Initial Environmental Examination

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IND: Rajasthan Secondary Towns Development Sector Project – Mandawa Water Supply and Sewerage Subproject, Jhunjhunu District, Rajasthan

Prepared by Project Management Unit, Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited, Government of Rajasthan for the Asian Development Bank.

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CURRENCY EQUIVALENTS

(as of 4 June 2020)

Currency unit	–	Indian rupee (₹)
₹1.00	=	$0.01327
$1.00	=	₹75.3560

ABBREVIATIONS

ACM	–	Asbestos containing Material
ADB	–	Asian Development Bank
BOCW	–	Building and Other Construction Workers
CGWB	–	Central Ground Water Board
CLC	–	City Level Committee
CPCB	–	Central Pollution Control Board
CPHEEO	–	Central Public Health and Environmental Engineering Organization
CTE	–	Consent to Establish
CTO	–	Consent to Operate
CWR	–	Clear Water Reservoir
DBO	–	Design-Build-Operate
DPR	–	Detailed Project Report
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
FAO	–	Food and Agricultural Organization
FCO	–	Fertilizer Control Ordinance
FSSM	–	Fecal Sludge and Septage Management
GOI	–	Government of India
GOR	–	Government of Rajasthan
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
LPCD	–	Liters per Capita per Day
LSGD	–	Local Self Government Department
MLD	–	Million Liters per Day
MOEFCC	–	Ministry of Environment, Forest and Climate Change
OHSR	–	Overhead Service Reservoir
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit
PMU	–	Project Management Unit
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment
ROW	–	right-of-way
RSPCB	–	Rajasthan State Pollution Control Board
RSTDSP	–	Rajasthan Secondary Towns Development Sector Project
RUDSICO-EAP	–	Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited-Externally Aided Projects
RUDSICO	–	Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation
SCADA	–	Supervisory Control and Data Acquisition
SBR	–	Sequential Batch Reactor
SEIAA	–	State Environmental Impact Assessment Authority

SPS 2009	–	Safeguard Policy Statement, 2009
STP	–	Sewage Treatment Plant
TEER	–	Treated Effluent Elevated Reservoir
TESR	–	Treated Effluent Storage Reservoir
ULB	–	Urban Local Body
WHO	–	World Health Organization
WTP	–	water treatment plant

WEIGHTS AND MEASURES

°C	–	Degree Celsius
km	–	kilometer
lpcd	–	litres per capita per day
mm	–	milli meter
m	–	meter
MLD	–	million litres per day
mm	–	millimeter
nos	–	numbers
km^2	–	square kilometer

NOTE

In this report, "$" refers to United States dollars.

CONTENTS

			Pages
I.	INTRODUCTION		1
	A.	Project Background	1
	B.	Purpose of Initial Environmental Examination Report	3
	C.	Report Structure	4
II.	DESCRIPTION OF THE PROJECT		4
	A.	Present Status of Water Supply and Sewerage	4
	B.	Infrastructure Improvements Designed in Mandawa Town under RSTDSP	5
	C.	Subproject Components	10
	D.	Subproject Benefits	14
	E.	Implementation Schedule	15
III.	ANALYSIS OF ALTERNATIVES		30
IV.	POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK		35
	A.	ADB Policy	**Error! Bookmark not defined.**
	B.	National and State Laws	38
V.	DESCRIPTION OF THE ENVIRONMENT		52
	A.	Physical Resources	52
	B.	Ecological Resources	56
	C.	Economic Development	56
	D.	Socio Cultural Resources	58
	E.	Environmental Settings of Investment Program Component Sites	59
VI.	ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES		65
	A.	Introduction	65
	B.	Pre-Construction Impacts-Design and Location	66
	C.	Environmental Audit of Existing Water Supply Infrastructure	76
	D.	Pre-Construction Impacts	81
	E.	Construction Impacts	82
	F.	Operation and Maintenance Impacts	92
	G.	Cumulative Impacts	96
VII.	PUBLIC CONSULTATION AND INFORMATION DISCLOSURE		97
	A.	Overview	97
	B.	Public Consultation	98
	C.	Information Disclosure	100
VIII.	GRIEVANCE REDRESS MECHANISM		101
	A.	Project Specific Grievance Redress Mechanism	101
IX.	ENVIRONMENTAL MANAGEMENT PLAN		105
	A.	Environmental Management Plan	105
	B.	Institutional Requirements	149
	C.	Capacity Building and Development	160
	D.	Monitoring and Reporting	162
	E.	EMP Implementation Cost	163
X.	CONCLUSION AND RECOMMENDATION		164

APPENDICES

1. REA Checklist for water supply and sewerage treatment
2. Surface water allocation letter from Executive Engineer, PHED
3. Compliance with Environment Criteria for Subproject Selection
4. Geographical position coordinates of all project sites
5. Subproject sites photographs
6. Details of land availability for proposed water supply and sewerage subproject components
7. Ambient Air Quality Standards, Emission limits for New DG sets, Stake Height Requirement of DG sets & Vehicle Exhaust Emission Norms Drinking water standards
8. Effluent Discharge Standards for STPs by NGT order Dated 30. 04. 2019
9. Ambient Air Quality Standards in respect of Noise and Noise Limits for DG set
10. Salient features of major labor laws applicable to establishments engaged in construction of civil works
11. Mandawa Heritage Impact Assessment and Chance Find Protocol
12. Water Analysis Report - Mandawa
13. Biodiversity Assessment Report for Mandawa
14. Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy
15. Preliminary Audit Note for Existing Facilities
16. Sample ACM Management Plan
17. Sample outline spoil management plan
18. Sample outline traffic management plan
19. WHO Interim Guidance on Water, Sanitation, Hygiene, and Waste Management for the COVID-19 virus
20. IFC benchmark standards for workers accommodation
21. Drinking Water Standards
22. Guidelines and emergency plan for handling and storing chlorine
23. Consultations conducted during Project/IEE Preparation
24. Minutes of City-Level Stakeholders Committee (CLC) Meeting
25. Semi-annual Environmental Monitoring Report Format
26. Sample environmental site inspection report
27. Environment Monitoring for Ambient Air, Noise, Water and Soil
28. Sample Grievance Registration Form
29. Office Order for establishing GRM
30. Layout of STP 3. 9 MLD Showing Sludge Handling Area

EXECUTIVE SUMMARY

Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns.[1] RSTDSP seeks to improve water supply and sewerage (WSS) services in secondary towns with populations between 20, 000-115, 000 through a sector loan modality. The project is aligned with the following impact(s): (i) access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;[2] and (ii) health status of urban population, especially the poor and under-privileged improved.[3] The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

- **Output 1**: Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1,350 kilometers (km) of water supply pipelines will be commissioned through a district metered area approach for effective non-revenue water (NRW) management, (ii) about 100, 000 households will be connected to an improved water supply system (including at least 95% below poverty line [BPL] households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants (WTP) will be commissioned with total capacity of at least 28 million liters per day (MLD) and (iv) 2 water treatment plants WTP will be rehabilitated.

- **Output 2**: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[4] By 2027: (i) about 1, 300 kilometers of sewers will be constructed, (ii) 19 sewerage treatment plants (STP)s with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day will be commissioned and 3 existing STPs will be upgraded to meet current effluent standards, (iii) about 103, 000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day (KLD) capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.

- **Output 3**: Institutional and human capacities strengthened for service improvements, gender equality and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO, (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on operation and maintenance (O&M) of WSS services, CWIS, financial sustainability and gender equality and social inclusion (GESI) action plan implementation, (iii) about 500 girls

[1] Secondary towns under consideration are Abu Road, Banswara, Didwana, Fatehpur, Kuchaman, Ladnu, Laxmangarh, Makrana, Pratapgarh, Ratangarh, Sardarshahar, Sirohi, and Heritage towns - Khetri, Mandawa.
[2] Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy.* Jaipur
[3] Government of Rajasthan. 2016. *State Sewerage and Wastewater Policy*. Jaipur.
[4] Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

will report enhanced knowledge in conducting water audits in schools and households, and (iv) data platforms will be established in all project towns.[5]

Mandawa Town water supply and sewerage subproject is one of the subprojects proposed under the investment component of RSTDSP. Presently source of water in Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 tube wells (TWs) are directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as groundwater source. Water from 7 tube wells are collected at Clear Water Reservoir at JE office and further transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1.76 MLD (11 TW). In view of surface water, a package "Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II" is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 km from Mandawa.

At present, an intermittent water supply system is running in the town with actual service level 40-45 liters per capita per day (LPCD) at consumers' end, which is less than standard of 135 LPCD. This is due to heavy losses in the existing distribution network about 35-40%. The supply duration is about 1 to 1.5 hours with low pressure. Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED. Remaining area which is newly developed and newly added to the municipality area remains unconnected with piped scheme. There is no sewerage system in the town. Presently the wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Pound, Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Due to lack of sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town.

Screening and assessment of potential impacts. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in ADB's SPS (2009). Per the government of India Environmental Impact Assessment (EIA) Notification, 2006, this subproject does not require EIA study or environmental clearance. The potential environmental impacts of the subproject have been assessed using ADB rapid Environmental Assessment (REA) checklist for water supply and sewerage. Potential impacts were identified in relation to design, construction and operation phases. This Initial Environmental Examination (IEE) addresses the infrastructure components proposed under Mandawa water supply and sewerage subproject.

Categorization. Environmental assessment has been done conducted for the Mandawa water supply and sewerage subproject based on (i) preliminary detailed design and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklist for water supply and "No Mitigation Scenario Checklist". The environmental assessment of Mandawa water supply and sewerage subproject are not likely to have any significant adverse environmental impacts that are irreversible, diverse or unprecedented. Potential impacts are mostly site specific and few of them are irreversible. In

[5] Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and drinking water and treated wastewater quality monitoring system.

most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

Mandawa water supply and sewerage subproject is classified as Environmental Category B per the ADB SPS, 2009 as no significant impacts are envisaged. Accordingly, this Initial Environmental Examination (IEE) assesses the environmental impacts and provides mitigation and monitoring measures to ensure that there are no significant impacts because of the project.

Project Scope. The subproject is formulated to address gaps in water and sewerage infrastructure in a holistic and integrated manner. The main objective of the RSTDSP is to improve water efficiency, security, and provide safe sewage collection and with the on-going investments in sewage treatment, this will have an important effect on public health and environment. Investments under this subproject include: Water Supply: (i) construction of 1 nos. of clear water reservoir (CWR) of 1200 KL with pump house (14 nos.) is proposed in the office of junior engineer, public health engineering department (PHED) (ii) proposed transmission mains- 0.98 km of dia 150 mm of DI materials (iii) proposed distribution- 108.40 km of dia 75 mm to 250 mm diameter of HDPE materials (iv) refurbishment of existing tube wells (11 no), OHSR of 360 KL capacity submersible motor pumps, existing faulty/old cables, existing leaked/worn out riser pipe of existing tube wells, the existing old and damaged panel board, (v) provision of SCADA system (v) electrical and mechanical works. (vi) provision for SCADA system. (vii) provision for house connections - 5400 no (viii) Construction of one Consumer relation management centre (CRMC), 1 nos centre control centre (CCC) and one master control centre (MCC). Sewerage: (i) Construction of one of STP of 3.9 million litre per day (MLD) capacity with Sequencing Batch Reactor (SBR) technology and), and Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR) near Bissau (ii) Construct new SPS of 0. 4 MLD (iii) laying of 53.40 km sewer lines in Mandawa town including 5 km of trenchless sewer network having depth more than 3.5 m and of different diameter are proposed to be laid using trenchless technology(iv) Construct 0. 91 km of pumping main (100 mm dia of DI materials). (iv) house service connection- 4000 nos. (v) electrical and mechanical works. (vi) Fecal sludge and Septage management (FSSM) to provide low costs sanitation where sewer network is not an immediate requirement for population on outskirts and scattered habitation till laying of sewer line (Provide 2 truck (4000L and 1000L) for desludging of septic tanks.

Description of the Environment. Subproject components are located in Mandawa town in Jhunjhunu district and in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at these sites. The project sites are located in Government lands for structures and for pipe laying in existing road right-of-way (ROW). There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations. Soils are deep, and do not require cutting of rocks for pipe laying. The climate of Mandawa is dry and hot in summers and cold in winters. The maximum temperature during summer months goes above 44°C quiet frequently. The temperature during winter months normally touches 3.6^{o}C. The mean annual rainfall is around 550 mm. Mandawa is one of the heritage towns in Rajasthan. There are various physical and cultural resources[6] (PCRs) in the town such as state-protected monuments and heritage sites. Mandawa is known for its havelis and forts. A fortified town, now only a few of the fort walls remain and only one gate survives. The town grew around the main bazaar street near the fort that was located on raised ground forming the historic core. The town has many beautiful havelis, shops and temples with a collection of some of the most exquisite

[6] ADB SPS, 2009 defines physical cultural resources as movable or immovable objects, sites, structures, groups of structures and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance.

frescoes. Due planning and care are considered to ensure to avoid damages to these physical cultural resources.

Potential Environmental Impacts and Mitigation Measures. Potential impacts were identified in relation to location, design, construction and operation of the improved infrastructure. During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of wastes oil and disturbance of residents and traffic. These are common temporary impacts of construction in urban areas, and there are well developed methods for their mitigation. Mitigation measures have been developed to reduce all negative impacts to acceptable levels

Locations and siting of the designed infrastructures were considered to further reduce impacts. These include (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people; and (ii) laying of pipes in ROW alongside main/ access roads, to reduce acquisition of land and impacts on livelihoods specifically in densely populated areas of the town.

Measures such as appropriate scheduling of works (non-monsoon season, low traffic hours, etc.) and minimizing in convenience by best construction methods will be employed like trenchless pipe laying for water supply and sewerage for the depth of more than 3.5 m and in areas where traffic is more. Traffic management plan will be prepared by contractor before start of construction works for pipe-laying works on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

Environmental Management. An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and there possible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The construction phase EMP will be included in civil work bidding and contract documents.

Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented and will determine whether the environment is protected as intended. It will include observations on-and off-site, document checks, and interview with workers and beneficiaries. Any requirement for corrective action to be carried out by the Contractor will be reported to the RUDSICO who shall reports to the ADB as per agreed upon reporting procedures. The cost for the implementation of the EMP and the associated monitoring measures is estimated at appropriately. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the EMP. The estimated implementation cost of the EMP is INR 19, 893, 880. This indicative cost includes INR 1, 400, 000 for asbestos management (identification, inventory, removal, transport, temporary storage, disposal/treatment and overall supervision of contractor works related to asbestos materials) and INR 700, 000 for heritage management (physical cultural resources survey and site verification, consultations, documentation of baseline conditions, assessment of mitigation requirements, supervision of contractors, documentation and reporting).

The draft IEE and EMP will be included in the bid and contract document to ensure compliance with the conditions set out in this document. The contractor will be required to submit to submit to PIU, for review and approval, an updated EMP /site-specific EMP (SEMP) including (i) designed 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 approval EMP; and (iii) monitoring program per EMP/ approved SEMP will be kept on-site during construction period at all.

Implementation Arrangements. Government of Rajasthan's Local Self Government Department (LSGD) acting through RUDSICO will be the project Executing Agency. The project management unit (PMU) is house in RUDSICO's division for externally aided projects (EAP). There will be two Zonal officers in Jaipur and Jodhpur and project implementation units (PIUs) in each project town/urban local body (ULB). PMU will be responsible for submitting environmental assessment and monitoring reports to ADB, monitoring of safeguards compliance, addressing safeguards issues, providing support and guidance to PIUs. The PIUs will be responsible for the day-to-day monitoring of EMP implementation, information disclosure, consultations and other field-level activities. PMU has appointed a Project Officer for environment and each PIU will deputize Assistant Safeguard Officers (ASOs). The PMU environment project officer will be assisted by specialists from Project Management and Capacity Building Consultants (PMCBC) and Construction Management and Supervision Consultants (CMSC).

Consultation, Disclosure and Grievance Redress. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. Apart from on-site public consultations, a stakeholder meeting of City Level Committee (CLC) was held and CLC has appreciated and approved the subproject. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and RUDSICO websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism (GRM) is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. The PMU, PIU and consultants will be responsible for monitoring and reporting. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU. PIU with the assistance of CMSC, will monitor the compliance of contractor, prepare a quarterly environmental monitoring report (QEMR) and submit to PMU. The PMU will oversee the implementation and compliance and will submit semi-annual environmental monitoring reports (SEMR) to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted RUDSICO/PMU websites.

Conclusions. The citizens of the Mandawa will be the major beneficiaries. The subproject is primarily designed to improve environmental quality and living conditions of Mandawa town through provision of sage drinking water supply and sanitation system. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water (iii) better public health particularly reduction in water borne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) reduced dependence on freshwater resource due to reuse of treated wastewater, and (vi) improvement in quality of waterbodies due to disposal of treated effluent meeting disposal standards.

The subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the project as Category “B” is confirmed. The subproject is not covered by the GOI EIA Notification (2006).

Recommendations. The following are recommendations applicable to the subproject to ensure no significant impacts:

- Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design;
- Include this IEE in bid and contract documents;
- Update and implement the asbestos management plan per site-specific conditions;
- Update and implement the recommendations from the heritage impact assessment (HIA), including the harmonization of architecture and design to the town’s physical cultural resources’ identity;
- Update and implement the recommendations from the biodiversity assessment report;
- Secure permits for the abstraction of groundwater from additional wells;
- Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
- Conduct safeguards induction to the contractor upon award of contract;
- Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendments) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
- Strictly supervise EMP implementation;
- Ensure contractor appointed qualified environment, health and safety (EHS) officers prior to start of works;
- Documentation and reporting on a regular basis as indicated in the IEE;
- Continuous consultations with stakeholders;
- Timely disclosure of information and establishment of GRM;
- Involvement of contractors, including subcontractors, in first level GRM;
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

I. INTRODUCTION

A. Project Background

1. Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns.[7] RSTDSP seeks to improve water supply and sewerage (WSS) services in secondary towns with populations between 20, 000-115, 000 through a sector loan modality. The project is aligned with the following impact (s): (i) access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;[8] and (ii) health status of urban population, especially the poor and under-privileged improved.[9] The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

(i) **Output 1**: Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1, 350 kilometers (km) of water supply pipelines will be commissioned through a district metered area approach for effective non-revenue water (NRW) management, (ii) about 100, 000 households will be connected to an improved water supply system (including at least 95% below poverty line [BPL] households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants (WTP) will be commissioned with total capacity of at least 28 million liters per day (MLD) and (iv) 2 water treatment plants WTP will be rehabilitated.

(ii) **Output 2**: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[10] By 2027: (i) about 1, 300 kilometers of sewers will be constructed, (ii) 19 sewerage treatment plants (STP)s with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 MLD million liters per day will be commissioned and 3 existing STPs will be upgraded to meet current effluent standards, (iii) about 103, 000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day (KLD) capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.

(iii) **Output 3**: Institutional and human capacities strengthened for service improvements, gender equality and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO, (ii) about 500 staff and 500 elected representatives of project ULBs,

[7] The project towns under consideration for the sector loan are: Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Ladnu, Laxmangarh, Makrana, Mandawa, Pratapgarh, Ratangarh, Sardarshahar and Sirohi. Of these towns, Khetri and Mandawa are heritage towns.

[8] Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy.* Jaipur.

[9] Government of Rajasthan. 2016. *State Sewerage and Wastewater Policy*. Jaipur.

[10] Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

including 80% of eligible women, will report increased knowledge on operation and maintenance (O&M) of WSS services, CWIS, financial sustainability and gender equality and social inclusion (GESI) action plan implementation, (iii) about 500 girls will report enhanced knowledge in conducting water audits in schools and households, and (iv) data platforms will be established in all project towns.[11]

2. A series of subprojects will be implemented under the Project, with each subproject providing improvements to water supply or sewerage or both in a project town. Mandawa Town water supply and sewerage subproject is one of the subprojects proposed in RSTDSP. Presently source of water in Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water from 7 nos tube wells are collected at Clear Water Reservoir at JE office and further it transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1. 76 MLD (11 TW). In view of surface water, a package "Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II" is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 Km from Mandawa.

3. Water is supplied for one and half hour daily @ 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0. 3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd. There is no sewerage system in the town. Presently the wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Pound, Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Due to lack of sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town.

4. The subproject is formulated to address gaps in water and sewerage infrastructure in a holistic and integrated manner. The main objective of the RUIDP Phase-IV is to improve water efficiency, security, and provide safe sewage collection and with the on-going investments in sewage treatment, this will have an important effect on public health and environment. Investments under this subproject include: Water Supply: (i) construction of one clear water reservoir (CWR) of 1200 KL with pump house (14 no.) is proposed in the office of junior engineer, public health engineering department (PHED) (ii) proposed transmission mains - 0.98 km of dia 150 mm of DI materials (iii) proposed distribution - 108.40 km of dia 75 mm to 250 mm diameter of HDPE materials (iv) refurbishment of existing tube wells (11 no.), OHSR of 360 KL capacity submersible motor pumps, existing faulty/old cables, existing leaked/worn out riser pipe of existing tube wells, the existing old and damaged panel board, (v) provision of SCADA system (v) electrical and mechanical works. (vi) provision for SCADA system, (vii) provision for house connections -

[11] Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and drinking water and treated wastewater quality monitoring system.

5400 no (viii) Construction of one Consumer relation management centre (CRMC), 1 nos. center control center (CCC) and one master control centre (MCC). Sewerage: (i) Construction of one STP of 3. 9 million liter per day (MLD) capacity with Sequencing Batch Reactor (SBR) technology and), and Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR) near Bissau (ii) Construct new SPS of 0.4 MLD (iii) laying of 53.40 km sewer lines in Mandawa town including 5 km of trenchless sewer network having depth more than 3.5 m and of different diameter are proposed to be laid using trenchless technology(iv) Construct 0.91 km of pumping main (100mm dia of DI materials). (iv) house service connection- 4000 nos. (v) electrical and mechanical works. (vi) Fecal sludge and Septage management (FSSM) to provide low costs sanitation where sewer network is not an immediate requirement for population on outskirts and scattered habitation till laying of sewer line (Provide 2 truck (4000L and 1000L) for desludging of septic tanks.

B. Purpose of Initial Environmental Examination Report

5. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB's Rapid Environmental Assessment (REA) checklist for water supply and sewerage treatment (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

6. The Mandawa water supply and sewerage is designed for implementation under the design build operate (DBO) modality, where in which the design is carried out by the selected bidder based on the feasibility/preliminary project report prepared prior to bidding. Thus, this IEE is based on the preliminary project report prepared by RUDSICO/PMU. The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

7. This IEE will be updated and finalized during detailed design stage to reflect change in scope of works, change in location of component and change in cost due to addition or subtraction of components which can change the environmental impacts. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from PMU and ADB.

8. The implementation of the subprojects will be governed by Government of India and Rajasthan and other applicable environmental acts, rules, regulations, and standards. Environmental safeguards will be followed in accordance with the ADB SPS, 2009. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards.

C. Report Structure

9. This Report contains the following eleven (11) sections including the executive summary at the beginning of the report:

(i) Executive Summary
(ii) Introduction
(iii) Description of the Project
(iv) Analysis of alternatives
(v) Policy, Legal and Administrative Framework
(vi) Description of the Environment
(vii) Anticipated Environmental Impacts and Mitigation Measures
(viii) Public consultation and information disclosure
(ix) Grievance Redress Mechanism
(x) Environmental management plan
(xi) Conclusions and Recommendations.

II. DESCRIPTION OF THE PROJECT

10. Mandawa is a town and tehsil headquarter in Jhunjhunu district of Rajasthan in India. Mandawa is located 190 km towards North from state capital, Jaipur. Mandawa is famous for its fort and havelis. The town lies between latitude 28°06' in the north latitude and 75°20' in the East longitude. It has an average elevation of 316 meters (1036 ft.).

A. Present Status of Water Supply and Sewerage

11. **Water Supply.** Potable water for the Mandawa town is available from two main sources i. e. Ground water (tube wells) and Surface water of Integrated Taranagar Jhunjhunu Sikar Khetri Drinking Water Supply Project Package-II.

12. **Groundwater source**: Presently, source of Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water from 7 tube wells are collected at Clear Water Reservoir at JE office and further it transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1.76 MLD (11 TW). The tube wells are fitted with submersible pumps.

13. All the pumps have served their useful lives, they work at very low efficiency. Refurbishing them under the present condition will be uneconomical. Further duty of these pumps will not suit the revised demand of the Mandawa. Hence these pumps are recommended to be phased out.

14. **Surface water source**: A package "Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II" is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 km from Mandawa.

15. Presently in Mandawa town one clear water reservoir is available of 450 KL capacity at JE office. Water is stored in the CWR and transferred (by pumping) to two ESR's located at JEN

office and Ward No 4. Condition of CWR at JE office is extremely poor. It was constructed in 1960. It is required to be re-constructed. Water Collected at CWR at JE office from 7 no. of tube well is transferred through 150 AC transmission line to ESR at JE office and 250 AC transmission line to ESR at Ward no 4 ESR. The existing distribution system with AC and PVC pipes are incredibly old with heavy leakages due to breakages and joints leakages due to ageing and hence need to be phased out.

16. Entire town has been divided into 2 water supply distribution zones with gravity fed from zone OHSRs. The existing distribution system with asbestos cement (AC) and polyvinyl chloride (PVC) pipes are very old with heavy leakages due to breakages and joints leakages due to ageing and hence need to be phased out.

