2340 C, APHA	40	-
5.	Calcium, (mg/L)	EDTA Titrimetric, 3500 - Ca B & 3500 - Mg B APHA	12.02	-
6.	Total Dissolved Solids, (mg/L)	Oven Drying Method, 180°C, 2540 C, APHA	88	-
7.	Sulphate, (mg/L)	Gravimetric Method with Ignition of Residue, 4500 - SO ₄ ²⁻ C, APHA	4.95	-
8.	Chloride, (mg/L)	Argentometric Titration, 4500 - Cl ⁻ B, APHA	1.49	-
9.	Ammonia, (mg/L)	Direct Nesslerization, 4500 - NH ₃ C APHA	0.14	-
10.	Nitrate, (mg/L)	UV Spectrophotometric Screening, 4500 - NO ₃ ⁻ B, APHA	2.66	-
11.	Aluminum, (mg/L)	Erichrome Cyanine R, 3500 - Al A: APHA	0.02	-
12.	Fluoride, (mg/L)	SPANDS, 4500 - F D, APHA	<0.05	2, max
13.	Iron, (mg/L)		2.38	-
14.	Manganese, (mg/L)		0.06	-
15.	Cadmium, (mg/L)	Direct Air - Acetylene AAS, 3111 B, APHA	N. D. (<0.003)	2, max
16.	Lead, (mg/L)		N. D. (<0.01)	0.1, max
17.	Copper, (mg/L)		<0.01	3, max
18.	Zinc, (mg/L)		0.04	5, max
19.	Arsenic, (mg/L)	SDDC, 3114 B: APHA	N. D. (<0.01)	0.2, max
20.	Mercury, (mg/L)	Cold Vapor AAS, 3112 B: APHA	N. D. (<0.0005)	0.01, max

N. D.: Not Detected

Note: The gravimetric analysis was carried out in controlled temperature condition (20°C).

APHA: American Public Health Association; AAS: Atomic Absorption Spectrophotometer; EDTA: Ethylenediaminetetraacetic acid; NTU: Nephelometric turbidity unit; UV: Ultraviolet.

Remarks: All observed values complied the prescribed effluent standards discharged into inland surface water.

(Analyzed By)

(Checked By)

(Authorized Signature)

- Note:
1. This report/certificate is in reference to Laboratory Quality Control Manual, QS (018), section OPT.
 2. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied.
 3. Liability of our institute is limited to the invoiced test parameters & amount only.
 4. Samples will be destroyed after one month from the date of issue of test certificate unless otherwise specified.
 5. This report should not be reproduced wholly / partially for any advertizing media without our permission.
 6. The clients are requested to take back their hazardous samples along with the report/certificate.



Nepal Environmental & Scientific Services (P) Ltd.

G.P.O. Box: 7301, Thapathali, Kathmandu, Nepal

Phone : +977-1-4244989, 4241001, Fax No.: +977-1-4226028, Email: ness@mos.com.np

http://www.nesspltd.com

Page 1 of 1

NESS/Lab, M-03/R1.1

QS Test Report / Certificate

NS Accreditation No. Pra: 01/053-54

Entry No. : NCL - 739(W) (I) - 06 - 2019 Date Received : 30 - 06 - 2019
 Sample : River Water (Sunkoshi) Date Completed : 11 - 07 - 2019
 Client : TAEC/ICON JV Accreditation No. Pra: 01/053-54 Sampling Date : 28 - 06 - 2019
 Sampled By : Client Location : Sunkoshi River