17. **Water Supply** in town is for one and half hour daily at 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0.3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd.

18. **Sewerage.** Mandawa Municipality does not have any organized sewerage system. Presently the wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. Though septic tanks are an accepted onsite treatment, but as the septic tanks are not designed and maintained properly, the effluent does not confirm to the standards. The effluent from the septic tanks is directly let into the open drains.

19. In the absence of safe disposal system of sewage as mentioned above, the people of Mandawa are facing unhealthy and unhygienic environmental conditions therefore public representatives are also demanding facilities of sewerage system on priority basis. The town requires sound drainage and sewerage system.

B. Infrastructure Improvements Designed in Mandawa Town under RSTDSP

20. **Need of the Project and Source of water:** All the TWs are connected to direct distribution and cannot be considered as sustainable source as they have very low discharge yield. A package “Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II” is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan as Kumbha Ram Lift Canal. The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 Km from Mandawa. Presently total water abstracted from tube wells is 1. 76 MLD (11 TWs) and availability of 5. 38 MLD (2047) water allocation from the “Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project.

21. **Water Demand and availability.** Overall drinking water supply requirements are as follows:

Table 1: Population and Water Demand

Year	Stage	Population	Water Demand at Consumer end	Total Water Demand	Total Available Water (Surface + TWs)	Treated Surface Water*	TWs near Bankoti Village
			MLD				
2021	Base Year	26, 543	3. 58	3. 98	5. 97	4. 21	1. 76
2036	Intermediate Year	30, 840	4. 16	4. 62	6. 49	4. 73	1. 76
2051	Ultimate Year	34, 517	4. 66	5. 17	7. 06	5. 30	1. 76

*Water from Integrated Taranagar-Jhujhunu-Sikar-Khetri Drinking Water Supply Project, Package II of PHED, GOR.

22. **Source Dependability for Water Supply.** Water demand of Mandawa town for year 2036 and 2051 are 4. 62 MLD & 5. 17 MLD respectively. Against demand of year 2036 & 2051 only 1. 76 MLD is available with existing TWs. Balance deficit demand will be supplied by Canal Water from "Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II" which is being executed by PHED. Water has been reached at Mandawa Town from Surface source. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Khumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI K-7 pipe has been laid to JE office CWR. Treated water will be available from "Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II" of PHED up to Mandawa Town JE Campus H/w. WTP of this scheme is at Malsisar Town around 50 Km from Mandawa. This will be a feasible source for water supply and the water allocation letter from the PHED Rajasthan is obtained (Appendix 2).

23. **Water distribution.** Entire town has been divided into 2 water supply distribution zones with gravity fed from zone OHSRs and through pumping. To efficiently cover the whole town, one new Clear Water Reservoir (CWR) is proposed at PHED J. En. Campus, 14 pump houses within same campus and water distribution network is proposed in the town.

24. **Operation and maintenance of water supply system**. The DBO contractor will operate and maintain the system for a period of 10 years after completion of construction and commissioning the new / improved system. This will include the following:

(i) Drawing water from TWs to CWRs including water pumping main and maintenance of entire underground water system.
(ii) Operating and maintaining all the Clear water pumping stations to fill all the CWRs/OHSRs/GLSRs through transmission pipelines and operation of chlorination system, maintenance of complete system including maintaining the infrastructure and specified water levels at each of the reservoir throughout the O&M period.
(iii) Managing the distribution network for distributing water efficiently, equitably and minimizing non-revenue water (NRW) and maintaining the infrastructure on DMA basis in the distribution network.
(iv) Providing continuous pressurized water supply with improvement in level of service on continuous basis to the connected consumers and maintaining the infrastructure while meeting the performance indicators. A minimum of 12 m water column pressure shall be maintained at all the ferrule points, but it shall not exceed the maximum allowable pressure.

(v) Meter reading, customer services and maintaining the infrastructure in water supply and sewerage sector.
(vi) Meter reading, bimonthly billing, bill distribution, revenue collection and customer services and maintaining the infrastructure in water supply sector.
(vii) Sampling treated water received at all the CWRs/ESRs/ GLSRs and from random points within the Zone/DMA to ensure that it meets the Potable water specification and monitor on monthly basis;
(viii) Assessing and minimizing non-revenue water and locating the causes for high NRW and bringing down the NRW level within the 7% for DMA, 12% from clear water source.
(ix) Provide customer service connections on approval or sanction by Employer Representative or line agency through Employer Representative.
(x) Contractor will provide continuous on-the-job training that will start from the day the contractor gets mobilized, and other capacity building programs by the contractor as important regular activities for staff of the employer PHE and Local body.
(xi) Maintaining environmental and safety norms at entire system components.

25. **Sewerage works.** Under RSTDSP, it is proposed to develop sewerage system in Mandawa town to collect, treat, and dispose/reuse the domestic wastewater safely. This is being provided in a combination of underground sewerage system including treatment facility, and Fecal Sludge and Septage Management (FSSM) system in areas that are not fully developed at present and not feasible to provide sewer network. About 91% of the total base year population (2021) is proposed to be covered by sewerage system, while the rest 9% will be covered by FSSM. The objectives of the proposed sewerage works are:

(i) Construction of sewerage network, including house sewer connection and collection of wastewaters from point of generation;
(ii) Construction of energy efficient and mechanized Sewage Treatment Plant and electromechanical machinery;
(iii) Septage management and decentralized wastewater treatment systems in suitable areas;
(iv) Provision for reuse of treated effluent etc.;
(v) To ensure 100% house service connections for wastewater collection; and
(vi) To ensure sustainability of the project by implementing a comprehensive asset management plan focusing on an integrated approach to operation and maintenance to minimize lifecycle costs.

26. The sewer system will be designed as a separate sewer system that carries only the domestic/municipal wastewater. The open drain system that exists in the town will cater to storm runoff. No industrial wastewater will be allowed into the sewers. This subproject complies with the environmental subproject selection criteria (Appendix 3) agreed between the government and the ADB.

27. **Sewage treatment.** It is proposed to develop Sequential Batch Reactor (SBR) based sewage treatment facility that will treat the incoming sewage to stringent discharge standards specified in this IEE and included in the bid documents. SBR is a cyclic activated sludge treatment process and provides highest treatment efficiency possible in a single step biological process. One treatment plant of capacities 3. 90 MLD is proposed to meet the demand.

28. **Reuse of treated effluent.** The Rajasthan State Sewerage and Wastewater Policy, 2016,

promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. This policy:

(i) aims to ensure improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment;
(ii) promotes the reuse and provides guidance on the same;
(iii) prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry, and non-potable domestic reuse;
(iv) requires monitoring of treated wastewater quality, soil quality etc.;
(v) prohibits artificial recharge of aquifers using treated wastewater, and promotes construction of storage tanks to store treated wastewater to facilitate reuse;
(vi) prescribes that the detailed project report (DPR) of a sewerage project should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR duly following the water quality norms and legal implications; and
(vii) suggests use of sludge produced from the treatment as fertilizer and soil conditioner after processing.

29. To further the implementation of the Policy, to promote the reuse and provide guidance to the stakeholders, the Local Self Government Department (LSGD) is currently in the process of publishing “Guidelines for Reuse of Treated Wastewater in Rajasthan 2019. These guidelines:

(i) promote the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources; and
(ii) promotes the use of treated wastewater as an economic resource.

30. Under the subproject, following the State Policy, treated effluent will be reused in applications such as agriculture, horticulture, development of urban forestry and industry as appropriate. A Treated Effluent Reuse Plan will be prepared by the DBO Contractor during the detailed design phase as envisage by the State Policy, and reuse modalities will be firmed up. To facilitate reuse and supply of treated effluent, A treated effluent storage reservoir (TESR), effluent pumping station and a treated effluent elevated reservoir (TEER) are proposed at the STP in the subproject.

31. **Discharge of treated wastewater.** The excess / surplus treated wastewater that is not reused will be discharged into nearby land, water channels/drains, and necessary facilities like pipelines and pumping requirements, will be developed. Mandawa is in Jhunjhunu district, located in western Rajasthan. Being a desert region, it is not part of any river basin, and the drainage pattern is not defined, therefore there are no notable natural drainage channels or stream. Soil is mostly sandy, and region receives low rainfall. At present, wastewater from the houses, and run off during the rains, accumulates in the low-lying areas in the town. There are drainage pumping stations set up by municipality in the low-lying areas in the town, from where accumulated wastewater/water is pumped to outside the town, and discharged on land, which again accumulates in low lying areas. Due to sandy soil, and high temperature, large proportion of accumulated water is lost due to evaporation and infiltration.

32. **Sludge treatment and disposal.** A Sludge Sump shall be provided to collect thickened sludge from SBR basins. Supernatant from the sump will be returned to inlet/equalization tank for treatment. Sludge from sump will be pumped to sludge thickener, and the thickened sludge will

be pumped to mechanical sludge dewatering system (such as centrifuge). Dewatered sludge cake will further air dried in a sludge storage shed for 15 days and disposed in an identified site.

33. **Operation and maintenance (O and M) of Sewerage system.** The DBO contractor will operate and maintain the system for a period of 10 years after completion of construction and commissioning the new system. This will include the following:

(i) Sewage pumping system to pump sewage to STP including maintenance of entire system and maintaining the infrastructure (power charges to be paid by the Employer);
(ii) Sewage treatment plant (STP) including maintenance of entire system and maintaining the infrastructure (power charges to be paid by the Employer);
(iii) Managing the sewerage network for collection of sewage including maintenance of entire system from property chambers up to disposal outfall of Sewage to STP
(iv) Sampling treated effluent to ensure that it meets the guaranteed treatment parameters;
(v) Provide house connections for collection of sewage from house properties on approval or sanction by Employer;
(vi) Contractor will provide continuous on-the-job trainings that will start from the day the contractor gets mobilized, and other capacity building programs by the contractor as important regular activities for staff of the Employer, PHED and Mandawa Nagar Palika; and
(vii) Maintaining environmental norms at entire system components.

34. **Fecal Sludge and Septage Management (FSSM).** It is proposed to provide FSSM in areas where the population density is low (less than 100 persons per hectare) and will not generate sewage in adequate quantity to convey by sewer network. FSSM will provide low cost sanitation system in areas where sewer network is not an immediate requirement, will make septage collection, treatment and effluent management environment-friendly. Of the 10 wards in Mandawa, there are 8 nos. (Wards 1 to 6, 9 and 10) that have areas with scattered development and low population density. Total base year (2021) population of these wards is 26,543 of which about 9 % (2389) will be covered with FSSM and rest will be covered by sewer network. This is about 9 % of total projected population of base year (26543 persons). Under the FSSM, fecal sludge/septage will be collected from the household level septic tank using truck mounted mobile desludging equipments and transported to sewage treatment plant (STP) for treatment. STP will have necessary provisions to receive and treat the septage along with the wastewater received via sewer network. STP will be designed accordingly by the successful bidders during the detailed design phase to comply with the treated effluent discharge standards specified in the bidding documents.

35. **Operation and maintenance (O&M) of FSSM.** The DBO contractor will operate and maintain the system for a period of 10 years. This will include the following:

(i) Desludging the septic tanks/pits from the individual houses using mobile truck mounted desludging equipment;
(ii) Transportation of the vehicle to STP and dispose-off septage to Inlet chamber/screen chamber of STP; and
(iii) Cleaning of the tank and proper garaging of the vehicle at designated place.

C. Subproject Components

36. Table 2 shows the nature and size of the various land components and co-ordinates Locations of different project locations in Google Earth Map is shown in Figures 1, 2, 3, 9, 10 to 12 and in SOI Toposheet in Figure 4. Conceptual layout plans are shown in Figure 5, 6, 7, 8, 11, 13, 14, 15 & 16. Geographical position coordinates of all project sites are given in Appendix 4. Photographs of existing conditions of infrastructures and proposed sites under the subproject in the town is given in Appendix 5. Layout of STP 3. 9 MLD showing sludge handling area is given in Appendix 30.

Table 2: Proposed Water supply and Sewerage subproject components

Infrastructure	Function	Description	Location
Water Supply			
Clear Water Reservoir (CWR)	Store clear water for supply	New 1 nos. of 1200 KL capacity	At PHED JEN Campus H/w
Chlorinator System	Post chlorination / disinfection of water prior to supply	New 1 nos. chlorinator room and vacuum feed chlorination system of capacity 1 kg per hour (For CWR)	At PHED J. En. Campus
Distribution network	To distribute water to consumers	New 108. 40 km of dia 75 mm to 250 mm of HDPE materials	Pipes will be laid underground along the public roads/streets covering entire area of the town; Majority of the existing pipes are of AC; new pipes will be laid without distributing the existing pipes, which will be left as it is in the ground untouched
Consumer connection with flow meters	Provide water to consumers and measure water usage	New Consumer connections with meters • 5400 Nos.	Water delivery pipe (PE of dia 20 - 25 mm) will be connected to distribution lines and meters will be attached to the delivery pipe at each house with a meter chamber
Tube wells	Abstract ground water	Rehabilitation and Refurbishment 11 Nos. of Tube wells, submersible motor pumps, existing faulty/old cables, existing leaked/worn out riser pipe of existing tube wells, the existing old and damaged panel board	At different location are as: Ganesh Mandir, BPS School, Shankar Baba, Sai Baba, Ice Factory, Electricity Board GSS, Ruth Hotel, Gulab bypass near Sai mandir, Tiba ka Mandir, Near Shamshan bhumi and PHED J. En. Campus
OHSR	Store clear water for	Rehabilitation and	

Infrastructure	Function	Description	Location
	supply	Refurbishment • 1 nos. of 360KL capacity	
Pump House	To pump clear water at followings: a. To OHSR – Jatbasti, Ward No. 4 (Zone-1) b. To Direct Distribution on VFD, Zone – 2. c. To Direct Distribution on VFD, Zone – 2.	New • 14 Nos.	At existing PHED J. En. campus
Transmission mains	Water transmission from CWR to OHSR/ESR	New 0. 98 kms of dia. 150 mm of DI material	
Offices for costumer relation and control centers for water supply operation	Consumer relations and SCADA system control for entire water supply system	New • Consumer Relation Management Centers (CRMC)- 1 Nos. • Central Control Center (CCC) – 1 nos. • Master Control Center- 1 nos.	CRMC, CCC and MCC will be constructed at existing PHED J. EN. campus
Sewerage			
Sewage collection network including house connections	Collect wastewater from houses and convey by a combination of gravity and pressure pumping to pumping station and ultimately to the STPs	New 53. 40 km of sewer line including 5. 0 km trenchless details are as: (HDPE DWC SN8 - 47. 4 km, RCC pipes NP4 - 1. 0 km, Trenchless Method adopting with HDPE PE-100 / PN-6 -5. 0 Km) House service connections- 4000 Nos.	Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the center of the road. The existing/ proposed water pipes are/ will be located on one or either side of the roads, and therefore sewers will be laid in the center without distributing the water pipes.
Rising Main	For pumping the sewage	New 0. 91 km of 100mm dia of DI material	For pumping the sewage. from SPS at govt. secondary school to existing MH
Sewage Pumping Station (SPS)	To Pump sewage to STP	New 0. 4 MLD capacity	Near existing PHED J. En. campus on Fatehpur Road
Sewage Treatment Plant (STP)	Treatment of collected wastewater to meet stipulated discharge standards	New- 1 Nos. STP • 3. 9 MLD capacity Components: • SBR (sequential	Near Bissau Road

Infrastructure	Function	Description	Location
		batch reactor) based STP with primary, secondary, tertiary treatment • Disinfection of treated wastewater for reuse – chlorination tank • sludge management (sludge collection, thickening, dewatering and disposal) • Laboratory, and online testing facilities for BOD, COD, TSS etc. ,) • Instrumentation, automation, SCADA etc. ,	
Treated wastewater storage tanks	Store the treated wastewater for reuse, and also provide adequate pressure / elevation for supply	New • Treated Effluent Storage Reservoir (TESR) – 200 KL one • Treated Effluent Elevated Reservoir (TEER) – 400 KL one. • Provision for mobile tanker filling points and rising mains/ distribution system, bypass/overflow arrangements at the TEER to facilitate reuse • Instrumentation, automation, SCADA etc. ,	At STP near Bissau Road
Outflow sewer	Disposal of treated effluent– surplus/excess treated effluent that is not put to reuse will be discharged through outflow sewer	• Outfall sewer/ effluent discharge pipe • This will be designed during the detailed design phase	From STP outlet to nearby drain/depression near existing road
FSSM			
Truck mounted mobile desludging equipment	Desludging of septage from	mobile tankers with suction and	Mobile equipment

Infrastructure	Function	Description	Location
	household pits/ septic tanks, transportation& discharge to STP	discharge arrangements – number of tankers to be procured will be estimated during the detailed design	

37. Subproject will be implemented under Design-Build-Operate (DBO) modality, wherein which the successful bidder will design the water supply and sewerage systems and components (based on the feasibility/preliminary design/standards/guidelines provided in the bid document), construct, commission, and operate for 10 years, after which it will be transferred to Mandawa Municipality. Therefore, at this stage, subproject is designed only in outline, and the details of components of the subproject provided in the table below are as finalized at this stage based on the preliminary designs and as included in the bid documents. This IEE is based on the subprojects and components detailed in the below table, and the IEE will be further updated during the detailed design phase.

38. Table 3 shows the nature and size of the land details of various components of the subproject: Details of land availability, ownership and status of No Objection Certificate (NOC) for Proposed Sites are given in Appendix 6.

Table 3: Land details of Proposed Water Supply and Sewerage Subproject Components

Subproject components	Location	Land Availability	Capacity/ Work proposed
Water Supply			
Clear Water Reservoir (CWR)	At Existing PHED J. En. Campus	Govt. Land available under ownership of PHED	1200 KL
Distribution network	Pipes will be laid underground along the public roads/streets covering entire area of the town; Majority of the existing pipes are of AC; new pipes will be laid without distributing the existing pipes, which will be left as it is in the ground untouched	Govt. Land	108. 40 km
Consumer connection with flow meters	Water delivery pipe (PE of dia 20 – 25& 32 mm) will be connected to distribution lines and meters will be attached to the delivery pipe at each house with a meter chamber	-	5400 Nos.
Tube wells	At different location near Bankoti Village	Govt. Land	11 Nos.
OHSR	Refurbishment of existing	Govt. Land	1 Nos. of 360 KL

Subproject components	Location	Land Availability	Capacity/ Work proposed
	OHSR		
Pump House	At Existing PHED J. En. Campus	Govt, Land (PHED)	14 Nos.
Transmission mains		Govt. Land	0. 98 kms of dia. 150mm of DI material
Offices for costumer relation and control centers for water supply operation	CRMC, CCC and MCC will be constructed within existing PHED J. En. campus	Govt. Land available (PHED)	• Consumer Relation Management Centers (CRMC) - 1 Nos. • Central Control Center (CCC) – 1 nos. • Master Control Center- 1 nos.
Sewerage			
Sewage collection network including house connections	Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the center of the road. The existing/proposed water pipes are/will be located on one or either side of the roads, and therefore sewers will be laid in the center without distributing the water pipes.	Govt. Land	Total 53. 40km of sewer line including 5. 0 km trenchless details are as: (HDPE DWC SN8 - 47. 4 km, RCC pipes NP4 - 1. 0 km, Trenchless Method adopting with HDPE PE-100 / PN-6 -5. 0 Km) House service connections - 4000 Nos.
Rising Main	For pumping the sewage. from SPS at govt. secondary school to existing MH	Govt. Land	0. 91 km of 100 mm dia of DI material
Sewage Pumping Station (SPS)	Near existing PHED J. En. campus on Fatehpur Road	Govt. Land (Nagar Palika)	0. 4 MLD capacity
Sewage Treatment Plant (STP)	Near Bissau Road	Govt. land as land has donated by Thakur Durga Singh to Nagar Palika Mandawa	3. 9 MLD capacity
One No. Treated Effluent Storage Reservoir (TESR)	At STP campus	Will be constructed on the available land with Nagar Palika.	1 Nos.
One No. Treated Effluent Elevated Reservoir (TEER)	At STP campus	Will be constructed on the available land with Nagar Palika.	1 Nos.

D. Subproject Benefits

39. The subproject is primarily designed to improve environmental quality and living conditions of Mandawa town through provision of water supply and sewerage. The benefits arising from this

subproject include: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water. (iii) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

E. Implementation Schedule

40. Construction will take about 36 months after the award of works. Dates for bids and works awards will be finalized by RUDSICO in due course of time.

Figure 1: Location of STP-1 at Bissau Road, Mandawa in Google Earth Map



Figure 2: Google Earth Map of proposed SPS site- Fatehpur Bypass Behind PHED Office



Figure 3: Google Earth Map of proposed CWR site- PHED JEN office

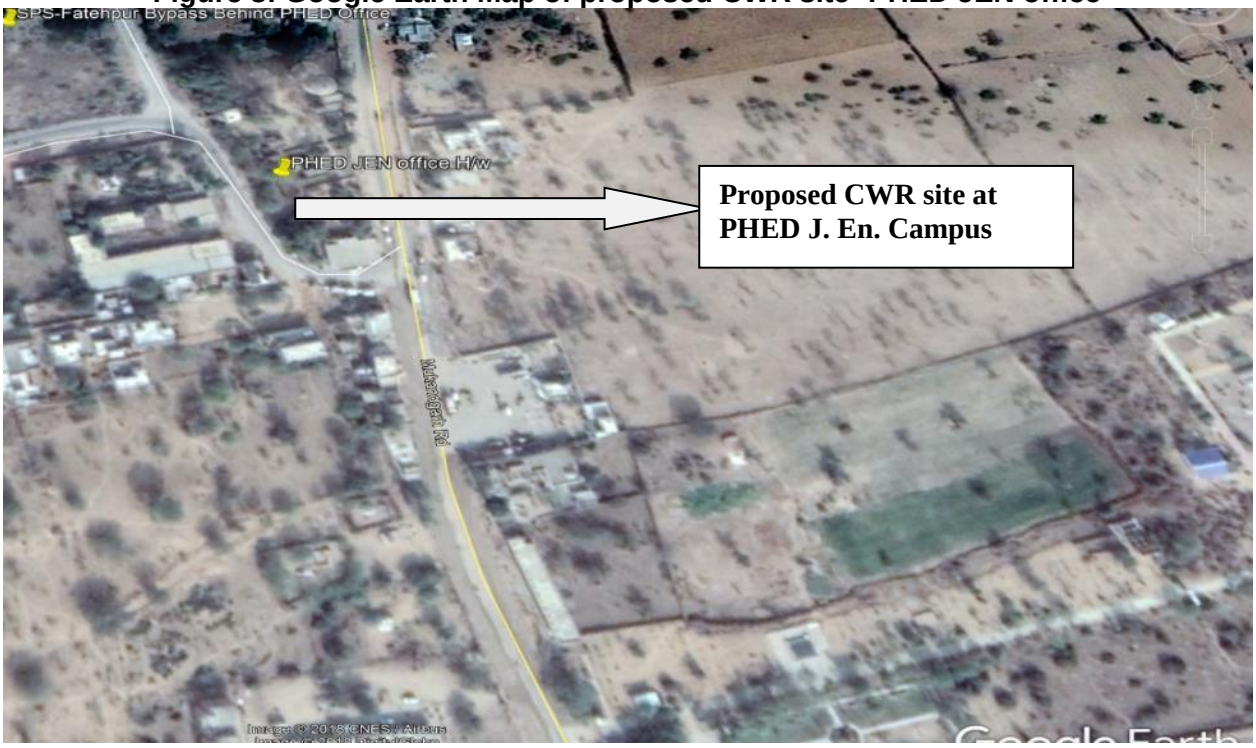


Figure 4: Locations of Proposed Component of WS- CWR & PH and Sewerage- STP and SPS in SOI Toposheet

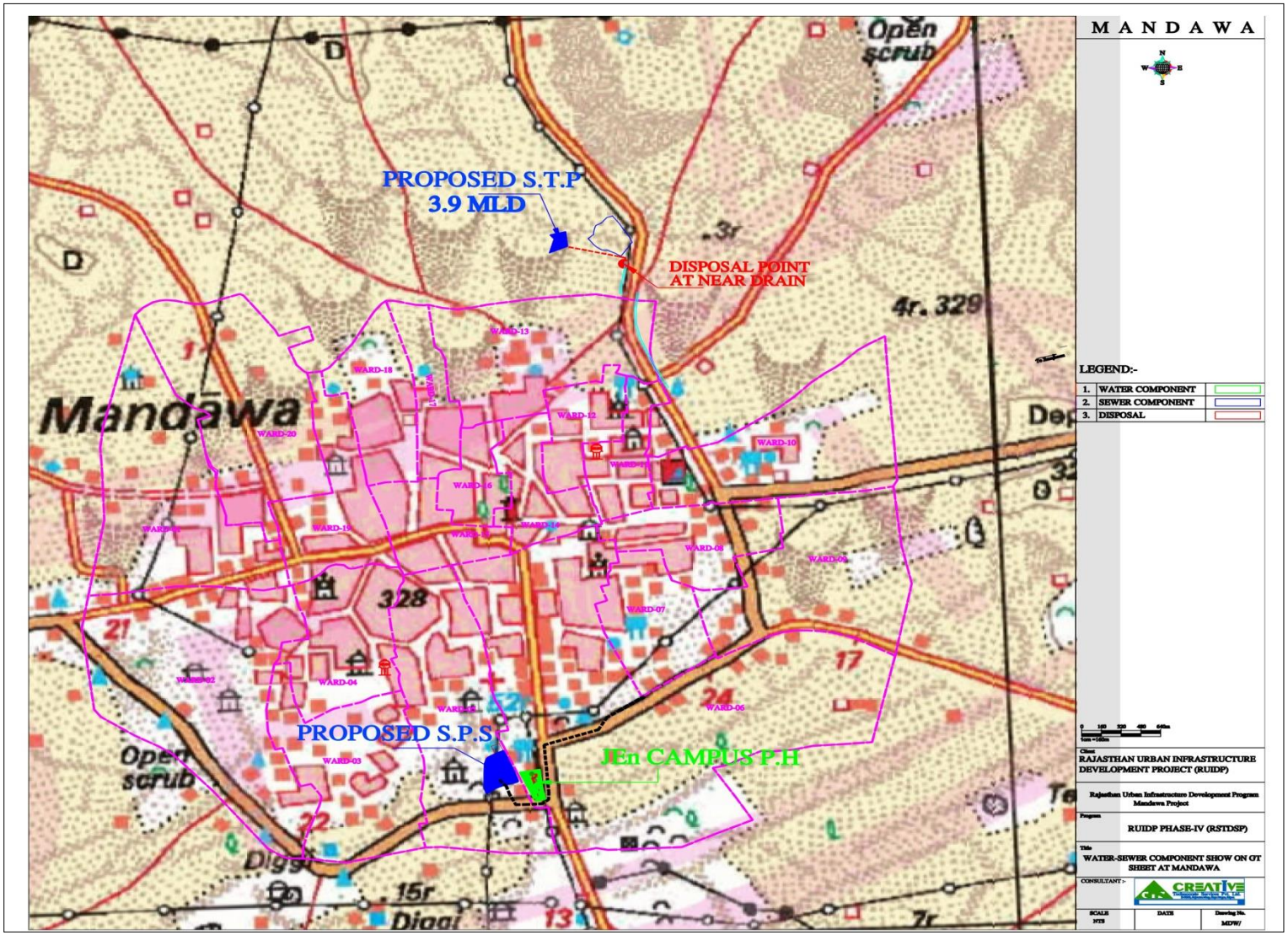


Figure 5: Flow Diagram of Water Supply at Mandawa

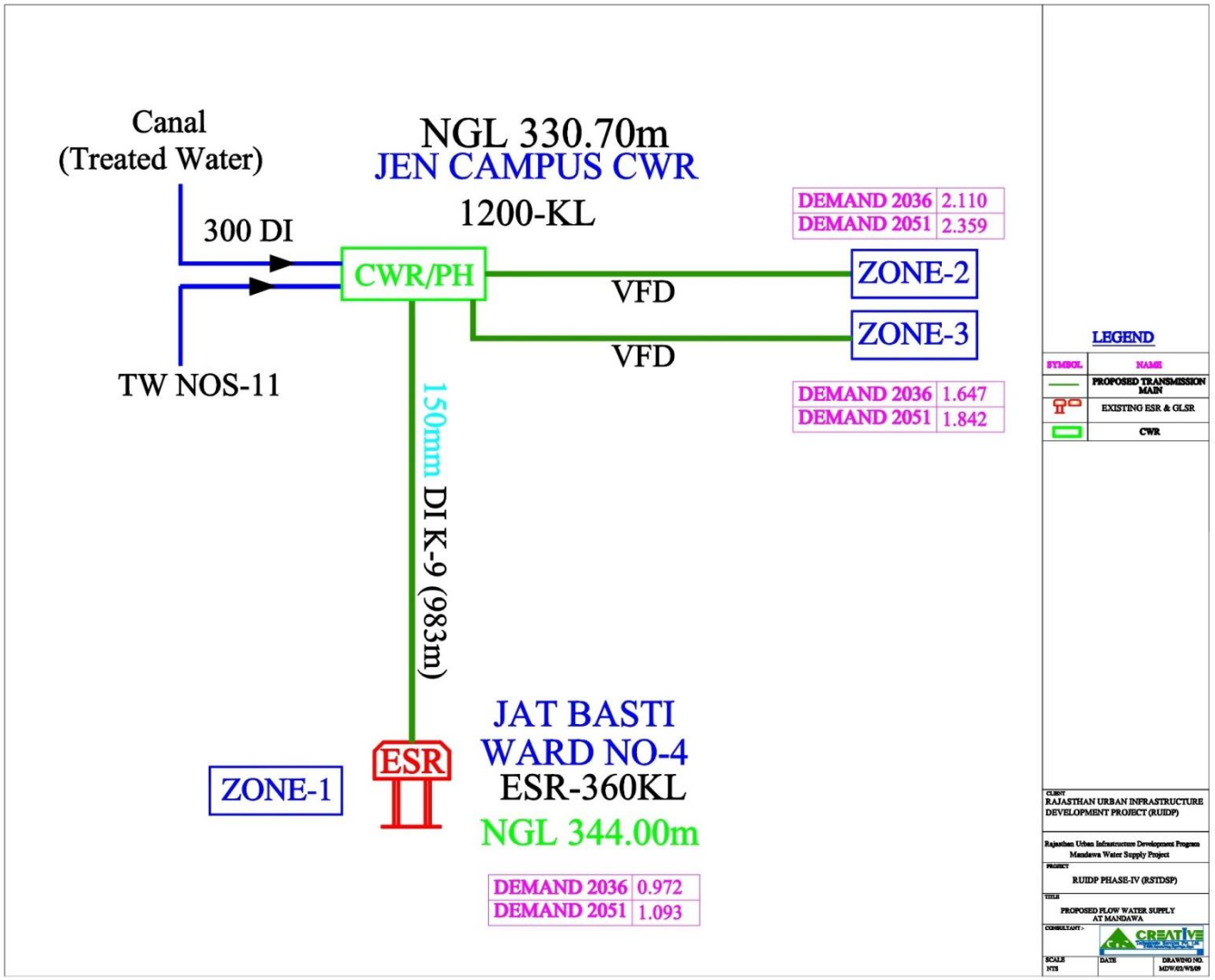


Figure 6: General Arrangement of PHED J. En. Office showing proposed CWR, PHs and Temporary ACM Store site