Panchkhal W.S.P

S. N.	Parameters	Test Methods	Observed Values	Generic Effluent Standards Discharged into Inland Surface Water, GoN 2001
1.	pH @ 25°C	Electrometric, 4500 - H ⁺ B, APHA	7.5	5.5 - 9
2.	Turbidity, (NTU)	Nephelometric, 2130 B, APHA	125	-
3.	Color, (Chromaticity Unit)	Spectrophotometric, 2120 C, APHA	0.13	-
4.	Total Hardness as CaCO ₃ , (mg/L)	EDTA Titrimetric, 2340 C, APHA	2.8	-
5.	Calcium, (mg/L)	EDTA Titrimetric, 3500 - Ca B & 3500 - Mg B APHA	18.44	-
6.	Total Dissolved Solids, (mg/L)	Oven Drying Method, 180°C, 2540 C, APHA	78	-
7.	Sulphate, (mg/L)	Gravimetric Method with Ignition of Residue, 4500 - SO ₄ ²⁻ C, APHA	0.82	-
8.	*Residual Chlorine, (mg/L)	Iodometric Titration, 4500 - Cl B, APHA	Nil	-
9.	Chloride, (mg/L)	Argentometric Titration, 4500 - Cl ⁻ B, APHA	2.97	-
10.	Ammonia, (mg/L)	Direct Nesslerization, 4500 - NH ₃ C, APHA	0.04	-
11.	Nitrate, (mg/L)	UV Spectrophotometric Screening, 4500 - NO ₃ ⁻ B, APHA	0.96	-
12.	Aluminum, (mg/L)	Enichrome Cynazine R, 3500 - Al A, APHA	0.04	-
13.	Fluoride, (mg/L)	SPANDS, 4500 - F D, APHA	<0.05	2, max
14.	Iron, (mg/L)	Direct Air - Acetylene AAS, 3111 B, APHA	3.42	-
15.	Manganese, (mg/L)		0.23	-
16.	Cadmium, (mg/L)		0.004	2, max
17.	Lead, (mg/L)		0.05	0.1, max
18.	Copper, (mg/L)		0.12	3, max
19.	Zinc, (mg/L)		0.11	5, max
20.	Arsenic, (mg/L)	SDDC, 3114 B, APHA	N. D. (<0.01)	0.2, max
21.	Mercury, (mg/L)	Cold Vapor AAS, 3112 B, APHA	N. D. (<0.0005)	0.01, max

*: Non-accredited Parameter

N. D.: Not Detected

Note: The gravimetric analysis was carried out in controlled temperature condition (20°C).

APHA: American Public Health Association; AAS: Atomic Absorption Spectrophotometer; EDTA: Ethylenediaminetetraacetic acid; NTU: Nephelometric turbidity unit; UV: Ultraviolet.

Remarks: All observed values complied the prescribed effluent standards discharged into inland surface water.

(Analyzed By)

(Checked By)

(Authorized Signature)

- Note:
1. This report/certificate is in reference to Laboratory Quality Control Manual, QS (018), section OPT.
 2. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied.
 3. Liability of our institute is limited to the involved test parameters & amount only.
 4. Samples will be destroyed after one month from the date of issue of test certificate unless otherwise specified.
 5. This report should not be reproduced wholly / partially for any advertising media without our permission.
 6. The clients are requested to take back their hazardous samples along with the report/certificate.

ANNEX 7: PHOTOGRAPHS



1. Proposed Intake Site Visit during Inspection



2. Proposed Intake/Sump Well Site



3. Proposed Sump well Site from left bank



4. Site Visit by PMO & the Consultant



5. Existing RVT at Thumka



6. Existing Community Tap Stand



7. Proposed WTP Site



8. Proposed RVT 5 Site (Radhakrishna School)



9. Proposed RVT 7 Site at (Jaretar)



10. Proposed RVT 8 site (Shikharpur)



11. Proposed RVT 9 site



12. Proposed RVT 11 site (Kharelthok)



13. Meeting during Inspection Visit



14. Meeting with the beneficiaries during field survey



15. Draft Detailed Engineering Design Report (DEDR) Presentation at Panchkhal



16. People Participation During Draft DEDR Presentation



17. People Participation During Draft DEDR Presentation



18. View of Panchkhal Valley