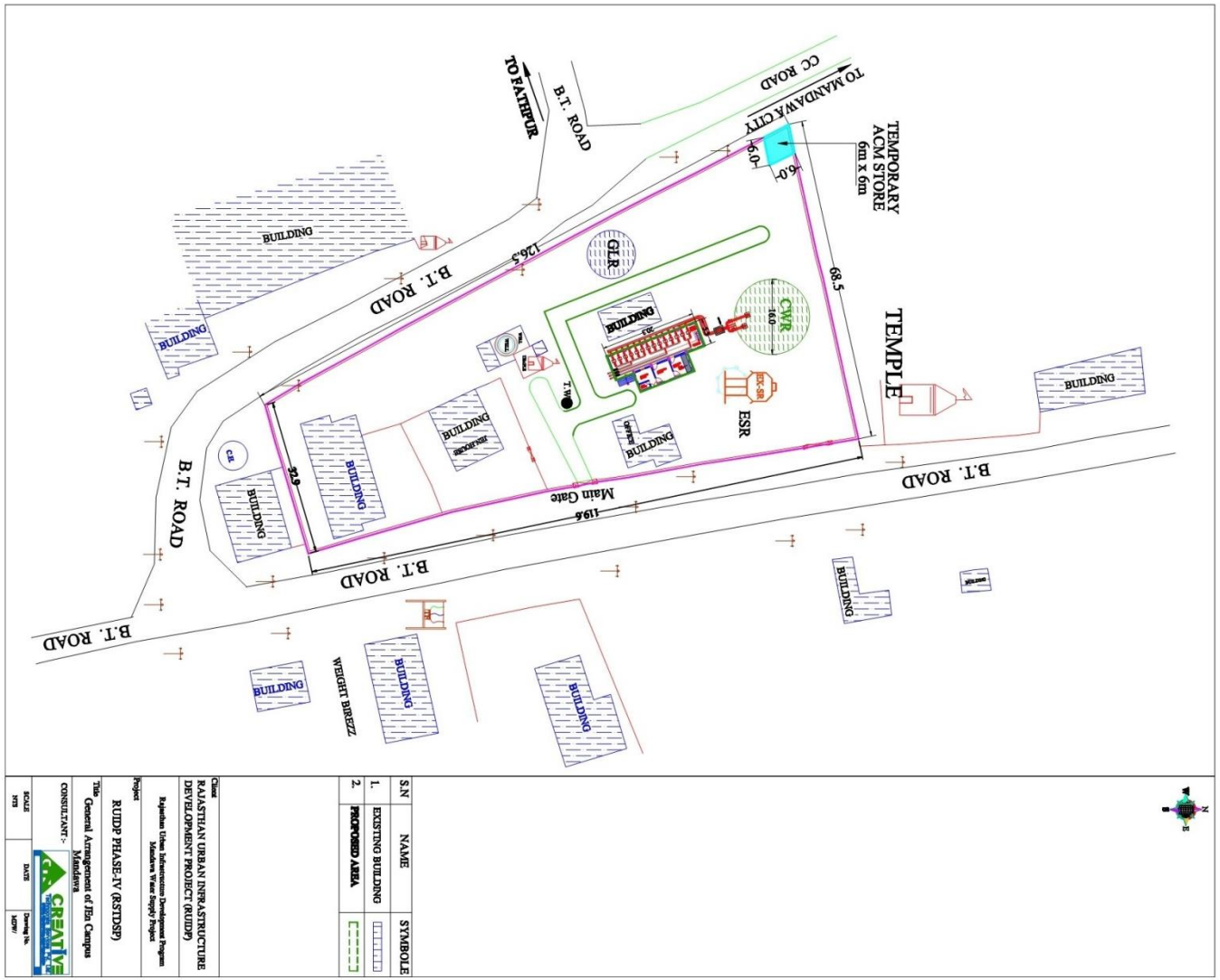


Figure 7: Proposed Water Supply Distribution Network Improvement

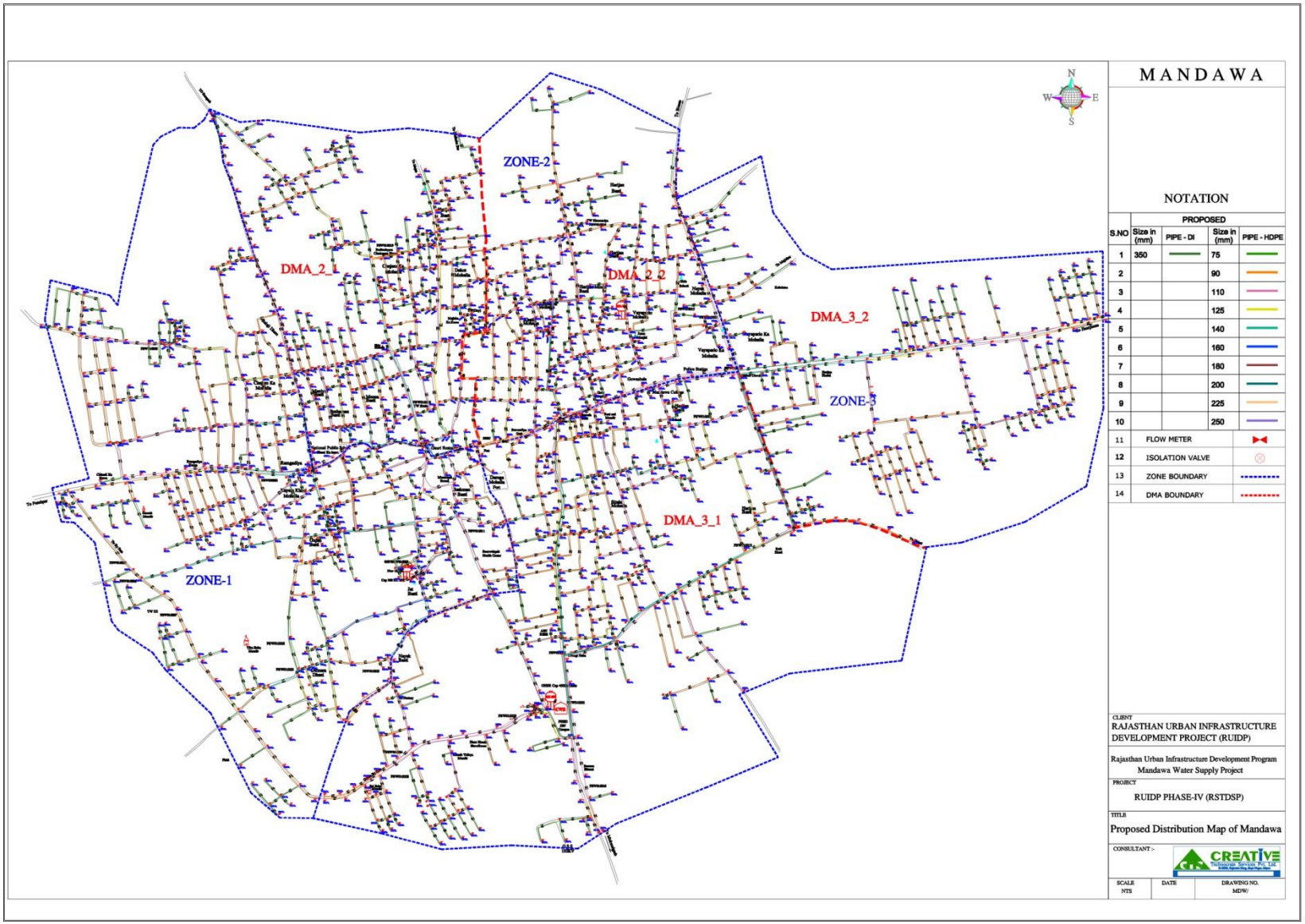


Figure 8: Layout of Proposed Water Transmission System – Mandawa town



Figure 9: Layout of Proposed Water Transmission System on Google – Mandawa town

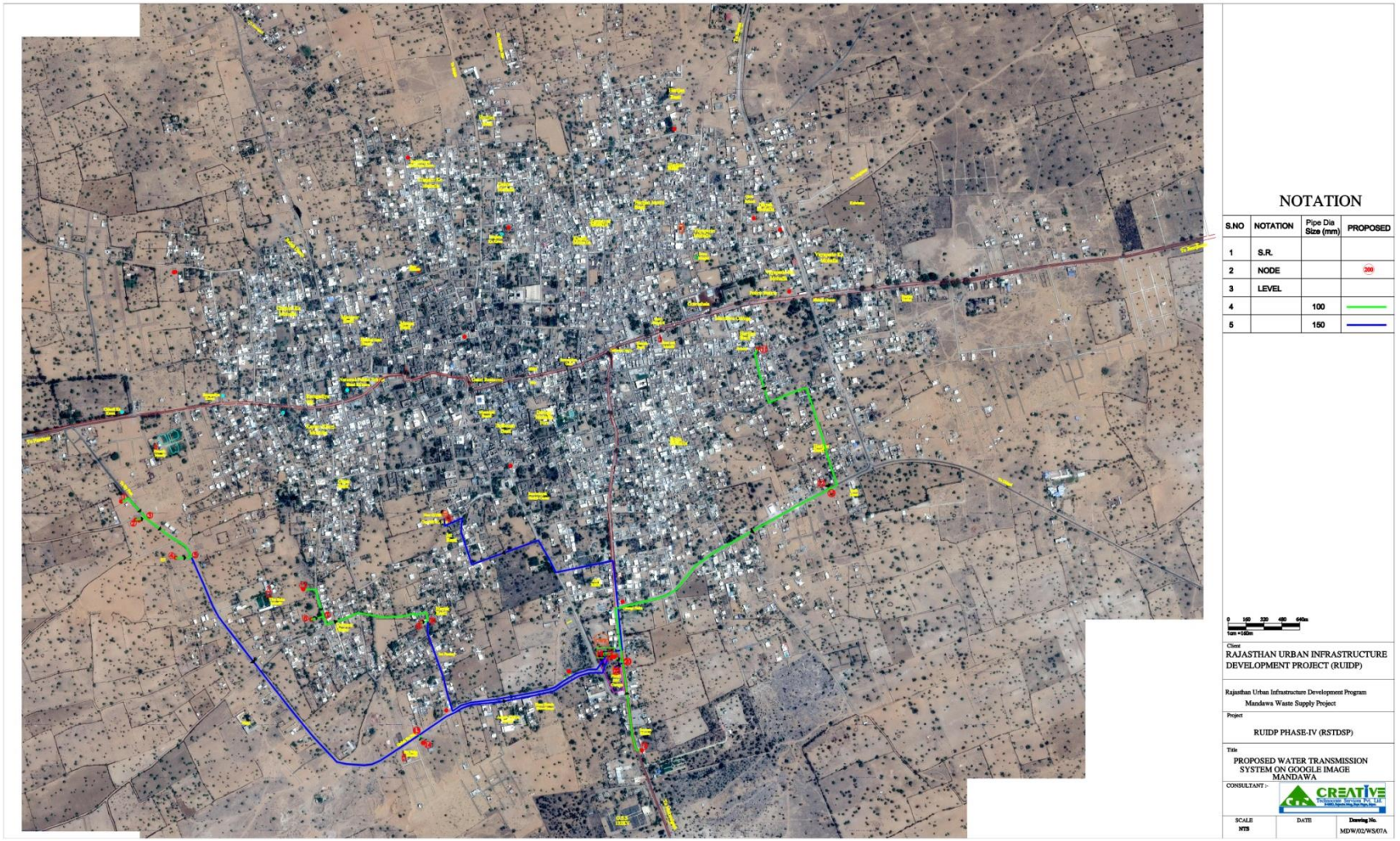


Figure 10: Tube wells Location on Google Map – Mandawa town

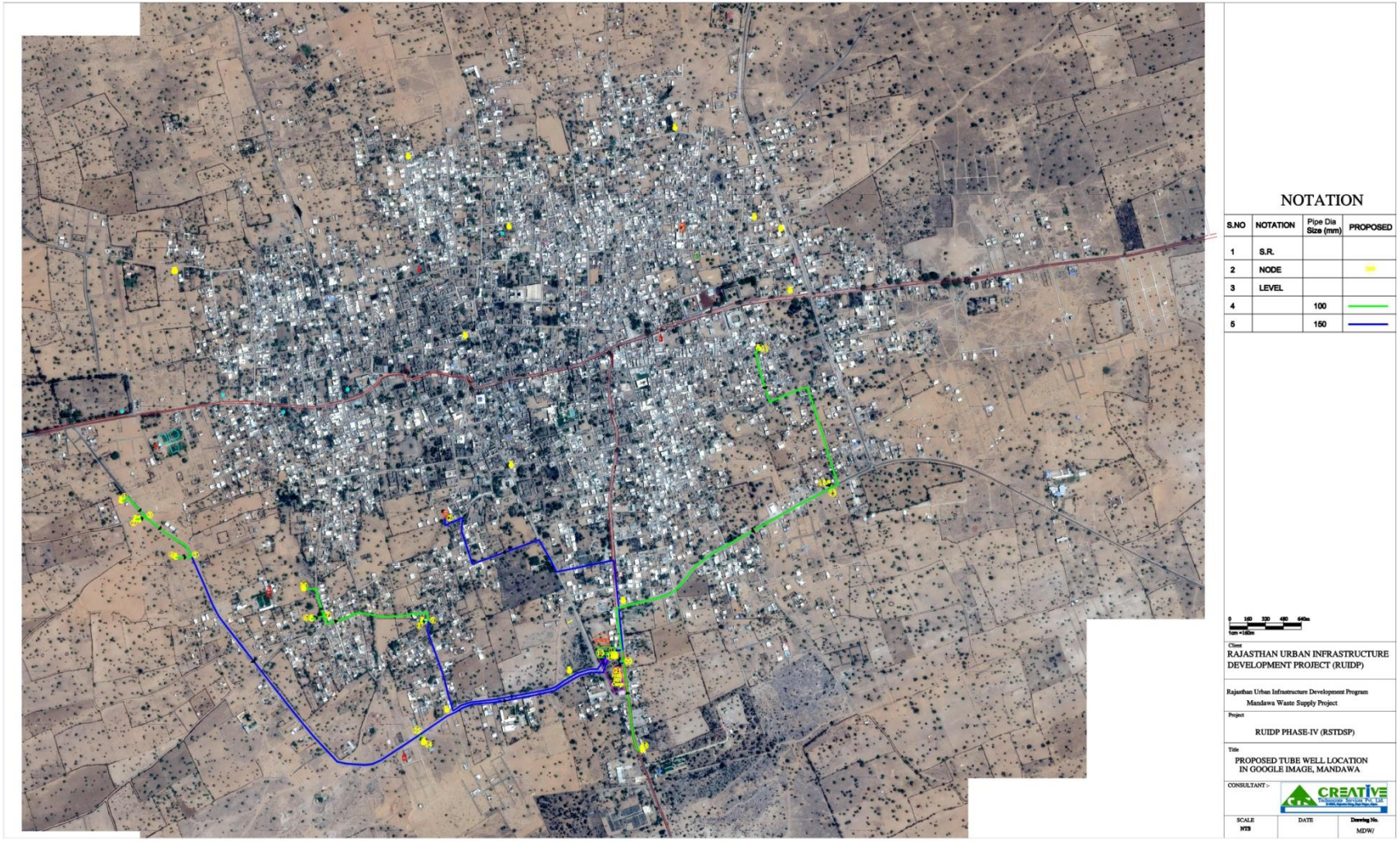


Figure 11: Proposed Sewerage Component – Mandawa town



Figure 12: Proposed Sewerage Component on Google – Mandawa town

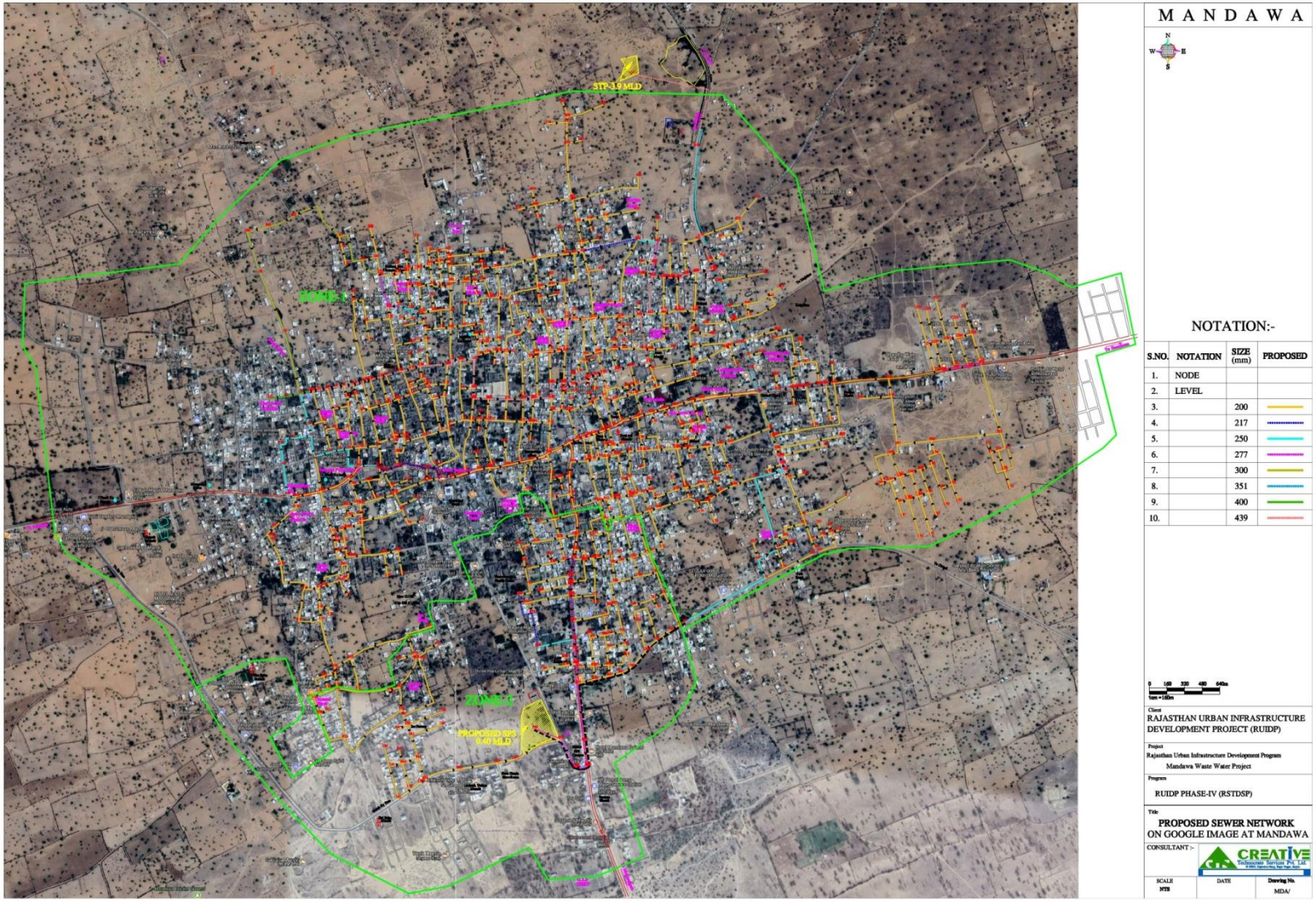


Figure 13: Layout Plan of proposed STP in Mandawa with SBR Technology

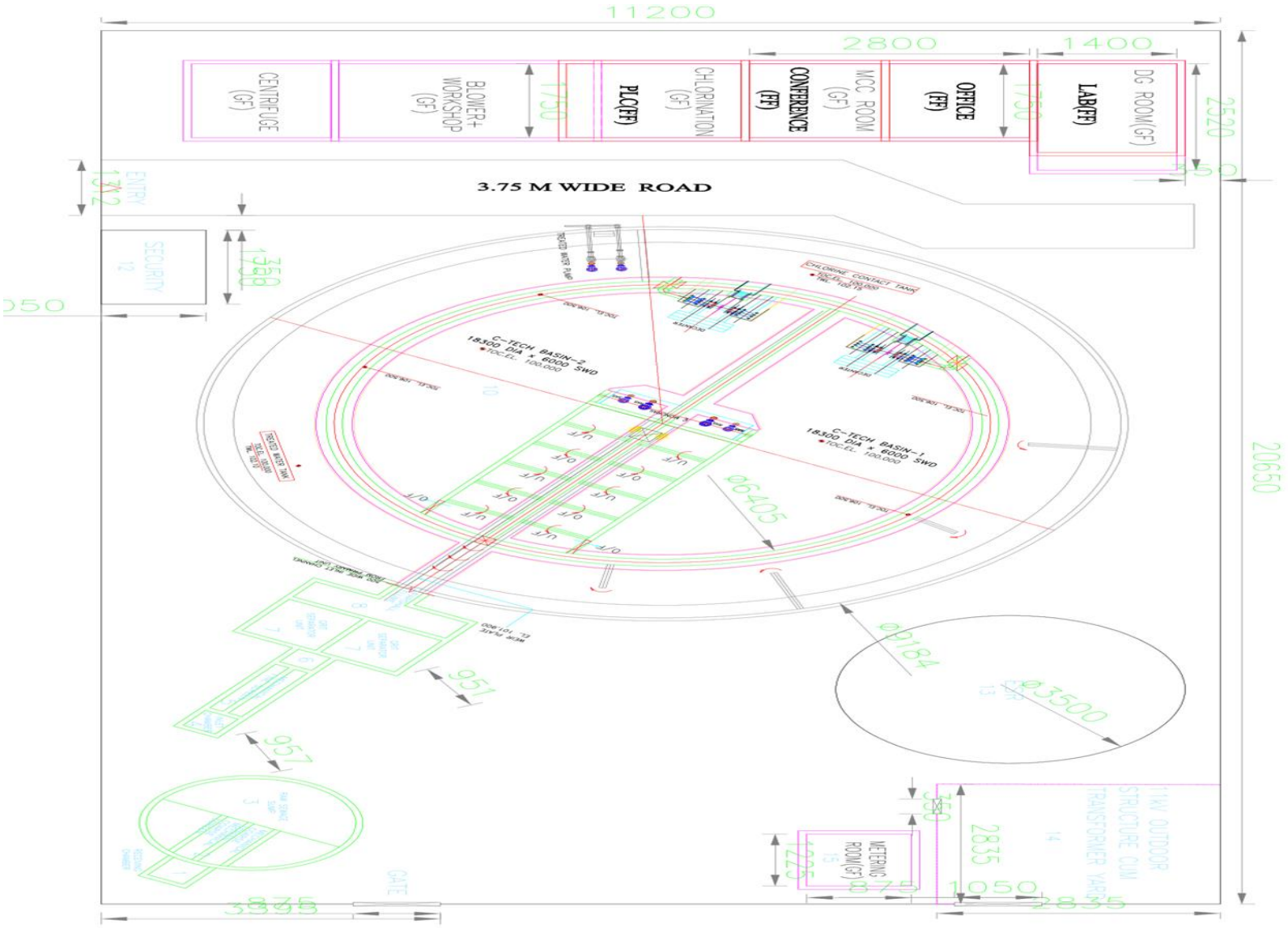


Figure 14: Layout of the Treated Effluent Elevated Reservoir (TEER)

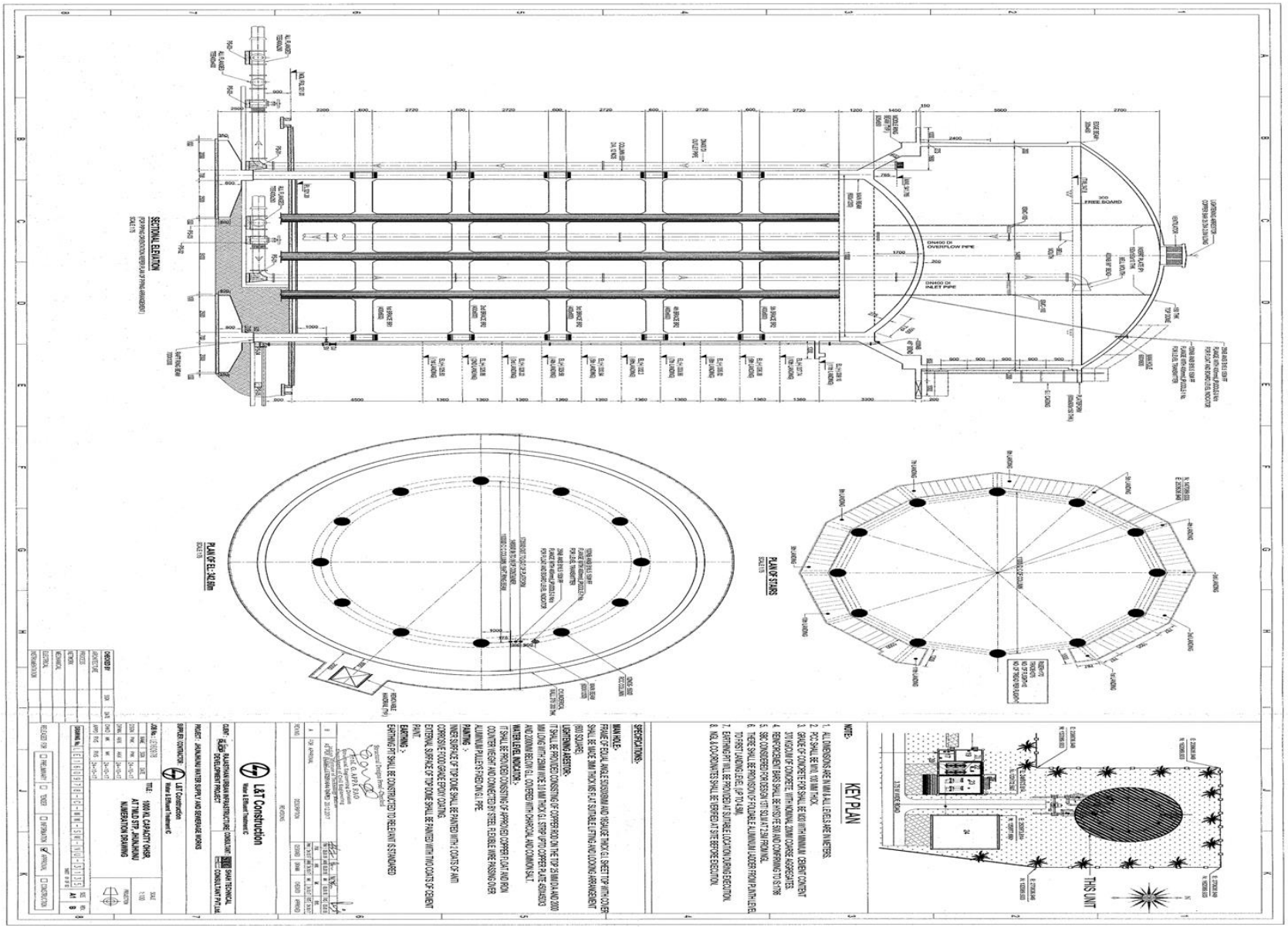


Figure 15: Layout of the Effluent Pumping Station (EPS)

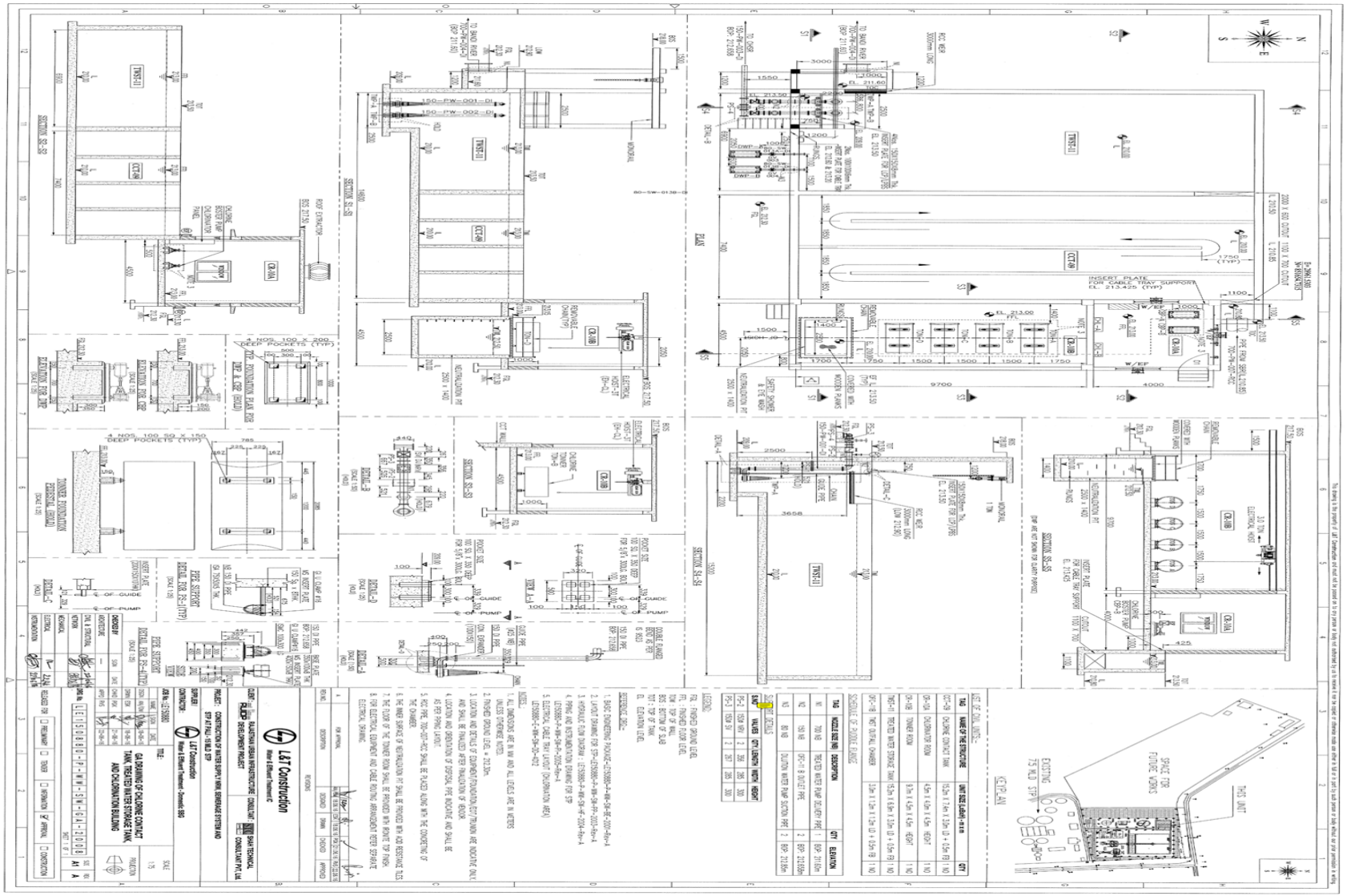
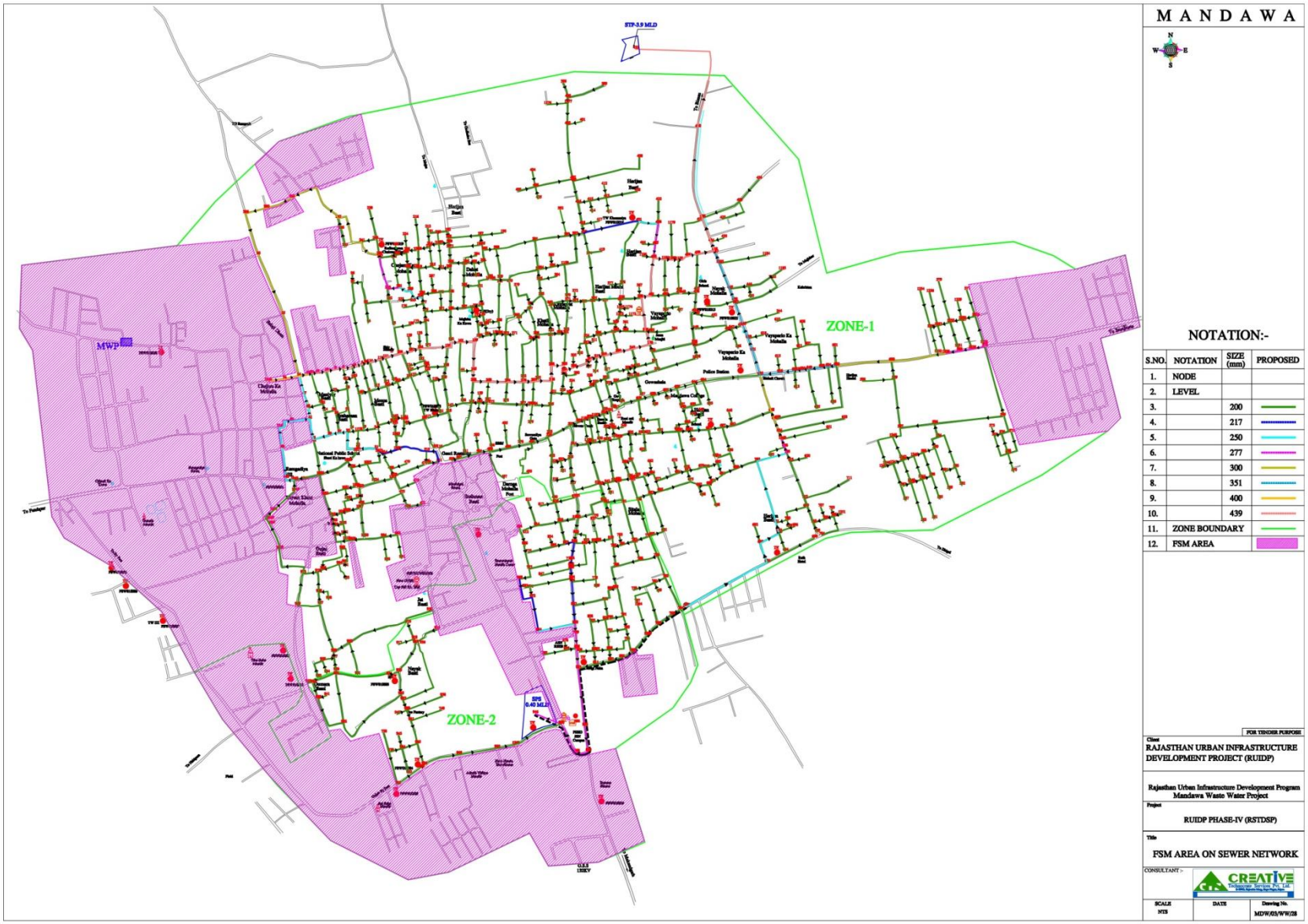


Figure 16: FSM Area– Mandawa town



III. ANALYSIS OF ALTERNATIVES

41. The SPS requires an analysis of project alternatives to determine the best method of achieving project objectives (which is providing potable water to people, and safely collecting and disposing the human waste generated, in Mandawa town, in this case) while minimizing environmental impacts. Alternative analysis provides opportunity to integrate environmental considerations into early stages of project (i. e. pre-feasibility or feasibility study), so that adverse environmental impacts can be avoided or minimized by various alternatives. It also provides opportunity to study various options *vis a vis* costs, provides a logical base, via transparent process, assist in decision making, gaining public support and ultimately in project approvals and timely implementation.

42. The proposed water supply subproject component in Mandawa Town include source augmentation to provide adequate water, water conveyance, treatment, storage and distribution. Similarly, the sewerage component includes sewage collection network, transmission, treatment and treated wastewater reuse and disposal. Descriptions of various alternatives considered for critical components such as water source, sewage treatment, treated wastewater disposal etc., are presented in the following Table 4:

Table 4: Analysis of Alternatives

1.	**Project Need-No Project Alternative**
Type of alternative	No project alternative
Description of alternatives	Mandawa Subproject is proposed to improve the service level of basic infrastructure – water supply and sewerage, which will ultimately improve Water is supplied for one and half hour daily at 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0. 3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd. Mandawa Municipality does not have any organized sewerage system. Presently the wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. Though septic tanks are an accepted onsite treatment, but as the septic tanks are not designed and maintained properly, the effluent does not confirm to the standards. The effluent from the septic tanks is directly let into the open drains. The untreated / partially treated sewage flow in the open drains through habitation areas and discharged into rivers/streams or low lying area/depression. Living conditions due to lack of proper water supply and sewerage, are poor, unhealthy, unhygienic. Lack of infrastructure is also causing environmental pollution, overall poor quality of life. Poor environmental quality affects the urban poor more. The project intends to provide following benefits to the town population, and the “no project” alternative will deprive people of these benefits: increased availability of potable water at appropriate pressure to all households including urban poor; reduced time and costs in accessing alternative sources of water. better public health particularly reduction in waterborne and infectious diseases; reduced risk of groundwater contamination;

	reduced risk of contamination of treated water supplies; and, improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards
Selected Alternative	Without subproject would yield the town to be continuously under-serviced that puts the health of the general public at an increasing risk and could potentially worsen the living environment. This 'no project' scenario would impede further social and economic development of the district and the defer commitments to improve the proportion of the population with sustainable access to clean water and basic sanitation. Given the large-scale benefits to the population and environment, 'with project' alternative is considered appropriate
2	**Alternative source of water**
Type of alternative	Water source
Description of alternatives	Groundwater source: Presently source of Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water from 7nos tube wells are collected at Clear Water Reservoir at JE office and further it transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1. 76 MLD (11 TW). Depending entirely on groundwater for water supply is considered sustainable. Surface water source: A package "Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II" is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 Km from Mandawa. Combined groundwater and surface water-adoption of conjunctive use: Either the ground water or surface water is not able to fulfill the project town demand, and therefore it is proposed to utilize both the source optimally. That is 4. 21 MLD water is provided from Kumbha Ram Lift Canal in year 2021 and 5. 38 MLD for year 2051, and remaining supply gap will be met by tube wells. Additional rehabilitation of 11 tube wells are proposed. Given less than 100% dependability of surface water, in the low rainfall years, the deficit from the Kumbha Ram Lift Canal will be met by tube wells and accordingly the water abstraction from groundwater source will be increased as required.
Selected Alternatives	Selected source Combined ground and surface source-Existing tube wells + Kumbha Ram Lift Canal water
3	**Sewage treatment process**
Type of alternative	Sewage treatment technology
Description of alternatives	Various secondary treatment technologies have been considered in the sewage treatment process after the primary treatment consisting of screening and grit removal. Secondary treatment is the critical process that removes the organic putrescible organic matters and brings down the BOD of the effluent to meet the discharge standards. Following process technologies considered: Waste Stabilization Ponds; Aerated Lagoons; Up Flow Anaerobic Sludge Blanket (UASBR) + FAL; Conventional Activated Sludge Process; and Cyclic Activated Sludge Process/Sequential Batch Reactor (SBR)

A comparison of various treatment technologies is presented below in terms of merits of the process over key parameters like quality characteristics and land requirement:

Item	**Conventional Activated Sludge**	**Extended Aeration**	**UASB followed by Facultative Aerobic Lagoon**	**Cyclic Activated Sludge Process / SBR**
Performance (Typical)	Mostly stable	Mostly stable	Varying with temperature variations	Complete Stable
BOD	<30 ppm	<30 ppm	<30 ppm	<10 ppm
COD	<250 ppm	<250 ppm	<250 ppm	<100 ppm
Suspended solids	<50 ppm	<50 ppm	<100 ppm	<10 ppm
Total Nitrogen	No Treatment	No Treatment	No Treatment	<10 ppm
Total Phosphorous	No Treatment	No Treatment	No Treatment	<2 ppm
Coliform removal, %	60-90	60-90	-	99. 99%
Re-use Options	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	Can be used for low end usages as well as for high end usages without any tertiary treatment.
Land requirement (m2/person)	0. 1-0. 18	0. 08-0. 15	0. 2-0. 25	0. 035-0. 07
Process Power requirement (kWh/person/year)	12-15	16-19	4-5	6-8
Sludge handling	Sludge needs digestion prior to drying on beds or use mech. devices	Digested sludge, dry on beds or use mech. devices	Digested sludge, dry on beds or use mech. Devices	Digested sludge, dry on beds or use mech. devices
Equipment requirement (excluding screening and grit removal)	Aerators, recycle pumps, scrapers, thickners, digester, dryers, gas equipment	Aerators, recycle pumps, sludge scrapers, (for large settlers)	Nil (gas collection optional)	Diffuse aeration system, recycle sludge and waste sludge

					pumps, decanters
	Operational characteristics	Skilled Operation required	Simpler than activated sludge	Simpler than activated sludge	Complete automatic operation by computer and PLC. Negligible manpower Intervention required
	Special features	Considerable equipment and skilled operation required especially if gas collection and usage involved. Method considered mainly for large sized plants	BOD removal high, effluent nitrified relatively high-power requirement, favoured for small and medium sized plants	Minimal to negligible power requirement of the system makes it an economical alternative if gas revenue is neglected land requirement is also relatively small but depends on type of past treatment adopted	Highest treatment efficiency with crystal quality power requirement is 50% of conventional technologies land requirement is less than 50% of conventional technologies

Selected Alternative

Selected processes: Sequential batch reactor (SBR)

The genesis of selecting a suitable treatment process is primarily correlated with degree of treatment aimed to be achieved. In India, the latest court Order of April 2019 (NGT Order dated 30-04-2019) mandates all the civic authorities to adopt the treated sewage characteristics applicable are as shown in table below:

Paramater	**Standards**
BOD, mg/l	10
TSS, mg/l	20
COD, mg/l	50
Nitrogen-Total, mg/l	10
Phosphorus- Total, , mg/l	1
Faecal Coliform (MPN/ 100 ml)	100 Desirable 230 (Permissible)

SBR provides highest treatment efficiency possible in a single step biological process. The system is operated in a batch reactor mode this eliminates all the inefficiencies of the continuous processes. A batch reactor is a perfect reactor, which ensures 100% treatment. Separate modules are provided to ensure continuous treatment. The complete process takes place in a single reactor, within which all

	biological treatment steps take place sequence. The complete biological operation is divided into cycles. Each cycle is of 3 – 5-hour duration, during which all treatment steps take place.
4	**Treated wastewater disposal**
Type of alternative	Treated wastewater disposal – reuse applications
Description of alternatives	(i) Discharge of treated wastewater into ponds / on land (ii) Reuse the treated wastewater in non-potable uses Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and to make sewerage projects environmentally sustainable. This policy prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy suggests construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications. Accordingly, it is proposed to utilize the treated wastewater for non-potable uses. A detailed Reuse Action Plan will be prepared during the detailed design phase, and, implemented. It is also proposed that the excess / surplus treated wastewater which is not being utilized in reuse will be discharge into local drains/streams and necessary facilities – pipelines and pumping facilities, will be developed.
Selected Alternative	Reuse in non-potable applications and discharge excess/surplus into local pond/ drain
5	**Project Locations**
Description of alternatives	Location of proposed infrastructure: The location of CWR, STP and SPS are selected to utmost consideration to energy efficiency. Gravity flow systems have been adopted. The sites are selected considering no involuntary resettlement. Location of CWRs, pump houses. The proposed clear water reservoir and pump house are located within the existing water supply facilities in Mandawa town. These are proposed in existing PHED J. En. Campus.
	STP and SPS location. Based on the technical feasibility of gravity flow system, sewerage system in Mandawa is designed and optimized with one sewage treatment plant (STP). Site selection is guided by technical suitability, availability of government owned two existing STP sites and one vacant land, adequate land parcel, site away from habitation, and where there is a drain/low lying/ depression point to discharge the treated wastewater. Site selected are away from habitation and surround by agriculture lands (nearest house is 185m from STP site. Although a 100m distance away from habitation is desirable as far as possible, due to lack of suitable lands, and also considering the selected superior and compact sewage treatment technology (SBR), the site is selected. **Sewage Pumping Station (SPS).** Sewage pumping station is proposed near Fatehpur Road near PHED J. En. campus. Site selected are away from habitation are quite away about 101m from proposed SPS site. Although a 50m distance away from habitation is desirable as far as possible due to lack of suitable lands also considering the appropriate sites, site is selected. **Water distribution and sewer lines**. Sewer and water supply pipes are proposed along the roads/streets in the town within the road right of way (ROW). In wider roads water pipes will be laid in the road shoulder beside the tarmac, and in narrow roads,

	where there is no space, pipes will be laid in the road carriage way by break opening the tarmac. Sewers will be mostly laid in the center of the road, away from water pipes. There are existing asbestos cement pipes underground, the alignment will be fine-tuned during the detailed design, to avoid existing AC pipe alignments as far as possible.

IV. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

43. ADB SPS, 2009 requires that during the design, construction and operation of the project necessary compliance to all applicable laws and international conventions / treaties along with pollution prevention and control technologies and practices consistent with international good practice, are ensured.

44. **Screening and Categorization with that of ADB SPS, 2009.** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

(i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.

(ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects. An initial environmental examination is required.

(iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

(iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

45. The environmental impacts of Mandawa water supply and sewerage subproject have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklist for Water Supply (Appendix 1) was conducted, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS's requirements for environment category B projects.

46. **Environmental Management Plan**. An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

47. **Environmental Audit of Existing Facilities.** ADB SPS requires an environmental audit,

if a subproject involves facilities and/or business activities that already exist or are under construction, including an on-site assessment to identify past or present concerns related to impacts on the environment. The objective of this compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients, and to identify and plan appropriate measures to address outstanding compliance issues.

48. **Public Disclosure**. The IEE will be put in an accessible place (e. g. , local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents will be put up in ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

(i) For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
(ii) Final or updated EIA and/or IEE upon receipt; and
(iii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

49. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation[12] with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

50. **Grievance Redress Mechanism.** ADB SPS require borrowers to establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

51. **Monitoring and Reporting.** Borrower shall monitor measure and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrower shall prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

52. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

[12] Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

53. **Occupational Health and Safety.** ADB SPS requires the borrower[13] to ensure that workers[14] are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

54. **Asbestos-containing Materials (ACM).** Based on (1) field visits in RSTDSP towns and (2) available records from the PMDSC, concerns on asbestos-containing materials (ACM) such as, but not limited to, pipelines, sheets, insulations, are present in the existing infrastructures. Asbestos is known as a hazard and can cause various diseases. International guidelines and national policies provide framework on the identification, management, handling and disposal of ACM in-situ or stored in existing RSTDSP sites.

55. **Community Health and Safety.** ADB SPS, 2009 requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

56. **Physical Cultural Resources.** Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS, 2009 requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

57. **Critical Habitat.** ADB SPS, 2009 does not allow implementing subproject activities in areas of critical habitats or in areas that would lead to significant conversion and degradation of natural / modified habitats. A precautionary approach shall be applied to management and use of renewable natural resources.

58. Global database such as the Integrated Biodiversity Assessment Tool (IBAT) will be used to conduct preliminary assessment on the site locations in reference to critical habitats, key biodiversity and key protected areas alongside the IUCN red list of species affected – critically endangered, endangered, endemic or restricted-range.

59. **ADB SPS International Best Practice Requirements.** ADB SPS, 2009 requires that,

[13] In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents

[14] Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

during the design, construction, and operation of the project, the executing agency shall apply pollution prevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. (IFC's General EHS Guidelines[15] and Sector Specific (Water and Sanitation) Guidelines).[16] These standards contain performance levels and measures that are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

B. National and State Laws

60. The implementation of the subprojects will be governed by Government of India and State of Rajasthan and other applicable environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize or mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether applicable international, national, state, or municipal or local. Key standards include those related to drinking water quality, air quality, effluent discharge, and protected areas. Compliance is required in all stages of the subprojects including design, construction, and operation and maintenance.

61. **Environmental assessment.** The GOI EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

62. **Category A** projects require EC from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive Terms of Reference (TOR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

63. **Category B** projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study) and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

64. None of the components of this water supply and underground sewerage system

[15] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines. pdf?MOD=AJPERES

[16] https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation. pdf?MOD=AJPERES

subprojects falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or EC is not required for the subproject.

65. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 5.

Table 5: Applicable Environmental Regulations

Law	Description	Requirement	Relevance to Project Phase
EIA Notification, 2006	Projects indicated in the schedule of this notification requires EIA study and environmental clearance.	None of the components of this subproject falls under the ambit of the notification; no EIA study or environmental clearance required	-
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments (1987)	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, by Central and State Pollution Control Boards and for conferring on and assigning to CPCB/SPCBs powers and functions relating to water pollution control. Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quantity and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the subproject having the potential to generate sewage or trade effluent will come under its purview. Such projects have to obtain Consent For Establish (CTE) under Section 25 of the Act from Rajasthan Pollution Control Board (RPCB) before starting implementation and Consent For Operate (CTO) before commissioning.	Consent to Establish (CTE) before start of construction works and Consent to Operate (CTO) before start of operation will be required for proposed STP (1 Nos.). All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the RPCB website. (http://environment. rajasthan. gov. in)	Construction and Operation
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	This Act was enacted to achieve prevention, control and abatement of air pollution activities by assigning regulatory powers to Central and State boards for all such functions. The Act also establishes ambient air quality standards The projects having potential to emit air pollutants into the atmosphere have to obtain CTE and CTO under Section 21 of the Act from RPCB The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	The following will require CTE and CTO from RPCB: (i) diesel generators; (ii) Batching Plant hot mix plants; and (iii) stone crushers, if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the RPCB website (http://environment. rajasthan. gov. in) CTE and CTO will be required for batching plant, hot mix plant, crushers etc. if specifically established for this project. If	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
		contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, he has to be assure that third party is having CTE/CTO from RPCB and should collect the copy of these and submit to PIU	
Biodiversity Act of 2002	This Act primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people.	Not Applicable	-
Wildlife Protection Act, 1972 and amendment 1991	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable -none of the project components are located in or near protected areas.	Construction
Forest (Conservation) Act, 1980	The Forest (Conservation) Act prohibits the use of forest land for non-forest purposes without the approval of Ministry of Environment Forests and Climate Change (MoEFCC), Government of India	Not applicable; none of the components of the subproject are located in forest.	Construction
Environmental (Protection) Act, 1986 amended in 1991 and the following rules/notifications:	This is an “umbrella” legislation that empowers the Central Government to take all necessary measures to protect and improve the quality of the environment and prevent, control and abate environmental pollution. Empowers central government to enact various rules to regulate environmental pollution, including standards for quality of air, water, noise, soil; discharge standards or allowable concentration limits for environmental pollutants, handling of hazardous substances, locating/prohibiting industries, etc. ,	There are rules/ notifications that have been brought out under this Act, which are relevant to RSTDSP, and are listed below	Construction and operation
Environmental Standards (ambient and discharge).	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix 7 provides applicable standards for ambient air quality, emission limits and emission stack height requirements for diesel generators	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
		Appendix 8 provides STP discharge standards	
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix 9 provides applicable noise standards, and noise limits for diesel generators	Construction and operation
Solid Waste Management Rules 2016	Responsibility of Solid Waste Generator segregate and store the waste generated in three separate streams namely bio-degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time; store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; (iii) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.	Contractor to follow all the rules during construction works	Construction and operation
Construction and Demolition Waste Management Rules 2016	Every waste generator shall segregate construction and demolition waste and deposit at collection center or handover it to the authorized processing facilities Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work, Large generators shall have environment management plan to address the likely	Construction waste shall be collected at stockpile area for 8-10 days and will be sent to disposal site. Disposal site shall be identified and allotted by Municipal Council after mobilization of contractor (during SIP period) and can't be mentioned at this time. Contractor to follow all the rules during construction works. Sludge or any material if classified as hazardous waste / material is to be handled and disposed according to this Rules	Construction

Law	Description	Requirement	Relevance to Project Phase
	environmental issues from construction, demolition, storage, transportation process and disposal / reuse of Cand D Waste. Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar, Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;		
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016,	Responsibilities of the occupier for management of hazardous and other wastes. - (1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely:- (a) prevention; (b) minimization; (c) reuse, (d) recycling; (e) recovery, utilization including co-processing; (f) safe disposal. (2) The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes. (3) The hazardous and other wastes generated in the establishment of an occupier shall be sent or sold to an authorized actual user or shall be disposed of in an authorized disposal facility. (4) The hazardous and other wastes shall be transported from an occupier's establishment to an authorized actual user or to an authorized disposal facility in accordance with the provisions of these rules. (5) The occupier who intends to get its hazardous and other wastes treated and disposed of by the operator of a treatment, storage and disposal facility shall give to the operator of that facility, such specific information as may be needed for safe storage and disposal. (6) The occupier shall take all the steps while managing hazardous and other wastes to- 6 (a) contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and (b) provide persons working in the site with appropriate	Contractor to comply all the requirements of this Act during construction works. There are asbestos cement (AC) in the existing water supply system. As per these Rules, any waste with asbestos concentration limit exceeding 10, 000 mg/kg (*i. e.* 1%), and is in the form of friable, powdered or finely divided state, is classified as hazardous waste. As per Bureau of Indian Standards (BIS), "AC pipes generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. There is very little possibility of generation of airborne asbestos fibers during any reasonable handling, storage, and use of such products. However, during storing and installation, recommended work practices shall be followed to avoid harmful exposure".	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	training, equipment and the information necessary to ensure their safety.		
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	Not applicable as subprojects components are not located in or near to designated wetland area.	
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond that up to 200 m as "regulated area" respectively. No "construction" is permitted in the "prohibited area" and any construction activity in the "regulated area" requires prior permission of the Archaeological Survey of India (ASI).	Not applicable - there are no protected monuments/ places of archeological/ historical places in or near the proposed work sites in Mandawa Town. In case of chance find, the contractor PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP).	Construction
The Building and other Construction Workers (BOCW) Act 1996 and Rajasthan Building and Construction Workers Rules 2009	Employer shall- • Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets • Provide sufficient urinals and latrines at convenient place, easily accessible by workers • Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as preconditions after completing the construction works • Provide crèche with proper accommodation, ventilation, lighting, cleanliness, and sanitation if more than fifty female workers are engaged • Provide first aid facilities in all construction sites **For safety of workers employer shall provide-** • Safe access to site and workplace • Safety in demolition works	Contractors are required to follow all the provisions of BOCW Act. and Rajasthan BOCW Rules. Salient features of Rajasthan BOCW Rules are- Chapter III, section 17- Registration of establishments Chapter VIII, section 61- Hours of works, intervals or rest and spread over, overtime Section 62- weekly rest Section 63- night shift Section 67- registers of workers Section 68- Muster roll, wages register Section 70- latrine and urinal facilities Chapter XI- Safety and Health Section 78- fire protection Section 79- emergency action plan	Construction

Law	Description	Requirement	Relevance to Project Phase
	• Safety in use of explosives • Safety in operation of transporting equipments and appoint competent person to drive or operate such vehicles and equipments • Safety in lifting appliance, hoist and lifting gears • Adequate and suitable lighting to every workplace and approach • Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in workplace and confined space • Safety in material handling and stacking/unstacking • Safeguarding the machinery with fly-wheel of moving parts • Safe handling and use of plants operated by compressed air • Fire safety • Limit of weight to be lifted by workers individually • Safety in electric wires, apparatus, tools and equipments • Provide safety net, safety sheet, safety belts while working at height (more than 1. 6 m as per OSHA) • Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required • Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials • Provide and maintain medical facilities for workers Any other matters for the safety and health of workers	Section 80- fencing of motors Section 81- lifting and carrying of weight Section 82- H&S policy Section 83- dangerous and harmful environment Section 84- Overhead protection Section 88- eye protection Section 89- PPEs Section 90- electrical hazards Section 97- use of safety helmets and shoes Chapter XIII- lifting appliances and gears Chapter XV- transport and earth moving equipments Chapter XVI- concrete works Chapter XVII- demolition works Chapter XVIII- Excavation and tunneling Chapter XX- ladders and step ladders Chapter XXII- structural frame and formworks Chapter XXIV- medical facilities and first aid box	
Contract Labor (Regulation	Provides for welfare measures to be provided by	Applicable to all construction works in the	Construction

Law	Description	Requirement	Relevance to Project Phase
and Abolition) Act, 1970; The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor. The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc. ,	project Principle employer (RUDSICO-EAP) to obtain Certificate of Registration from Department of Labour, as principle employer Contractor to obtain license from designated labor officer Contractor shall register with Labor Department, if Inter-state migrant workmen are engaged Adequate and appropriate amenities and facilities shall be provided to workers including housing, medical aid, traveling expenses from home and back, etc. , Appendix 10 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	and operation
The Child Labour (Prohibition and Regulation) Act, 1986	Prohibits employment of children below 14 years of age in certain occupations and processes Employment of child labor is prohibited in building and construction Industry.	No child labour shall be employed	Construction and operation
Minimum Wages Act, 1948	Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads and runways are scheduled employment.	Applicable to all construction works in the project All construction workers should be paid not less than the prescribed minimum wage	Construction and operation
Workmen Compensation Act, 1923	Provides for compensation in case of injury by accident arising out of and during the course of employment.	Compensation for workers in case of injury by accident	Construction and operation
Equal Remuneration Act, 1979	Provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against female employees in the matters of transfers, training and promotions etc.	Equal wages for work of equal nature to male and female workers	Construction and operation
Rajasthan State Environment Policy, 2010 including	Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental resources; assure	- Project implementation should adhere to the policy aims of: conservation & enhancement of environmental resources,	Operation

Law	Description	Requirement	Relevance to Project Phase
And Rajasthan Environment Mission and Climate Change Agenda for Rajasthan (2010-14)	environmental sustainability of key economic sectors; and, improve environmental governance and capacity building - it recommends specific strategies and actions to address the key environmental issues: water resources, desertification and land degradation, forest and biodiversity, air quality, climate change: adoption and mitigation, mining, industry, tourism, energy, urban development, etc. - Establishment of Environment Mission under the chairpersonship of the Chief Minister and a Steering Committee under the chairpersonship of Chief Secretary, Government of Rajasthan Tasks force set up for six key areas	integration of environmental concerns into projects/plans, and capacity building in environmental management - under water sector, major concerns, as the policy notes, are: huge water losses & wastage, declining water availability, pollution - Relevant recommendations for the project include: control of losses, integrated water resources management, control of raw water pollution, reuse and recycling -avoid/minimize use of forest lands With reference to Climate change adoption & mitigation following should be considered in the project: - diminishing flows in surface water bodies, and groundwater depletion, and revival traditional water bodies as water sources (lakes/tanks) - equal stress on demand side management in water -minimize energy use - design energy efficiency systems-	
The Rajasthan Monuments, Archaeological Sites and Antiquities Act, 1961; the Rajasthan Monuments, Archaeological Sites and Antiquities (amendment) Act 2007	Any construction/excavation work in the 'protected area' (as declared by GoR under the Act) requires priori permission of Department of Archeology& Museums -Application under the Rules shall be submitted to Director, State Archeological Department, at least 3 months prior to the work. Department provides conditional permission, including time for completion, procedures to be followed during the work and for chance finds etc.	There are no state protected monuments in the town. However, the Mandawa town being a heritage place, in case of chance finds, the contractor/PIU will be required to follow chance finds protocol (Appendix 11)	Construction
Rajasthan Forest Act, 1953, and Rajasthan Forest Rules, 1962	This Act makes the basis for declaration of Reserved Forests, constitution of village forest committees, management of reserved forests and penalties and procedures.	Not applicable; none of the components / pipeline alignment are in forest areas.	Construction

Law	Description	Requirement	Relevance to Project Phase
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste material	The standard emphasis that every employer who undertakes work which is liable to generates asbestos containing waste, shall undertake adequate steps to prevent and /or reduce the generation of airborne dust during handling, storing, transportation and final disposal of final disposal of asbestos and asbestos containing products.	The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation. Waste Collection: In the project circumstance, the waste is referred to the damaged powered asbestos which will be collected in the Permissible plastic bags to be disposed to the nearest TSDF facilities.	Construction
IS 12081: Pictorial Warning to be implemented on equipment containing Asbestos Contaminated Products.	The objective of the caution is to make the person handling to take all pre-cautionary measures and make them aware of all the possible risk.	The following signs and personal protective equipment shall be used in handling ACM.  	Construction

Law	Description	Requirement	Relevance to Project Phase
IS 11451: Safety and Health Requirements related to Occupational Exposure to Asbestos contaminated Products.	This standard detail the occupational exposure allowable and safety at workplace to be enforced.	In the project the norms pertaining to limiting number of hours working with ACM will be 8. 0 hrs/48 hrs a week and the medical examination has to be periodic; the environmental monitoring has to be done as per the protocol. The safety at workplace shall be enforced.	Construction
IS 11768: Waste Disposal Procedure for Asbestos Containing Products.	The protocol pertaining to disposal of the waste is emphasized.	The collection of ACM powered will be in permissible plastic bags, which will be twisted tight at the neck so that the wear and tear due to abrasion will be minimum and the transportation of the asbestos waste has to be done by the authorized vendor to the approved landfill site.	Construction
International conventions and treaties			
Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	There are no Ramsar sites in Mandawa. Not applicable to Mandawa water supply and sewerage subproject	-
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	India is a signatory of this convention which aims to control international commercial trade in endangered species	Not applicable in this project as no endangered species of wild fauna and flora is found in project town	-
Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and	Not applicable in this project as no ODS are involved in construction works	-

Law	Description	Requirement	Relevance to Project Phase
	Hydrochlorofluorocarbons (HCFCs)		
Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989	India is a signatory of this convention which aims to reduce trans-boundary movement and creation of hazardous wastes	Contractor to follow the provisions of Hazardous Waste Rules 2016 for storage, handling, transport and disposal of hazardous waste emerged during construction works	-
Convention on Migratory Species of Wild Animals (CMS), 1979 (Bonn convention)	CMS, also known as Bonn convention was adopted in 1979 and entered into force on 1 November 1983, which recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II, and CMS encourages the Range States to conclude global or regional agreements.	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

66. **Clearances / permissions to be obtained prior to start of construction.** Table 6 shows the list of clearances/permissions required for project construction. This list is indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction.

Table 6: Clearances and permissions required for Construction activities

S. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Construction of new STP	Consent to establish and consent to operate under Water Act, 1974 from RSPCB	PIU & Contractor	PIU
2	Tree Cutting	State forest department/ Revenue (Tehsildar)	PIU	PIU and PMU
3	Hot mix plants, Crushers, Batching plants& DG set etc.	Consent to establish and consent to operate under Air Act, 1981 from RSPCB	Contractor	PIU
4	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules. 2016 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from RSPCB	Contractor	PIU
5	Sand mining, quarries and borrow areas	Permission from District Collector/ State Department of Mines and Geology	Contractor	PIU
6	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU
7	Temporary traffic diversion measures	District traffic police	Contractor	PIU
8	Pipe laying works	Permission from Nagar Palika and PWD	PIU and Contractor	PMU
9	Construction Waste and Demolition Debris Management	Approval from Municipal Council for disposal site is required per Construction and Demolition Waste Management Rules 2016	Contractor	PIU
10	Use of construction area	Approval for use of city roads and shifting of utilities	ULB, PWD and other utility agencies such as BSNL, electricity department	PIU
11	Establishment of construction camps	Allotment and approval for specific land use	Contractor	PIU
12	Use of vehicles and equipment	Pollution under control certificate (PUC) form RTO	Contractor	PIU

67. PMU will be overall responsible for supervision in getting all clearances and provide details to ADB through semi-annual report. PMU will ensure all necessary regulatory clearances and approvals are obtained prior to commencement of works. Respective PIUs, with support of project consultants and DBO contractors, are responsible for obtaining the clearances/permits and ensuring conditions/specifications/provisions are incorporated in the subproject design, costs, and implementation. The PIUs shall report to PMU the status of compliance to clearances/permits as part of the regular progress reporting.

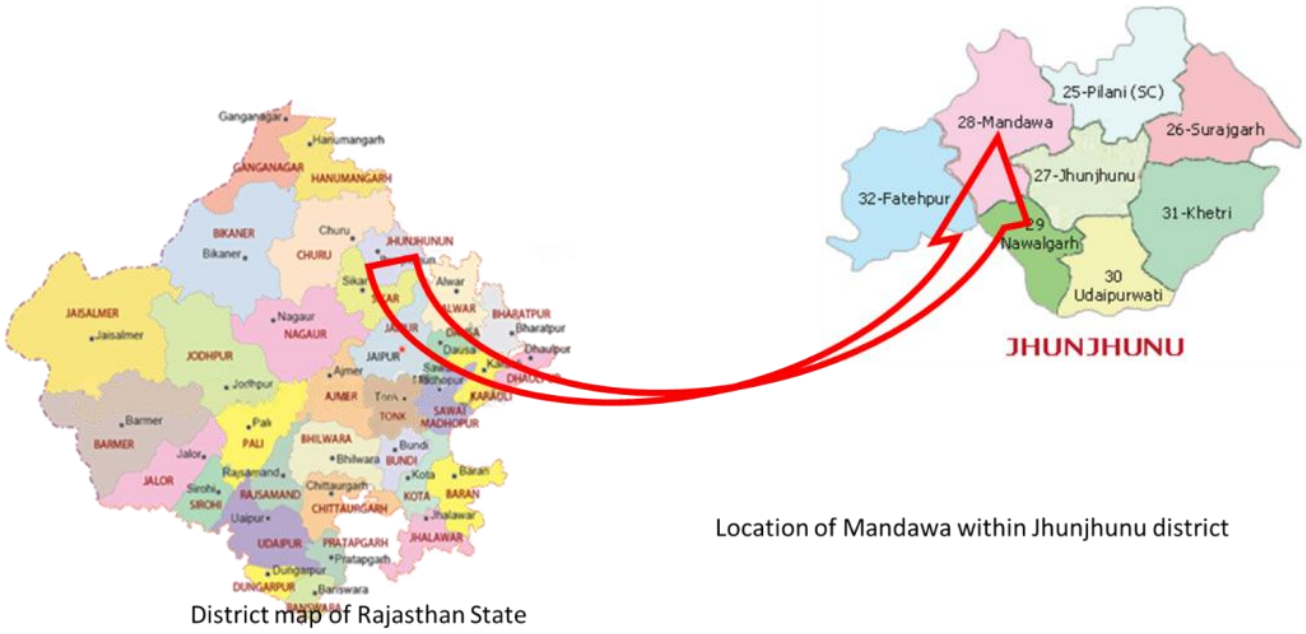
V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location, Area & Connectivity

68. Mandawa is a town in Jhunjhunu district of Rajasthan in India. It is part of Shekhawati region. The town lies between latitude 28°06' in the north and longitude 75°20' in the east. Jhunjhunu district is surrounded by Churu District on the northwestern side, Hissar and Mahendragarh District of Haryana State in the northeastern part and by Sikar District in the west and south. Mandawa Town is well connected by road to Jaipur, and other parts of the state. The nearest airport is at Jaipur. The geographical area of the Mandawa is about 4.83 km^2. As per 2011 census population of town is 23,335. Figure 17 shows the location of Mandawa.

Figure 17: Location of Mandawa in District Jhunjhunu



69. Road and Rail Connectivity. State Highway 41 (SH-41) passes through Mandawa town. Mandawa is situated 190 km distance from Jaipur in the north. The nearest Railway station to Mandawa is in Dundlodh Mukundgarh, which is 17 km away from Mandawa. Nearest International Airport is at Jaipur located away about 190 km.

2. Topography, Soils and Geology

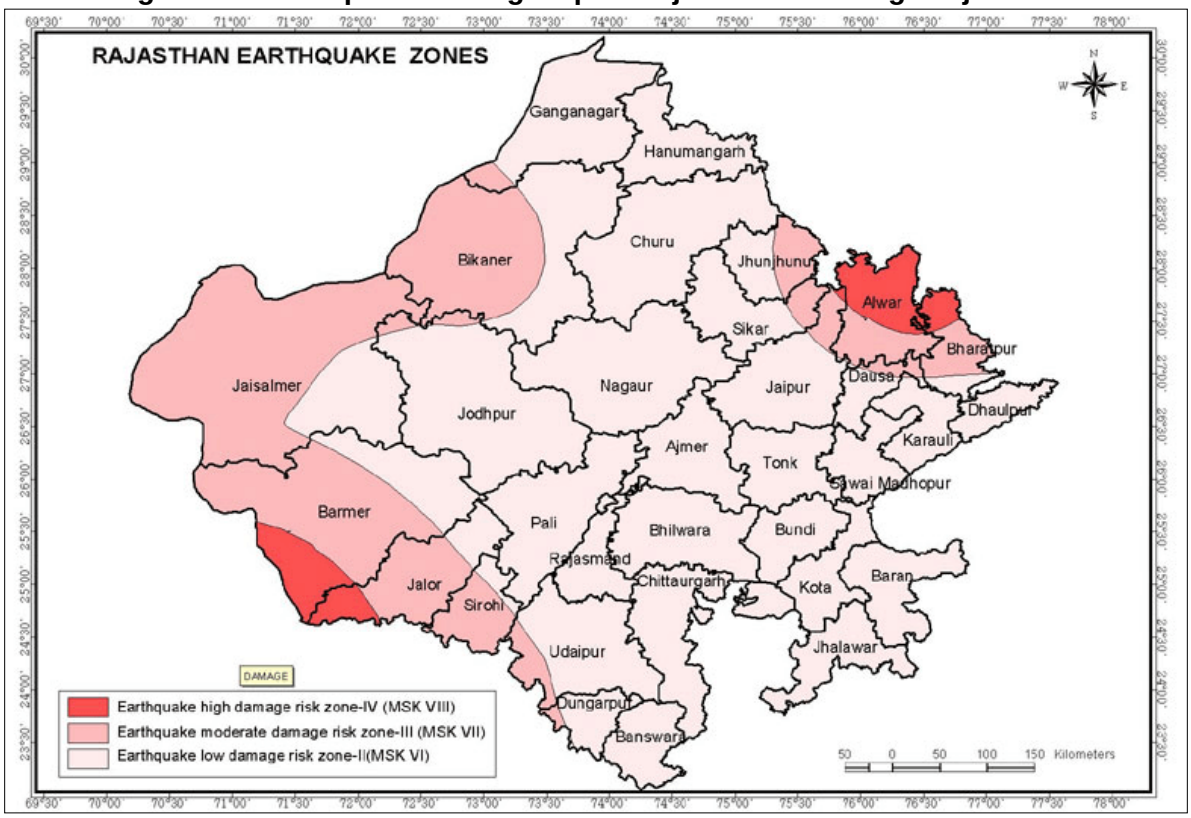
70. Mandawa falls under the desert plain lying at an altitude of around 316 m above the mean sea level (MSL). Most of the part of the Jhunjhunu district is characterized by blow sand and dunes which is part of the Great Thar Desert sand, and the shifting and active dunes are main hazards to cultivation. Soil erosion is prevalent resulting from deforestation and high winds. Soils are yellowish brown, sandy to sandy loam, loose, structure less, well drained with high permeability. Part of Jhunjhunu district is also covered by red desert soil. These are pale brown to reddish brown, structure less, loose and well drained having texture from sandy loam to sandy clay loam. They are suitable for agriculture but suffer from adverse climatic conditions. As stated

above, major part of the district is covered by blow sand. A small area in the eastern part of the district is occupied exclusively by the rocks of Delhi super stoup and later intrusive. The Delhi super group is represented by quartzite, phyllite/ schist, gneisses and limestone and granites, pegmatite and amphibolite of Post Delhi.

3. Seismology

71. As per the seismic zoning map of India, Jhunjhunu falls partly under the Zone II and Zone III. Zone II is the “low damage risk zone” and Zone III is the “moderate damage risk zone”. Mandawa town fall in the Zone –II as per seismic zoning map of Rajasthan. Figure 18 presents the earthquake zoning of Rajasthan state.

Figure 18: Earthquake Zoning Map of Rajasthan Showing Project Area



4. Climatic Conditions

72. Mandawa experiences arid and dry climate characterized by hot summers, cold winters with low rainfall during south-west monsoon period. The summer seasons are long starting in the month of March and ends in the month of June. The maximum temperature during summer months goes above 44°C quiet frequently. The temperature during winter months normally touches 3. 6°C. The mean annual rainfall is around 550 mm.

73. **Climate Change Projections**. Average temperature projections from global climate models (PRECIS) suggest a strong increase in temperature for state of Rajasthan. Baseline data of temperature from 1975 to 2005 has been considered. Projections of maximum temperature predicted that temperature varies from 0.6°C in 2020 to 3.2°C in 2080s. Projection trends of minimum temperature increases clearly stated that minimum temperature of atmosphere in the

state is slightly increases from 0. 9°C in 2020s to 3. 9°C in 2080s. In context of precipitation, available rainfall projection from global climate models (PRECIS) suggest an increase in average rainfall for state of Rajasthan depicts that based on the baseline data of precipitation from 1975 to 2005, projection of average annual rainfall varied from 6. 6% in 2020s to 9. 1% in 2080s. The models also suggest an increase in the duration of dry spells as well as a tendency towards more intense rainfall events. Any likely increase in precipitation would occur in the northern part of the state and any decrease in the southern part of the state. Climate of Rajasthan is varied in nature. Temperature and rainfall are the main climatic factors that determine eco climate of the area. Diurnal variations in temperature could be seen in the state of Rajasthan. Temperature reaches above 50°C in summer and 0° in winter in some of district in the state. Pattern of rainfall is uneven and erratic in nature.

5. Surface Water

74. Owing to its location in desert region, with dry and low rainfall climate, there are no notable natural water bodies in the town or region. Mandawa falls under Sekhawati basin and north western part falls outside the basin and has inland drainage. Most of the Jhunjhunu district is drained by Kantli River, while south eastern part is drained by Singhana River and a small area in south western corner of district is drained by Budhinala. The south and east of hill ranges in Mandawa area is drained by Dohana River. All the rivers/nalas are ephemeral in nature and flow in response to heavy precipitation during monsoon. Being mostly deserted terrain, Northern part of the district, has inland drainage and rainwater is mostly collected in depressions. Due to lack of sewerage system, wastewater from the Mandawa town flows in open drains and accumulates in these depressions at several places. There are no any surface water sources near to any proposed sites under this project.

6. Groundwater

75. Quaternary alluvium is the principal water bearing formation in Jhunjhunu District. Besides, hard rocks of Delhi Super Group including post Delhi Intrusive form ancillary aquifers in Jhunjhunu. Alluvium (composed of sand, silt, clay, kankar and gravel) forms the principal and potential aquifer in the area. Area and thickness of sediments varies widely from 15 to 140 m whereas saturated thickness varies from 30 to 70m. Ground water occurs under unconfined to semi-confined conditions in the primary porosity i. e. pore spaces. Aquifer system is present to a depth of 100 m in general. The depth to water level varies from 7. 53 to 75 m below ground level. In Jhunujhunu town, groundwater occurs under alluvial conditions and thickness of alluvium ranges from 80 to 100 m. Groundwater table is very deep in the town, and ranges between 70 to 80 m.

76. According to Central Ground Water Board (CGWB) Report of Jhunjhunu District (2008), ground water is alkaline in nature. The electrical conductivity ranges between 450 and 3000 ms/cm. Fluoride, Nitrate and Iron concentration is more than permissible limit (1.5 mg/l, 45 mg/land 1. 0 mg/l respectively) in some of parts of the district.

77. There are several tube wells installed by PHED for existing Water Supply of town. Laboratory analysis of few of samples from different tube wells in the town reveals that quality of ground water is fairly good for drinking and has no colour and odour (Water quality reports are given in Appendix 12). The result of physico-chemical analysis of groundwater is presented in Table 7 below.

Table 7: Results of Physico-Chemical Analysis of Ground Water of Mandawa

Parameter	**Results**		
Location and date	(Tap) Suresh Kumar Ward No. 16	(Tap) Karni Singh Rajput Mohalla	CWR at J. En. Office
	31. 05. 2019	31. 05. 2019	31. 10. 2019
pH of Raw Water	8. 6	8. 4	8. 0
Turbidity NTU)	Nil	Nil	Nil
Colour	None	None	None
Odour	U. O.	U. O.	U. O.
Chlorides as Cl mg/l	450	330	460
Nitrate as NO3	58	43	55
Total Dissolved Solids (mg/L)	1560	1170	1530
Magnesium (as Mg) mg/l	24	31	34
Calcium (as Ca) mg/l	32	40	48
Fluorides (as F) mg/l	1. 3	0. 9	1. 2
Total Alkalinity (as CaCO3) mg/l	690	560	600
Total Hardness (as CaCO3) mg/l	180	230	260
Calcium Hardness	80	100	120
Magnesium Hardness	100	130	140

Source: PHED, Mandawa

78. Presently ground water is the only source of drinking water for the people of Mandawa town and it's surrounding area and the result of the chemical analysis of ground water indicates considerable variation. In maximum locations it is contaminated Chloride, nitrate and alkalinity are higher at some places of study area. Hence, it suggested that underground water source in the study area be monitored before the use for domestic and drinking purposes. It also suggested that more emphasis should be given to reduce F^- contents and NO_3^- contents; where ever these cross the limits of IS standards.

7. Air Quality

79. Ambient air quality in Rajasthan is monitored by Rajasthan Pollution Control Board. However, at present there is no monitoring station in Mandawa or Jhunjhunu. However, few monitoring in past have been done in Jhunjhunu District by RUIDP and it was observed ambient air quality in district Jhunjhunu is well within the permissible limits.

80. Baseline air quality monitoring of Mandawa is not done during initial design phase and shall be done during SIP period by contractor and shall be updated in IEE.

8. Noise Quality

81. As there are no major industrial or alike other activities in Mandawa city area, there is no major source of noise pollution in the town. Main source of noise pollution in the city area is traffic only that also in main and busy roads and other inner and connecting roads are quiet peaceful.

82. Baseline ambient noise quality monitoring of Mandawa is not done during initial design phase and shall be done during SIP period by contractor and shall be updated in IEE.

B. Ecological Resources

83. Due to harsh physiographic and climatic condition, the forest and other ecological resources in Jhunjhunu District is limited. About 6. 8% of total area of district is under forest cover. These are open forests with very less tree cover and the vegetation is characterized by tropical thorn species and tropical dry-deciduous species represented by *Prosopis cineraria*, *Acacia leucophloea*, *Acacia nilotica*, *Salvadora oleoides*, *Capparis decidua*, *Opuntia* species, *Tephrosia purpuria*, *Aerva persica*, *Cenchrusciliaris* etc. Having the blend of varied habitat types, there is rich diversity of bird species in Jhunjhunu district. Some of the most common birds found in Jhunjhunu are Grey Francolin, Black Francolin, Indian Peacock, Yellow-Crowned Woodpecker, Asian Koel, Spotted Owlet, Spotted Dove, Black Kite, and White-Throated Kingfisher.

84. Proposed subproject components are located in the Mandawa town area of Jhunjhunu District, an urban area located in arid dry deserted zone covered mostly with sand and surrounded by a harsh desert environment of wind-blown sand and dunes. Natural vegetation is very limited, and consists of mainly sparse, scattered shrubs and grasses. The fauna of the town comprises mainly domesticated animals. Within the town, tree cover is very limited. Major trees found within town are mostly planted beside the roads in open public areas and comprises mainly Babool, Keekar, Neem, Pipal, Sheesham, Mango and Ber etc.

85. No Schedule-I species fauna was recorded in the study area according to Wildlife Protection Act, 1972. Also, no rare or endangered species of flora and fauna prescribed by IUCN or WPC, 1972 are found along the project areas. None, of these are reported in project area. Biodiversity Assessment was done using Integrated Biodiversity Assessment Tool (IBAT) and report is attached as Appendix 13.

C. Economic Development

1. Land use

86. According to the base data of 2010, of the total 975 acre land comes under urban area, out of which 684 Acre comes underdeveloped area which is 70.16% of urban area. At present 466 Acre land is being used for residential purpose and 96 Acre land is under circulation and 74 Acre of land is under public and semipublic use. Land use patter of Mandawa is given in Table 8 below.

Table 8: Existing Land Use of Mandawa

S. No	Land use	Area	Developed Area	Urbanizable Area
		Acre	*%*	*%*
1	Residential	466	68. 13	47. 79
2	Commercial	34	4. 97	3. 49
3	Industrial	12	1. 75	1. 23
4	Recreation	2	0. 29	0. 21
5	Public & Semi-public	74	10. 82	7. 59
6	Circulation	96	14. 04	9. 85
	Sub Total (Developed Area)	**684**	**100**	
7	Forest Land & Barren	291		29. 84
	Total (Urbanizable Area)	**975**		**100. 0**

Source: Mandawa Master Plan, 2010

2. Industry & Agriculture

87. Industrial development in Jhunjhunu district limited. Availability of mineral resources, which includes both metallic and non-metallic, in the district has led to development of mineral based industries. The metallic minerals include copper and iron ore whereas the non-metallic minerals include calcite, dolomite, soapstone and fireclay. In Jhunjhunu district Rajasthan State Industrial Development and Investment Corporation (RIICO) has developed four industrial areas viz. , Jhunjhunu, Chirawa, Pilani and Singhana. In Jhunjhunu district RIICO has established 6 industrial areas. The district houses about 7990 industrial units including 2 large scale units *viz.* M/s. Hindustan Coppers Ltd. , Khetri Nagar and M/s. Bhagwati Gases Ltd. , Banwas, Khetri Nagar of which about 225 small and micro industrial units are located in and around Jhunjhunu city. Major small units are leather, cotton, wool, food and mineral based units.

88. No major industries are there in Mandawa town only small-scale industries like tourism, tie and die, school bags and other handicrafts are few small-scale industries present in the town.

89. On the basis of climatic conditions and prevailing agricultural practices, Jhunjhunu district falls under Internal Drainage Dry Zone as per the agro-climatic classification. The area is covered in sand dunes and inter-dunal sandy plains. Climatically, this zone is slightly wetter as compared to the western arid zone. Kharif (April to September) season cultivation is rain-fed and Rabi (October to March) cultivation is mostly based on ground water. The main kharif crops grown in the District are Bajra, Guar, Cow Pea (Chola), Moong, Moth whereas principal rabi crops are Wheat, Gram, Mustard etc. In the town, about 2% of the land is under cultivation.

3. Infrastructure

90. **Water Supply.** Entire town has been divided into 2 water supply distribution zones with gravity fed from zone OHSRs. There are 2 No's of OHSR located in Mandawa town. The capacity of the OHSRs is 360 KL to 450 KL.

91. Water is supplied for one and half hour daily at 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0. 3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd.

92. Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED. Remain area which is newly developed and newly added to the municipality area is remain unconnected with piped scheme

93. **Sewerage**. Presently, the town lacks a comprehensive sewerage system. The sewage is either drained in roadside open drains/nallas or soak pit outside houses or ponds.

94. **Solid Waste Management**. Solid Waste Management in Manadawa is done by Nagar Palika Mandal through door to door waste collection. There are two old tippers and 3 new tippers available with Nagar Palika Mandal, to collect and dispose solid waste from town. Collected solid waste is disposed through open dumping near Akhyan Beed (near Shamshan).

95. **Power Supply**. Power distribution is provided by a regional company i. e. the Ajmer Vidyut Vitaran Nigyam Limited (AVVNL). Power is supplied from the 132 KV Sub Grid by Overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads.

96. **Transport.** Buses are the major source of transport in Mandawa. There is no rail connectivity in Mandawa. Nearest railway station is Mukundgarh situated on Jaipur Loharu Meter Guage about 35 kms from Mandawa.

D. Socio Cultural Resources

1. Demography

97. The Mandawa Municipality has population of 23, 335 of which 11, 682 are males while 11, 653 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 3578 which is 15. 33 % of total population of Mandawa (M). In Mandawa Municipality, Female Sex Ratio is of 998 against state average of 928. Moreover, Child Sex Ratio in Mandawa is around 836 compared to Rajasthan state average of 888. Literacy rate of Mandawa city is 74. 38 % higher than state average of 66. 11 %. In Mandawa, Male literacy is around 87.20 % while female literacy rate is 61. 93 %.

98. Mandawa is known for its havellis and forests. A fortified town, now only a few of the fort walls remain and only one gate survives. The town grew around the main bazaar near the fort that was located on raised ground forming the historic core. The town has many beautiful havellis, shops and temples with a collection of some of the most exquisite frescoes. A full heritage impact assessment was conducted for the town of Mandawa in Appendix 11.

99. Mandawa Municipality has total administration over 3, 708 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Municipality limits and impose taxes on properties coming under its jurisdiction.

100. The town has been growing steadily since 1981. The growth of the town has been phenomenal during 1991-01 when there was an influx of population of immigrants to this town. However, thereafter also the growth was not stable. The average decadal increase is 40%. However, the last decadal (2001-2011) growth is only 20. 3%.

2. History, Culture and Tourism

101. Mandawa is famous for fort and Havelis. Most of them are use as Heritage Hotels. The fort of Mandawa was founded in the 18th century situated in the middle of the town, the Mandawa Fort has been converted into a heritage hotel. Thakur Nawal Singh, son of Shardul Singh, founded the fort in Vikram Samvat 1812 (1755 AD). The fort dominates the town with a painted arched gateway adorned with frescoes of Lord Krishna and his cows. Built as per a medieval theme, the castle of Mandawa is adorned with beautiful frescoes. Rooms in the palace are decorated with paintings of Lord Krishna, exquisite carvings and amazing mirror work. The palace's Durbar Hall houses a number of antiques and paintings.

102. Mandawa town has been referred to as the "open art gallery" of Rajasthan because the entire Shekhawati region and not just Mandawa is dotted with fascinating mansions(havelis) that have lavishly painted walls. Some of the famous Havelis are described below-

(i) Sewaram Saraf Haveli. This 100-year-old Haveli is famous for its architecture and paintings, Bollywood's Favorite Destination for Movie Shooting, PK, Bajrangi Bhaijan, Mirza Sahibaan and many more

(ii) Ram Pratap Nemani Haveli. The Haveli has been recently converted into a Heritage Hotel where one can experience untouched frescos dating back to the

18th century. Vivaana Culture Hotel is a captivating twin haveli adorned with fascinating paintings. Both the exterior and interior boast of superb and rare artifacts and frescos. The over a century old haveli has been lovingly restored and renovated maintaining the old-world charm.

(iii) Hanuman Prasad Goenka Haveli. This haveli has a painting depicting Indra Dev on an elephant and Lord Shiva on his Nandi bull.

(iv) Goenka Double Haveli. This haveli, with two gates, has a monumental façade of elephants and horses. The outer walls, jutting balconies, alcoves and overhanging upper storeys are replete with patterns and paintings, ranging from traditional Rajasthani women and religious motifs to Europeans wearing stylish hats and other Victorian finery.

(v) Murmuria Haveli. The paintings of trains, cars, George V, and Venice were executed on the walls of this haveli during the 1930s by Balu Ram, one of the last working artists of the region. In pictures - like Lord Krishna with his cows in the English courtyard and a young Nehru on a horseback, holding the national flag - this haveli uses a unique theme blending the East with the West. The haveli also features a long frieze depicting a train with a crow flying above the engine and much activity at the railway crossing.

(vi) Jhunjhunwala Haveli. The haveli features a striking gold leaf painted room located to the right of main courtyard.

(vii) Gulab Rai Ladia Haveli. This haveli is located in the south of town, where the decoration of the outer and inner walls is perhaps the finest in Shekhawati. Blue washes here and there betray twentieth-century censorship of the erotic scenes that had been commonly acceptable one hundred years earlier.

(viii) Aakharamka Haveli. This more than 100 year old haveli is located in main market of the town, near Sonthaliya Darwaza.

(ix) The Bansidhar Newatia Haveli, Lakshminarayan Ladia Haveli and Chokhani Double Haveli are some of the other painted havelis in the area.

(x) Murals in the Thakurji temple, located opposite the Goenka Double Haveli and the Murmuria Haveli, include soldiers being shot from the mouths of cannons, a reflection of the horrors of the Mutiny of 1857. Further west are a couple of chhatris, and a step-well, still used today and bearing paintings inside its decorative corner domes.

E. Environmental Settings of Investment Program Component Sites

103. Sewers and water supply pipes will be laid along the roads/streets in the town within the road right of way (ROW). In wider roads pipes/sewers will be laid in the road shoulder beside the tarmac, and in narrow roads, where there is no space, sewers will be laid in the road carriage way by break opening the tarmac. Roads in some part of the town are narrow. Roads are lined both sides with open drains. In narrow roads sewers will be laid in the middle of the road, which may affect the traffic. Bigger diameter trunk sewers will be laid along the main roads, which are wide and have adequate space. No tree cutting is anticipated as there is adequate space to lay the water and sewer pipeline in those roads. Trenchless technology is also suggested at congested places and critical crossings.

104. Proposed site of construction of STP with SBR technology are away from habitations and surrounded by agricultural land. Some trees and shrubs are present at these sites. No wild fauna is found in these sites. STP will be constructed on available vacant which will be donated by private party to Nagar Palika, Mandawa for public use and encumbrance free Land will be made available by Nagar Palika Mandal, Mandawa for the construction of both the STP. There are

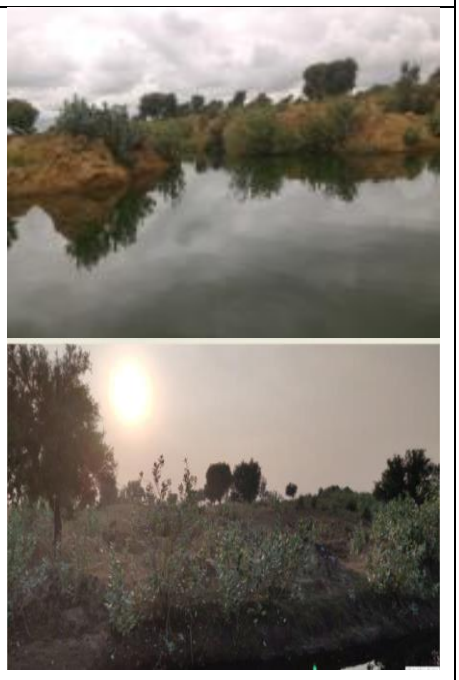
agricultural fields in the surroundings of the site and no habitation exist within 100 meters distance. Nearest, sensitive receptor in the form of houses are located at 185 m from STP near Bissau road. Some trees of various ages present at these sites. During design phase efforts will be required to save the trees as much as possible. In unavoidable conditions, if trees are needed to be cut, prior approval from concerned authorities is required for required tree cutting activities and compensatory plantations in the ratio of 1:3 should be done as per RUIDP Policy

105. Land of STP near Bissau Road is adjacent to road and having depression, where sewage from the part of town is being collected and causing nuisance. After construction of STP at this site, this water will be treated in STP and nuisance will be eradicated. Treated water from the STP can be effectively utilized in nearby agricultural practices. The excess/unused treated effluent can be discharged innear by drains through pipeline of about 326 meter from STP near Bissau Road (Figure 19).

106. SPS near Fatehpur Road will be constructed in available vacant municipal government lands near PHED J. En. Campus, where some habitations exist (approx. 101 m distance-Figure 20) and proper public information will be required before construction works. Few shrubs and bushes also exist at this land. Land is having roads on two sides, agricultural lands and habitations on other two sides.

107. Land for construction of one CWR is available in existing PHED J. En. campus where there is no any issue of environmental impact on flora, fauna or public. There are few trees of Neem, Pipal, Bargad and Bel exist which need to be cut for site clearance. During detailed design all efforts should be done to reduce numbers of trees to be cut for construction works. Tree plantation will be carried out as per replacement ratio of 1:3 as per RUIDP Policy. Site environmental features is given in Table 9 below:

Table 9: Site Environmental Features

S. No.	Subproject Component	Environmental Features of the Site	Photographs
1	Construction of STP 3. 9 MLD near Bissau Road, TEER, TESR & Pump House	Proposed site of STP (3. 9 MLD) is near Bissau Road in vacant land, which will be made available by Nagar Palika for construction of proposed new STP. There are agricultural fields in the surroundings of the site and no habitation exist within 100 meters distance. Nearest receptor in the form of houses are located at a distance of 185 m from STP near Bissau road. The excess/unused treated effluent can be discharged in nearby drains through pipeline of about 326-meter distance from STP near Bissau Road (Figure 19): Topography of land is undulating Site connected with existing road	

S. No.	Subproject Component	Environmental Features of the Site	Photographs
		There are no sensitive receptors or habitation in nearby vicinity No wildlife is reported in this area.	
2	SPS (0. 4 MLD) near PHED J. En. Campus on Fatehpur Road	Proposed site of SPS (0. 4 MLD) is proposed near PHED J. En. Campus on Fatehpur Road and shall be made available for construction of proposed SPS. Few scattered habitations also exist approx. 101m distance from this site. • No tree exist only shrubs and bushes exist on site. • Topography of land is undulating. Land is vacant is not used in any productive use. Site connected with existing road	
3	CWR 1200 KL in existing PHED J. En. Campus	The CWR will be constructed within the existing PHED J. En. campus. A flat vacant land (not any productive use) is available within PHED campus. The PHED campus is well defined boundary wall. Few trees exist at the proposed site. Nearest habitation/sensitive receptor is located about 26m distances and given in Figure 21. • The proposed site is well connected with black top road.	

Figure 19: Map Showing Distance of the nearest receptor/stakeholder from STP I site at Bissau Road & Treated Effluent Discharge Point

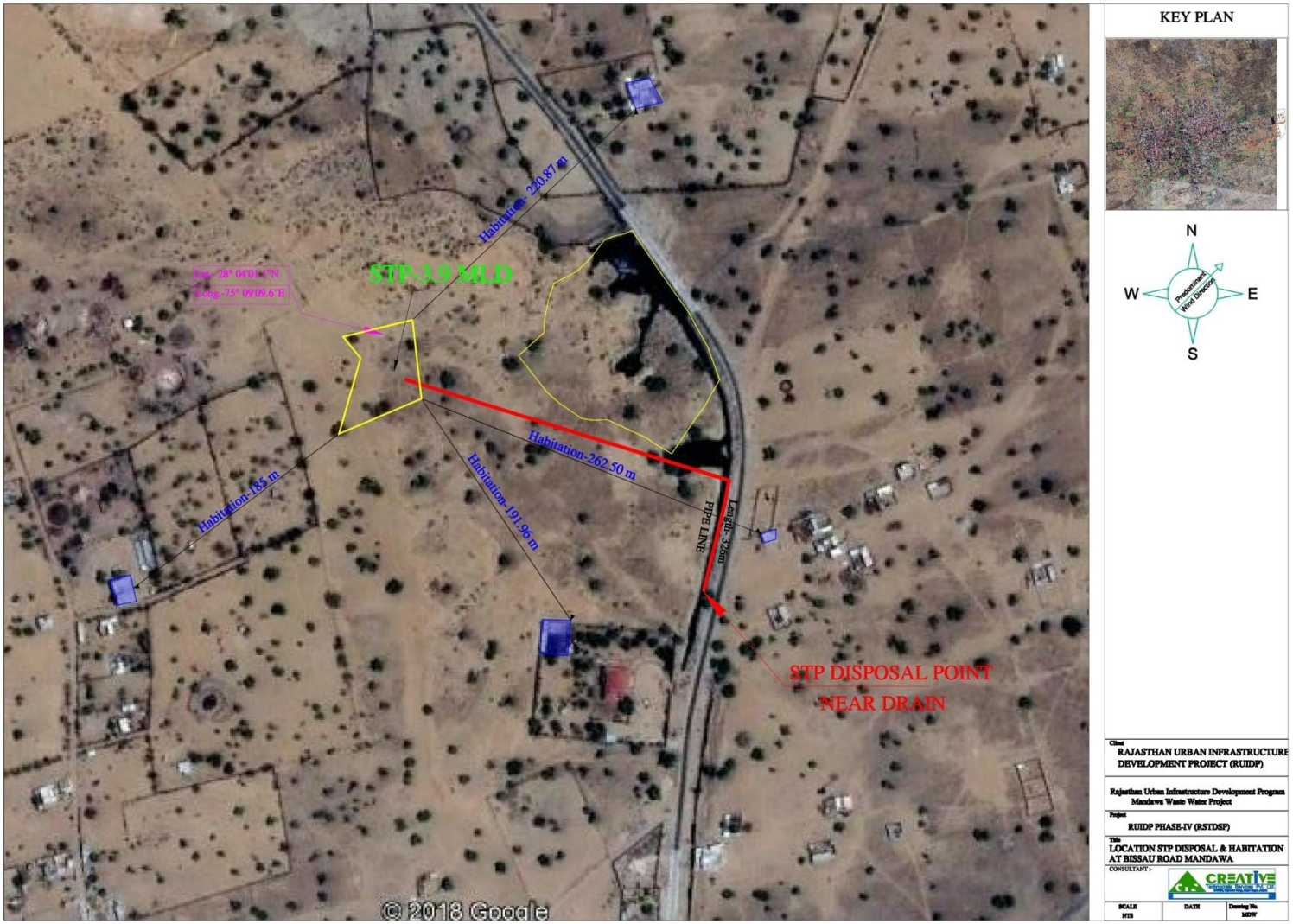
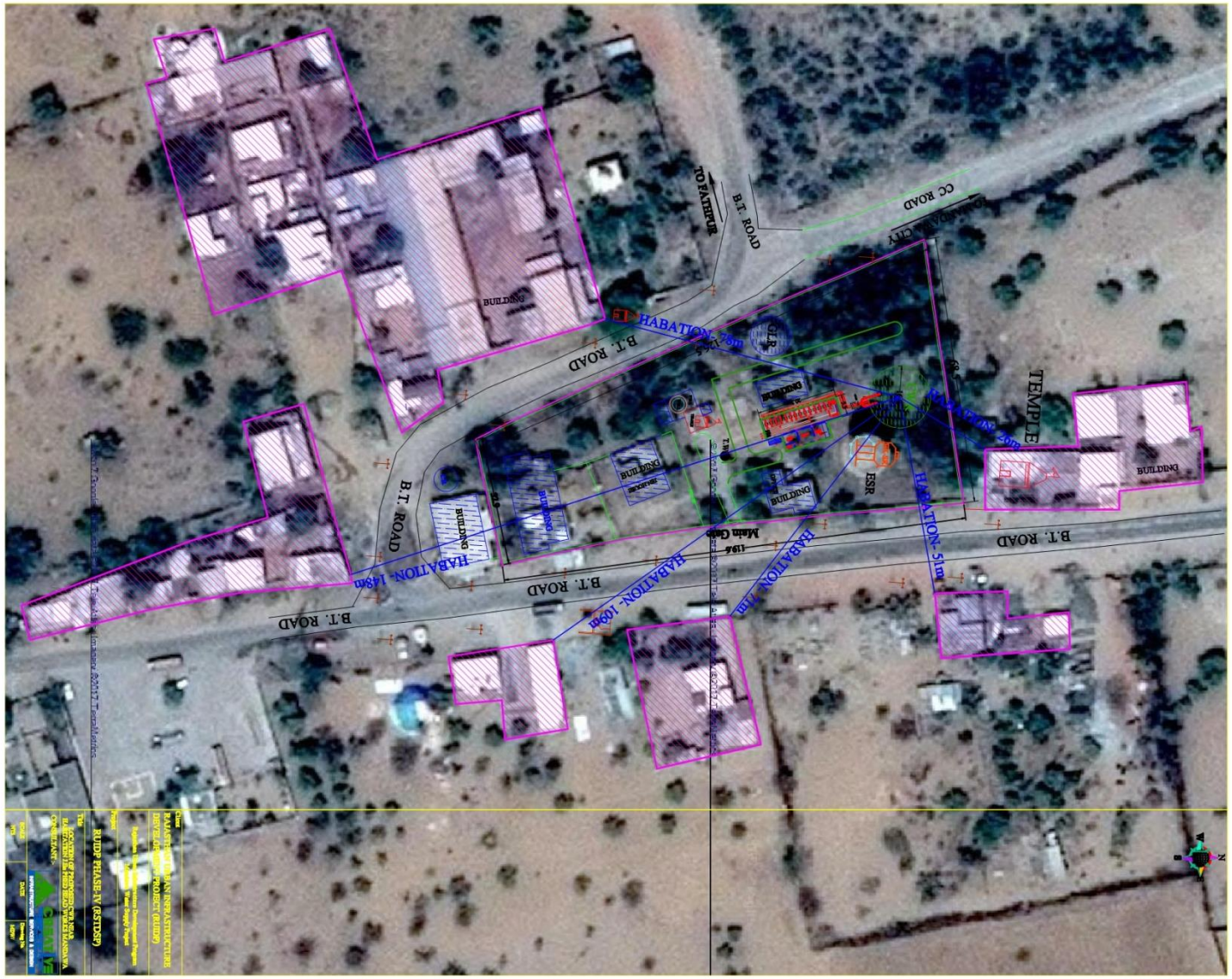


Figure 20: Map Showing Distance of the nearest receptor/stakeholder from SPS site near Fatehpur Road NearPHED J. En. Campus



Figure 21: Map Showing Distance of the nearest receptor/stakeholder from CWR site at PHED J. En. Campus



VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

108. Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

109. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iii) **Pre-construction impacts.** During pre-construction stage site shall be made free from any of the environmental issues such as tree cutting, arrangement of required facilities etc. Site selection of construction work camps, stockpile areas, storage areas, and disposal areas & Site selection of sources of materials shall be done in pre-construction stage and all the required arrangements should be made in this stage.
(iv) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(v) **O&M impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

110. Screening of environmental impacts has been based on the impact magnitude (negligible/ moderate/ severe–in the order of increasing degree) and impact duration (temporary/permanent).

111. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

112. The ADB Rapid Environmental Assessment Checklist for water supply and sewerage has been used to screen the project for environmental impacts and to determine the scope of the IEE.

113. In the case of this project (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private

property will not occur.

B. Pre-Construction Impacts-Design and Location

114. **Location impacts of CWR (1200 KL) at existing PHED J. En. Campus**: Clear Water Reservoir (CWR) of 1200 KL capacity is proposed at existing PHED J. En. Campus, Mandawa. Adequate land is available within PHED campus. Campus have defined boundary wall all around. Few trees exist at site which needs to be cut. During design phase efforts will be required to save the trees as much as possible. In unavoidable conditions, if trees are needed to be cut, prior approval from concerned authorities is required for required tree cutting activities and compensatory plantations in the ratio of 1:3 should be done as per RUIDP Policy. There are few habitation/sensitive receptors about 26 m (nearest) from proposed site (Figure 21). All the efforts should be taken to save tree cutting and if tree cutting is necessary, mitigation measures shall be taken during construction works.

115. **Location impacts of Water Transmission Main and Distribution Networks-** There are total 0. 98 km of transmission main of DI pipe proposed and about 108. 40 Kms of distribution networks proposed under this project, which will be laid in ROW of existing roads. There will be no significant impact on the nearby habitants and there are no trees being affected due to proposed works.

116. **Odour Nuisance from STP and SPS**. As presented in the baseline profile, the STP site identified away from habitation, Nearest receptor in the form of houses are located at a distance of 185 m from proposed STP site near Bissau road, and site are currently vacant, and do not have any notable sensitive environmental features with some trees of sparsely distributed of various ages. The excess/unused treated effluent can be discharged in nearby drains through pipeline of about 326 meter distance from STP near Bissau Road (Figure 19). SPS site are quite remote the habitation (approx. 101 m distance) and low lying area where waste water is accumulated. The proposed treatment technology, SBR, being an aerobic process and conducted in a compact and a closed system with automated operation, odour nuisance will be very minimal and negligible. Limited bad odors may be generated from wet well, primary treatment units and sludge treatment. However, to account for future development potential around the sites, and to enhance the environmental benefits following measures should be included in the STP/SPS site planning and design:

(i) Provide a green buffer zone of 10-20 m wide all around the STP, and 5-10 m around SPSs, with local varieties of trees in two to three rows as far as possible. This will act as a barrier and visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation; and

(ii) Develop layout plan of SPS/STP such that odour generating units (such as sludge/solids handling facilities) are located away from the surrounding area with future development potential.

117. **Social and Cultural Resources.** Mandawa is one of the heritage towns in Rajasthan. There are various physical and cultural resources (PCRs) in the town such as state-protected monuments and heritage sites. Mandawa is known for its havelis and forts. A fortified town, now only a few of the fort walls remain and only one gate survives. The town grew around the main bazaar street near the fort that was located on raised ground forming the historic core. The town has many beautiful havelis, shops and temples with a collection of some of the most exquisite frescoes. Due planning and care are considered to ensure to avoid damages to these physical cultural resources. Therefore, no impacts envisaged but risk of uncovering archeological remains,

given the long history of town, during the excavations cannot be ruled out completely. Construction contractors therefore should follow the below measures in conducting any excavation work:

(i) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;
(ii) Stop work immediately to allow further investigation if any finds are suspected;
(iii) Inform Archeological Department if a find is suspected and take any action, they require to ensure its removal or protection in situ; and
(iv) Prepare a chance find protocol (sample is provided in Appendix 11).

118. **Tree cutting at project sites.** At the proposed STP site near Bissau Road, there are few trees (approx. 15 nos.) of various ages of local species and SPS site near PHED J. En. campus, there are no trees except few shrubs and bushes exist. These trees may be required to cut for construction. There are no notable tree cover or vegetation in other sites. Sewers will be laid along the road within road right of way or at the middle of the road. There, are no notable trees in the alignment, therefore no tree cutting is envisaged. Following measures need to be implemented to minimize and/or compensate for the loss of tree cover.

(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP and SPS or any other site with trees;
(ii) Obtain prior permission for tree cutting at sites that may require tree cutting finalized during detailed design; and
(iii) Plant and maintain 3 trees for each tree that is felled as per RUDSICO-EAP policy

119. **Handling and Disposal of accumulated Solid Waste at proposed SPS Sites.** As stated earlier, the selected low-lying lands for sewage pumping stations are filled with wastewater and solid waste, which needs to be cleared for construction of sewage pumping stations. Site clearance and removal of solid waste is part of the scope of DBO contract. The handling of this accumulated waste will involve occupational health and safety issues to the workers engaged for such work and also to the people residing close to the work site. This is because the waste handling and working conditions will be harmful and may also emit harmful gases. Proper health and safety precautions are necessary. Following measures are to be implemented during the handling/ transfer of solid waste and site clearance:

(i) Prepare a waste handling and management plan for the work, considering handling, disposal and occupational and public health safety;
(ii) Assess the working conditions, develop appropriate working method, and work shall be only conducted under continuous supervision of EHS supervisor;
(iii) Waste shall not be handled manually; use appropriate equipment;
(iv) All workers shall be provided with necessary personal protection equipment, including gloves, boots, face/gas masks. and oxygen cylinders in handy for emergency use etc. ; if gas emission is suspected at any point of time, workers shall use gas masks with oxygen cylinders;
(v) Inform surrounding public about the work;
(vi) Fire control and safety equipment shall be provided at the work site;
(vii) Waste shall be properly covered during transport; and
(viii) Manage the solid waste as per the Solid Waste Management Rules, 2016

C. Design Impacts

120. **Design of the Proposed Components**. The Central Public Health and Environmental Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years in general while designing the systems for water supply and sewerage components. It is proposed to consider 2051 as the design year for all the components in order to maintain unanimity in the design period and design population. Accordingly, 2021 shall be the base year and 2036 the intermediate year to cross check the designs pertaining to intermediate demand. The rate of water supply has been taken as 135 LPCD for 100% population. Sewage generation is 85% of water supply (including 5% to account for infiltration). Technical design of all the elements of water supply (intake, WTP, reservoirs, pumping, transmission and distribution system etc.), and sewerage (STP, reuse arrangements, sewer mains and network including manholes and house connections, etc. , follows the relevant national planning and design guidelines, include the Sewerage and Wastewater Policy of Rajasthan 2016.

121. Following environmental considerations are already included in the project to avoid and/or minimize adverse impacts and enhance positive benefits:

(i) Adopting conjunctive use approach in water use; utilizing feasible surface water sources and groundwater source optimally thereby reducing the existing groundwater abstraction to the extent possible;
(ii) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically);
(iii) Recovering wash water from treatment process to optimise the water use;
(iv) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs;
(v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage;
(vi) Avoiding usage of asbestos containing materials;
(vii) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies;
(viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources;
(ix) Adopting a combined approach of sewerage system and fecal sludge and septage management to cover 100% population of the town with safe collection, conveyance and treatment of sewage generated in the town; and
(x) Provision of appropriate personal protection equipment to the workers and staff.

122. **Design of Sewage Treatment Plant.** One STP of capacity 3. 9 MLD is proposed to be constructed at the identified site to treat the sewage generated from Mandawa town. It is proposed to establish STP based on SBR (sequential batch reactor) process, followed by disinfection by chlorine. As the bid is DBO type, detailed design of the STP will be carried out by the contractor to the following specific discharge standards. Currently for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2017 (see column (4) in table 10 below) are applicable. However, under RSTDSP, PMU has decided to base the STP design on discharge standards for STPs suggested by CPCB in 2015, which are more stringent. The strident standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of

Rajasthan.[17] It is also to be noted that, in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider stringent standards for STPs.

Table 10: Proposed Raw and Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for Mandawa STP	MOEF&CC STP Discharge Standards, 2017	CPCB discharge standards, 2015#	IFC Guideline value for sewage discharge	WHO Guideline Value for safe use in agriculture
1	pH	6. 5 – 9. 0	6 – 9	6. 5-9. 0	6 - 9	6 – 9
2	Biochemical Oxygen Demand (BOD) (mg/l)	≤10	<30 <20 (metro cities)	<10	30	-
3	Chemical Oxygen Demand (COD) (mg/l)	≤50	-	50	125	-
4	Total Suspended Solids (TSS) (mg/l)	≤20	<100 and <50	<20	50	-
5	Total Nitrogen (mg/l)	<10	-	<10	10	-
6	Ammonical Nitrogen (mg/l)	<5	-	<5	-	-
7	Total Phosphorus (mg/l)	-	-	-	2	-
8	Fecal Coliform MPN/100 ml	100 (Desirable) and 230 (Permissible)	<1000	<100	-	<1000
9	Oil and grease, mg/l	-	-	-	10	-
10	Nematodes, number of eggs per litre	-	-	-	-	1

MOEF&CC= Ministry of Environment, Forest and Climate Change; CPCB = Central Pollution Control Board; IFC = International Finance Corporation, the World Bank Group

in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider the standards issued in 2015 for STPs.

123. **Treated wastewater Reuse/disposal.** Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. Government of Rajasthan adopted this policy to ensure “improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment”. To further promote the reuse and provide guidance, Policy prioritized reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy requires monitoring of treated wastewater quality, soil quality etc. Policy prohibits artificial recharge of aquifers using treated wastewater and promotes construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse

[17] “The use of treated wastewater in irrigation and industrial application shall be given the highest priority and shall be pursued with care. Effluent quality standards shall be defined based on the best attainable treatment technologies, and calibrated to support or improve ambient receiving conditions, and to meet public health standards for end users”.

option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications. LSGD is currently in the process of publishing Guidelines for Reuse of Treated Wastewater in Rajasthan 2019 to promote the reuse and provide guidance to the stakeholders. Guidelines promotes the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources.

124. **Policy provided priority to reuse in agricultural for unrestricted irrigation.** It suggests blending of treated wastewater with fresh water to improve quality where possible, and crops to be irrigated shall be selected to suit the irrigation water, soil type and chemistry. Policy requires monitoring of accumulation of heavy metals and salinity. It encourages farmers to use modern and efficient irrigation technologies, and to ensure protection of on-farm workers and crops. As a contingency measure, policy requires regular monitoring of treated water quality, and emergency alerts to users in any event of deterioration of quality. Policy prohibits use of treated wastewater for artificial recharge (excerpts from Policy on Reuse is provided in Appendix 14).

125. **Reuse Options.** Following the Sewerage and Wastewater Policy, 2016, the draft Guidelines on Reuse provides the following reuse applications:

(i) Agriculture, horticulture, irrigation
(ii) Gardening in park
(iii) Road washing and water sprinkling to reduce fugitive dust
(iv) Industries including mining
(v) Recreational ponds and lakes
(vi) Social forestry
(vii) Construction Activities
(viii) Firefighting and other municipal uses
(ix) Railway
(x) Thermal power plants
(xi) Cantonments
(xii) Individual Users

126. **Allocation of treated wastewater for reuse.** City Level Committee (CLC) headed by the district collector will allocate the water for most appropriate uses. According to the proposed procedure, agencies/individuals that require treated wastewater shall apply to the district collector. CLC will allocate water to users.

127. **Reuse Plan.** The State Policy require the sewerage detailed project report provide reuse options and strategy to implement reuse, and detailed reuse action plan. As the Mandawa subproject is proposed under DBO, the reuse plan will be prepared by the DBO contractor during the detailed design phase in consultation with the stakeholders in Mandawa, and reuse modalities will be firmed up. Subproject includes following components as part of the STP to facilitate reuse: disinfection of treated wastewater, treated effluent storage reservoir (TESR), effluent pumping station and a treated effluent elevated reservoir (TEER).

(i) As part of the plan, identify potential reuse application in Mandawa, and establish quality criteria for each of the use;
(ii) For applications that use treated wastewater directly (e. g. , agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured;

(iii) Prepare a reuse plan for agriculture/ horticulture, clearly indicating the limits (geographical / crops / type of application / type of soils etc. ,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.
(iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e. g. , Agricultural Department, District Collectorate)
(v) Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse

128. **Use of treated wastewater for irrigation.** Use of wastewater for irrigation is associated with some health risks – from germs in wastewater, which may contaminate food and spread disease, health risk to farm workers from worms (helminths) and nematodes and chemical risk is associated if industrial wastewater enter the sewers. If the wastewater with bacteriological contaminants are used for food crops like lettuce, tomato, which are eaten without peeling or cooking, it will present a greater health risk if precaution such as such washing with chlorinated water or storing for adequate time in normal temperature before use (at least 10 days). According to the WHO, effluent which is used to irrigate trees, industrial/commercial (not food, like cotton) and fodder crops, fruit trees, and pasture should have less than one viable nematode egg per liter. Effluent used for the irrigation of food crops, sports fields, public parks, should have and less than one viable nematode egg per liter and less than 1, 000 fecal coliforms per 100 milliliters (ml). These shall be considered in the reuse plan that will be prepared during the detailed design and complied accordingly.

129. **Disposal of treated wastewater.** Proposed STP site are located close to dry water channels (drain) and excess/surplus /unused treated wastewater will be discharge into this drain/depression. As the wastewater is treated to stringent disposal standards, no notable impacts envisaged. Drains are mostly dry except during monsoon. They carry untreated wastewater from the surrounding areas of town. The disposal of treated wastewater meeting the set quality standards, in fact will improve the quality of water by dilution. There are no water intakes or abstraction points in the downstream proximity. STP site is surrounded by agricultural and barren lands. Considering the existing status of drains and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the proposed STP to ensure that treated wastewater always meet the stipulated standards prior to its disposal into drain. Any change/lowering of treatment efficiency during operation may lead to poor quality of wastewater and may further pollute the drain and create nuisance. It is therefore critical that STP treats the sewage as designed. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency. This therefore requires monitoring:

(i) Obtain of consent of RSPCB for discharge of treated wastewater into nearby drains.
(ii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards
(iii) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan

130. **Sludge treatment and disposal.** Sewage sludge generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Since no industrial wastewater is allowed into sewers, it is unlikely that sludge contains heavy metals. Heavy metal concentration may not be ruled out completely as the chemicals used in treatment may potentially contains heavy metals,

which will then leach into the sludge.

131. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner” and it requires DBO contractor “to conform to the regulations of public health and environment protection norms”. This follows the Sewerage and Wastewater Policy, 2016, which suggests “use of sludge produced from the treatment as fertilizer and soil conditioner after processing”.

132. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria. To achieve adequate drying minimum drying period (15 days) shall be ensured. The drying period, which will be varying depending on the season will be determined during operation and be followed. A sludge management plan will be developed by the DBO contractor during the detailed design phase. Proper sludge handling methods should be employed. Personal Protection Equipment should be provided to the workers.

133. Contractor will propose the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 14) and best international practices in consultation with PMU and Municipal Council. Properly dried sludge can be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests shall be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 have been adopted here. Rules stipulate that “In order to ensure safe application of compost, the following specifications for compost quality shall be met”.

Table 11: Standards for Sludge Reuse as Manure

Standards for Composting. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards “In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:			
Parameters	**Units**	**Organic Compost (FCO 2009)**	**Phosphate Rich Organic Manure (FCO 2013)**
Arsenic	mg/kg	10	10
Cadmium	mg/	5	5
Chromium	mg/kg	50	50
Copper	mg/kg	300	300
Lead	mg/kg	100	100
Mercury	mg/kg	0. 15	0. 15
Nickel	mg/kg	50	50
Zinc	mg/kg	1000	1000
C/N ratio	-	<20	<20:1
pH	-	6. 5 – 7. 5	(1:5 solution) maximum

			6. 7
Moisture, percent by weight, maximum		15. 0 – 25. 0	25. 0
Bulk density	g/cm3	<1	Less than 1. 6
Total Organic Carbon, per cent by weight, minimum	percent by weight	12	7. 9
Total Nitrogen (as N), per cent by weight, minimum	percent by weight	0. 8	0. 4
Total Phosphate (as P205) percent by weight, minimum	percent by weight	0. 4	10. 4
Total Potassium (as K20), percent by weight, minimum	percent by weight	0. 4	-
Odour		Absence of foul Odor	
Particle size		minimum 90% material should pass through 4. 0 mm is sieve	minimum 90% material should pass through 4. 0 mm is sieve
Conductivity, not more than	dsm-1	4	8. 2

* compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.
FCO = Fertilizer Control Order, Department of Agriculture, Government of India

(i) Prepare a dried sludge utilization plan for Mandawa with the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner
(ii) Plan should clearly various potential uses and demand in Mandawa and surroundings
(iii) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc.); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.
(iv) Identify a landfill / suitable site for disposal of surplus dried sludge
(v) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO
(vi) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)

134. **Mixing of industrial effluent in wastewater**. One of the critical aspects in sewerage system operation is, change in raw sewage characteristics at inlet of sewage treatment plant may affect the process and output quality. STPs are designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP and will upset process and affect the efficiency. Various types of small to medium-scale industries are in Mandawa. Most of these industries generate wastewater from the process, which is generally treated at effluent treatment plants specifically established for the purposes and are not allowed into municipal sewers. While the project does not provide sewerage system in established industrial areas, there is a risk of industrial effluent joining municipal sewers from the small/household units established in town areas where sewers are being provided. Mixing of industrial effluent will severely deteriorate the quality of treated wastewater, and therefore the

proposed reuse. Reuse of such water may have significant impact on public health, and on land and water. Following measures should be incorporated to safeguard the sewerage system and the intended reuse:

(i) No industrial wastewater shall be allowed to dispose into municipal sewers
(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers
(iii) Ensure that there is no illegal discharge through manholes or inspection chambers
(iv) Conduct public awareness programs in coordination with RSPCB and CLC
(v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards

135. **Design of SPS.** As explained earlier, SPS is proposed away from habitation about 101 m. However, care should be taken while designing for this SPS to avoid impacts during construction and operation phases. Design engineers should take following mitigation measures to reduce impacts due to proposes SPS-

(i) Incorporate in design pumps of low noise
(ii) Provide dedicated power supply to SPS, if possible, otherwise DG set to be used during power failure, should be soundproof and having acoustic enclosures with low/permitted air emission standards
(iii) Firm barricades should be provided during construction works all around the SPS site
(iv) Boundary wall of sufficient height with barbed wire fencing should be provided during operation phase so that no children/residents can entre in the SPS premises
(v) Odour control system should be provided in SPS
(vi) Plantations should be provided in 5-10 m around SPS if space available to reduce foul smell of sewer during operation
(vii) Entry should be restricted through provision of gate and guard during operation of SPS.

136. **Sewer system – collection & conveyance.** The sewerage system is designed as a separate system of sewage collection (i.e. caters only to wastewater). There is considerable length of existing surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to trunk sewers and further to STPs. To maximize the benefits as intended, Mandawa Nagar Palika Mandal should ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system.

137. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability.

138. Measures such as the following shall be included in sewer system design to ensure that the system provides the benefits as intended:

(i) Limit the sewer depth where possible
(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);
(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the

difference between top of the sewer and bottom of water pipeline should be at least 300 mm)

(iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)

(v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;

(vi) Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry

(vii) Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation

(viii) Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas

139. **Fecal Sludge and Septage Management (FSSM).** The proposed FSSM will help the ULB to cover entire population with safe disposal of human excreta by serving areas which are not feasible to be provided with a sewerage system. About 9 % of population will be served by this method. Under the FSSM, fecal sludge / septage will be collected from the household level septic tanks using truck mounted mobile desludging equipment and transported to Sewage Treatment Plant (STP) for treatment. At this stage, the quantity of septage generated from this area is not available. This will be estimated during the detailed design phase, and number of mobile tankers required to collect the transport the septage to STP, frequency of collection depending on the size of septic tanks etc. , will be worked out accordingly. IEE needs to be updated during the detailed design phase to reflect the final project design. Although handling, transportation and disposal into STP is completely mechanized, the system will however be operated by the workers, therefore proper precautions as workers will be dealing with highly harmful septage. Accessibility of septic tanks to mobile suction tankers to collect septage is critical for success of the septage management system. At STP, the septage will be mixed with the sewage and will be co-treated in the STP. Septage will be in concentrated and partially degraded form, and disposal of the same into STP inlet stream may upset the sewage treatment process, may generate bad odours, and may ultimately affect the quality of treated wastewater. Treatment process needs to be properly designed. Following measures are suggested for implementation:

(i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses

(ii) Create awareness program on the FSSM from collection to treatment system that will be adopted

(iii) Design the sewage treatment process duly considering mixing of septage

(iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers

(v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP

(vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment

(vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places

(viii) Conduct regular health checks

(ix) Prepare Health and Safety Plan for FSSM

D. Environmental Audit of Existing Water Supply Infrastructure

140. It is proposed to utilize existing water supply infrastructure like tube wells, clear water reservoirs, pump houses etc. , with necessary improvements. As per the ADB SPS 2009, these are associated facilities and therefore the component operation shall comply with the ADB and applicable environmental laws of India. Besides, ADB SPS lays emphasis on impacts and risks on biodiversity and natural resources, pollution prevention abatement including hazardous waste, occupational health and safety, community health and safety, and physical cultural resources. A random environmental audit is conducted to (i) assess the compliance of the existing infrastructure with environmental legislations and (ii) improve environmental performance to minimize future potential liabilities. The preliminary audit note is given in Appendix 15. A more detailed environmental audit and risk assessment shall be carried out during detailed design stage and incorporated into the final IEE.

141. All the existing infrastructure facilities located in Mandawa town, which is an urban area and where there are no protected or sensitive environmental areas such as forests, wildlife sanctuaries or archeologically protected areas. Therefore, there are no risks or impacts on biodiversity and natural resources. The proposed project will optimally utilize the surface and groundwater sources. Due to nature of components, the existing infrastructure components do not fall under the ambit of any environmental related regulations, and therefore there is no requirement of permissions or clearances. Presence of ACM in the form of asbestos cement pipes in the existing water supply infrastructure is a cause of concern due to its potentially hazardous nature. Project, however, do not include rehabilitation or repair of asbestos cement pipes, and the project, in fact, proposes to discontinue the use of asbestos cement pipes. Presence of asbestos cement pipes in the existing facilities may create hazardous conditions for the workers and surrounding community. Besides, the generation and disposal of debris and discarded materials, and construction phase health and safety need to be considered and mitigated to comply with the SPS provisions. Following table 12 provides component wise compliances and concerns. Corrective actions for the identified environmental concerns are discussed in the following section.

Table 12: Environmental Audit of Existing Facilities

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
Tube wells	11 Tubewells at Ganesh Mandir, BPS School, Shankar Baba, Sai Baba, Ice Factory, Electricity Board GSS, Ruth Hotel, Gulab bypass near Sai mandir, Tiba ka Mandir, Near Shamshan bhumi and PHED J. En. Campus	• Replacement of pipes, submersible pumps, cables, panels, valves, flow meters and synchronization with SCADA enabled devices	No requirements under existing laws New tube wells require permission from State Groundwater Department; however, these are existing, and permission not required	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris There are no asbestos containing material / AC pipes noticed

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
Clear water reservoirs (CWRs)	1 CWR of 450 KL at Existing PHED J. En. Campus	• Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required • Cleaning • Instrumentation and SCADA	No requirements under existing laws	Presence of AC pipes in existing connections Occupational health and safety, public safety during the construction works Disposal of discarded material, debris including AC pipes
OHSR	1 OHSR 360 KL	• Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required • Cleaning • Instrumentation & SCADA	No requirements under existing laws	Presence of AC pipes in existing connections Occupational health and safety, public safety during the construction works Disposal of discarded material, debris including AC pipes
Transmission and distribution	Transmission mains: 983 m, 150 mm diameter distribution: 108. 4 km, 75mm to 250mm diameter pipes	• Pipes will be left as it is in the ground, no rehabilitation / removal proposed	No requirements under existing laws	Presence of underground AC pipes (983 m transmission mains and 63. 5 km distribution lines of 75-250 mm dia); exact location is known but condition is not known; map is available. Accidental disturbance / need to remove in narrow roads Occupational health and safety, public safety during trenching Disposal of AC pipes / debris

142. **Corrective Measures.** As presented in the above table, there are no regulatory non-compliance issues in the existing infrastructure. The environmental concerns are mainly related to occupational health and safety, public safety, disposal of debris, discarded materials etc. A work specific environmental management plan needs to be prepared for these aspects. The exact nature of rehabilitation and repair works will be known only during the detailed design phase as the detailed technical audit will be conducted by the DBO contractor and the required rehabilitation and repair measures will be proposed accordingly. Therefore, a separate EMP will be prepared for rehabilitation works during the detailed design phase by the DBO contractor, and reviewed and approved by PMU/consultants, and the same will be implemented by the DBO contractor. These are included in the EMP.

143. Presence of ACM, mainly asbestos cement pipes, in the existing infrastructure is the main concern. Asbestos is recognized as a cause of various diseases and is considered health hazard if inhaled.

144. Nearly half of the existing 64. 5 km of underground water transmission and distribution system consists asbestos cement pipes of 75-250 mm diameter. Most of the asbestos cement are old. There is no use of new asbestos cement pipes but for repairing work in the existing network, and for replace the damaged sections, asbestos cement pipes are being used. There will be no use of any asbestos cement pipe in the future as under the present project, water supply network is being provided in the entire town with non-asbestos cement pipes. It is normal practice in Rajasthan that existing asbestos cement pipes are left as it is in the ground and new pipes will be laid in a new alignment.

145. However, complete avoidance of handling and disposal of asbestos cement pipes may not be possible. There are narrow lanes, where asbestos cement pipes may be encountered during the laying of new pipes. Some connections/inlet/outlet pipes at the existing CWRs are also of asbestos cement pipes. These will be removed and replaced with new non-asbestos cement pipes. At present no maps available on the exact location/position of asbestos cement pipes. The local long serving O&M staff of PHED seem to be well aware of the location of asbestos cement pipes in the roads.

146. A temporary storage area shall be provided in the project site by the PMU. A layout map of PHED J. En. campus showing temporary ACM storage site is given in Figure 6. Asbestos materials present and removed from the construction activities will be temporarily maintained at the identified area. The temporary storage area shall be constructed by the DBO contractor based on the specifications of the asbestos management service contractor.

147. Bureau of Indian Standards (BIS) Guidelines for Safe Use of Products containing asbestos states that “asbestos cement products (such as asbestos cement pipes) generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. There is very little possibility of generation of airborne asbestos fibers during any reasonable handling, storage, and use of such products. However, during storing and installation, recommended work practices shall be followed to avoid harmful exposure”. According to Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016, any waste having asbestos concentration limit of 10, 000 mg/kg (i. e. 1%), however this will apply only if the asbestos containing substances are in a friable, powdered or finely divided state. Under the

Basel Convention,[18] asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste.

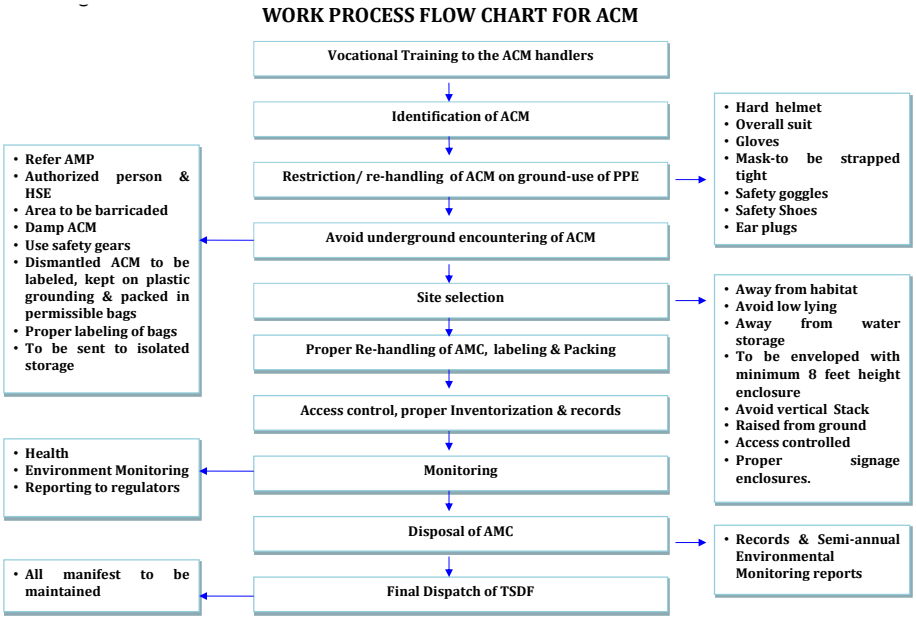
148. Working with or handling asbestos cement pipes in manner that produces dust, fibers, air borne particles etc. , is very harmful and hazardous to the workers and general public around the work sites. The condition of existing underground asbestos cement pipes is not known, however, as these are old, pipes may be in deteriorated conditions. Condition needs to be assessed to check whether it is in friable form or in a condition in which it can release fibers before it is subjected any disturbance or removal.

149. During the project preparation, an expert on Asbestos and ACMs was mobilized to assist PMU to conduct an assessment and field validation of the extent of asbestos cement materials covered under the sample RSTDSP subprojects. The assessment has indicated that specific measures are necessary to safeguard the health and safety of the nearby communities and the potential contractors consistent with the requirements of the ADB SPS, 2009. Activities such as clearing, transfer and disposal of asbestos cement pipes, work in narrow streets, and interventions in existing asbestos cement pipes may have adverse impacts on workers and surrounding population. Air borne asbestos if handled unsafely, cut, drilled or broken into pieces that may cause health issues such as Inflammation of the lungs, mesothelioma, peritoneal mesothelioma, pleural plaques, asbestosis and bronchogenic carcinoma. Following measures are to be implemented to avoid any impacts:

(i) Develop and implement the ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 16. Adhere to the workflow process suggested in Figure 22;
(ii) Conduct awareness program on safety during the construction work;
(iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day;
(iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches;
(v) Identify risk of intervention with existing asbestos cement pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods;
(vi) Appropriate actions as defined in the AMP will have to be adhered to; and
(vii) Maintain records of asbestos cement pipes as per the AMP.

[18] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal adopted in 1989.

Figure 22: ACM Management Plan – Work Process Flow Chart



150. Requirement for the contractor and the subcontractor. The following are operational requirements related to works involving asbestos:

(i) engaging certified and competent asbestos service provider to identify, handle and remove the asbestos materials present and encountered in the project sites;

(ii) adopting good practices per EHS Guidelines[19] to minimize the health risks associated with asbestos materials by avoiding their use in new construction and renovation, and, if installed asbestos-containing materials are encountered, by using internationally recognized standards and best practices to mitigate their impact;[20]

(iii) training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work;

[19] ADB SPS specifies application of pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety (EHS) Guidelines.* These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in this document.

[20] The EHS Guidelines specify that the use of ACM should be avoided in new buildings and construction or as a new material in remodeling or renovation activities. Existing facilities with ACM should develop an asbestos management plan that clearly identifies the locations where the ACM is present, its condition (e. g. , whether it is in friable form or has the potential to release fibers), procedures for monitoring its condition, procedures to access the locations where ACM is present to avoid damage, and training of staff who can potentially come into contact with the material to avoid damage and prevent exposure. The plan should be made available to all persons involved in operations and maintenance activities. Repair or removal and disposal of existing ACM in buildings should be performed only by specially trained personnel following host country requirements or, if the country does not have its own requirements, internationally recognized procedures. Decommissioning sites may also pose a risk of exposure to asbestos that should be prevented by using specially trained personnel to identify and carefully remove asbestos insulation and structural building elements before dismantling or demolition.

(iv) removal, repair, and disposal of ACM shall be carried out in a way that minimizes worker and community asbestos exposure, and require the selected contractor to develop and submit a plan, subject to the PMU and PIU's acceptance, before doing so;
(v) providing adequate protection to its personnel handling asbestos, including respirators and disposable clothing; and
(vi) notifying the Rajasthan State Pollution Control Board (RSPCB) of the removal and disposal according to applicable regulations as indicated in the technical requirements and cooperating fully with representatives of RSPCB during all inspections and inquiries.

151. PMU will engage an asbestos management specialist to provide training and awareness, and to coordinate with various stakeholders on the risks, management, and mitigation measures required for the identification, safe handling, transport and disposal of the asbestos materials.

E. Pre-Construction Impacts

152. **Utilities**. Telephone lines, electric poles and wires, water lines within the proposed project locations may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with ULB will:

(i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
(ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

153. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i. e. to curb accident risks, health risks due to air and water pollution and dust and noise and to prevent social conflicts, shortages of amenities and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, swamps or in areas which will inconvenience the community. Construction sites will be selected by DBO contractor in compliance with these conditions and the same will be reflected in Site Environmental Management Plan (SEMP) which is to be prepared by DBO contractor prior to start of construction and approved by PIU. Material stockpiles will be protected by bunds during the monsoon season to prevent silt runoff into drains. The subproject is likely to generate soil from excavations, which needs to be disposed of safely. The following measures should be considered for disposal of surplus and/or waste soil:

(i) The excavated soil should be removed from construction area at the earliest for beneficial reuse such as land raising / filling of excavated areas;
(ii) Soil should be covered with tarpaulin sheets during the transportation; and
(iii) Soil transportation should not be done during the peak hours and should avoid narrow and heavy traffic routes and important religious or tourist sites.

154. **Site selection of sources of materials**. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be assessed

by PIU. Priority would be sites already permitted by Mines and Geology Department. If new sites are necessary, these would be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Department of Mines & Geology and local revenue administration. If additional quarries will be required after construction is started, then the construction contractor shall use the mentioned criteria to select new quarry sites, with written approval of PIU.

F. Construction Impacts

155. The civil works for the subproject includes construction of CWR, SPS and STP. These works will be confined to sites, and construction will include general activities like site clearance, excavation for foundations, and creation of concrete structures will be one of the major construction activities for this project. Most such structures will be constructed from reinforced concrete, where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc. , and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pump station, facilities, etc. , may be constructed from brick work, in which case this work will be done using standard house-building techniques. Some components of STP may comprise a variety of prefabricated elements which will be are installed on site as ready-made individual units. These will be directly brought from the manufacturers place to the sites lifted into position by crane, affixed to plinths or other installation points, and connected up to pipework and the electricity supply. Since these works are confined to the boundary of identified sites, there is no direct or significant interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps etc. , will have negative impacts, which needs to be avoided or mitigated properly.

156. Subproject also includes linear works (laying of 108.4 km of water pipes, and 53.4 km of sewer along the roads). This cover almost entire project area of Mandawa town. Distribution lines/small sewers (tertiary sewers) will be laid in all streets and roads, the larger sewers and water mains will be laid mostly on wider main roads. Pipes/sewers will be laid by open cut method. Water pipes will be laid in the ground without a maximum cover of 1 m, so that depth of excavation will be up to 1.5 m-1.8 m. The maximum depth for sewers depends on the design, and in Mandawa most of the sewers will be laid 1. 2 to 2 m below the ground, and some sewers will be laid deeper (>2m) and maximum depth will be 5m. Sufficient care will be taken while laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Trenchless method may also be used even where depth is less than 3. 5 m for important roads in the city where traffic density is more, and in the streets where traffic diversion is not feasible etc. Trenches deeper than 1. 5 m will be protected by bracings to avoid collapse of trenches, and also to avoid any risk to surrounding buildings. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Extraneous soil after backfilling of trenches shall be used for filling low lying area or stored/ dumped in approved debris disposal sites.

157. Although construction of these project components involves quite simple techniques of civil work, the invasive nature of excavation and the project locations in the built-up areas of the town where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as schools, religious places, hospitals and the community in general.

Although these anticipated impacts are temporary and for short duration, require proper mitigation measures to limit the impacts to acceptable levels. Physical impacts will be reduced by the method of working and scheduling of work. Likely impacts of construction phase, and appropriate mitigation measures are discussed below:

158. **Sources of Materials**. Significant amount of gravel, sand, coarse aggregate, and cement will be required for this project. The construction contractor will be required to:

(i) Use material sources permitted by government only;
(ii) Verify suitability of all material sources and obtain approval of PIU; and
(iii) Submit to PIU on a monthly basis documentation of sources of materials. If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the parties/ suppliers are having CTE/CTO from RPCB and will collect the copy of these certificates and submit to PIU/consultants.

159. **Air Quality**. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. These however will be temporary limiting to construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials;
(ii) Damp down exposed soil and any stockpiled material on site by water sprinkling;
(iii) Use tarpaulins to cover sand and other loose material when transported by trucks;
(iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site;
(v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel;
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctlycontractor’s vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site;
(vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers and DG set etc. if specifically established for this project;
(viii) If contractor procures any material (such as ready mix concrete, asphalt/macadam, aggregates etc.), from third party agencies, contractor shall ensure that such agencies have all necessary clearances/permissions as required under the law; these include CTE/CTO from RPCB, environmental clearance etc. ; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted; and
(ix) Conduct air quality monitoring according to the EMP.

160. **Surface Water Quality-Works during rains**. Run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. These potential impacts are temporary and short-term duration only. However, to ensure that these are mitigated, construction contractor will be required to:

(i) Prepare and implement a spoils management plan (Appendix 17);

(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
(iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall;
(v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it;
(vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. ;
(vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall
(viii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(ix) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(x) Dispose any wastes generated by construction activities in designated sites; and
(xi) Conduct surface quality inspection according to the EMP.

161. **Noise and Vibration Levels**. Construction works will be conducted along the roads in Mandawa urban area, where there are houses, schools and hospitals, religious places and small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearly buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle’s approach;
(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor; and
(iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.
(v) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
(vi) Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
(vii) Conduct noise monitoring/ inspection according to the Environmental Management Plan (EMP)

162. **Landscape and Aesthetics**. Some trees will be required to cut due to which landscape and aesthetic of those sites will be reduced. The construction works will produce excess

excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. Haphazard disposal of these will have negative impacts on landscape and overall aesthetics. These impacts are negative but are of short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Take all the efforts to reduce number of tree cutting by amending design;
(ii) Compensatory plantation in the ratio of 1:3 is required to increase landscape and aesthetics of the sites where tree cutting has been done;
(iii) Prepare and implement spoils management plan;
(iv) Avoid stockpiling of excess excavated soils;
(v) Coordinate with ULB for beneficial uses of excess excavated soils or immediately dispose to designated areas;
(vi) Recover used oil and lubricants and reuse or remove from the sites;
(vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(ix) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

163. **Accessibility**. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement a Traffic Management Plan (Appendix 18)
(ii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(iii) Schedule transport and hauling activities during non-peak hours;
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Drive vehicles in a considerate manner;
(vii) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
(viii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

164. Wherever road width is minimal, there will be temporary loss of access to restrains and vehicular traffic (including 2-wheelers) during the laying of pipes. Under those circumstances, contractor shall adopt following measures:

(i) Inform the affected local population 1-week in advance about the work schedule
(ii) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
(iii) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.

165. **Traffic diversion and/or road closure.** Laying of water and sewer lines simultaneously may significantly impact the traffic movement. This should be avoided as far as possible by proper

planning of construction works. If traffic diversion and/or road closure is required for the proposed works, prior consent from traffic department will be required and prior information to affected areas and public should be disseminated through consultations by CAPPC. Proper road signage and traffic aids should be provided at site. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. As the trenchless method adopted for sewers of more than 3. 5 m deep avoiding open cut excavation, this will avoid large scale disturbances in the busy roads. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan water and sewer line works to minimize traffic disturbance/blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations;
(ii) Prepare and implement a TMP (Appendix 18);
(iii) Duly consider and select sections for trenchless method of pipelaying based on traffic conditions;
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Coordinate with traffic police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints; and
(viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges.

166. **Socio-Economic–Income.** The project components will be located in government land and there is no requirement for land acquisition or any resettlement. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Prepare and implement spoils management plan (SMP)-Appendix 17; ensure that there is no unnecessary obstruction due to soil, debris on the site;
(ii) Leave spaces for access between mounds of soil;
(iii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
(iv) Increase workforce in the areas with predominantly institutions, place of worship, business establishment, hospitals, and schools;
(v) Consult businesses and institutions regarding operating hours and factoring this in work schedules;
(vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints;
(vii) Notify community/ water users in advance about likely interruptions in water supply; and
(viii) Provide alternate sources of clean water until water supply is restored.

167. **Socio-Economic** – Employment. Manpower will be required during the 36-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be

required to employ local labor force or to the maximum extent possible.

168. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Comply with all national, state and local labor laws (see Appendix 10);
(ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines[21] WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID-19 virus (Appendix 19), and Sector Specific (Water and Sanitation) Guidelines;[22]
(iii) Develop and implement site-specific occupational health and safety (OHS) plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training[23] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(iv) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology;
(v) Ensure that qualified first aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(vi) Provide medical insurance coverage for workers;
(vii) Secure all installations from unauthorized intrusion and accident risks; and
(viii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following:
- Work schedule should be adjusted to avoid peak temperature hours (12 -3 PM);
- Provide appropriate shade near the workplace; allow periodic resting and provide adequate water; and
- Provide necessary medicine and facilities to take care of dehydration related health issues.

(ix) Provide supplies of potable drinking water;
(x) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;

[21] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines. pdf?MOD=AJPERES

[22] https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES

[23] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence, but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective, and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

(xi) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(xii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(xiii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xiv) Ensure moving equipment is outfitted with audible back-up alarms;
(xv) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate;
(xvi) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively;
(xvii) Conduct regular health check-ups for workers;
(xviii) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites; and
(xix) During working in Dam area, workers should be made aware of risks of water depth and dangerous areas of water should be properly marked by fix or floating barricades and signage of danger. Workers should also be made aware for protection of biodiversity of the water and fishing should be strictly prohibited. A boat should be made available at site for transport of labour and materials and should be well maintained for any emergency condition. Workers should not be allowed to dip or bath in water of dam. Suitable working platform should be provided during construction works in water.

169. **Asbestos Containing Materials**. No ACM is proposed to be used in the subproject construction. There are however ACM in the existing water supply infrastructure, which may be disturbed or come in contact with the workers and general public and may have serious health implications. This is already discussed in under the existing facilities audit, and necessary measures are suggested.

170. **Community Health and Safety.** Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan routes to avoid times of peak-pedestrian activities;
(ii) Liaise with PIU in identifying risk areas on route cards/maps;
(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure; and
(iv) Provide road signs and flag persons to warn of on-going trenching activities.

171. Central part of the town is characterized by narrow roads. Particularly, the areas located on slopes have very narrow roads with sharp turns and are accessible only to pedestrians. Besides impeding the access, the trench excavation and pipe laying will pose safety risks to pedestrians, and the people living in these areas. The construction contractor will be required to:

(i) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned;
(ii) All trenches deeper than 1. 5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3. 5 m by adopting trenchless technology;
(iii) Survey the surrounding vulnerable buildings for likely issues in structural stability/ differential settlement during the excavation works;
(iv) Provide prior information to the local people about the nature and duration of work;
(v) Conduct awareness program on safety during the construction work;
(vi) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day; and
(vii) Provide hard barricade sand deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches.

172. **Establishment and Operation of Construction Camps and Workers Facilities.** It is likely that the contract may employ workers from outside project area, and therefore may provide temporary workers accommodation during the construction phase. Proper provision and maintenance of facilities is necessary for proper living conditions and avoid health, environment and safety issues. Workers camps may also adverse impacts on surrounding communities. Operation of construction camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Consult PIU before locating project offices, sheds, and construction plants;
(ii) Minimize removal of vegetation and disallow cutting of trees;
(iii) Provide drinking water, water for other uses, and sanitation facilities for employees;
(iv) Provided temporary rest and eating area at all work sites;
(v) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc. , shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation[24] which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meter (m^3) (volume) or 4 to 5.5 square meters (m^2) (surface) per worker, a minimum ceiling height of 2.10 m; a reasonable number of workers are allowed to share the same room– (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation

[24]https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

(IFC benchmark standards for workers accommodation is provided in Appendix 20);

(vi) Prohibit employees from poaching wildlife and cutting of trees for firewood;
(vii) Train employees in the storage and handling of materials which can potentially cause soil contamination;
(viii) Recover used oil and lubricants and reuse or remove from the site;
(ix) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(x) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(xi) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

173. **Social and Cultural Resources.** Mandawa is famous for fort and Havellis. Most of them are use as Heritage Hotels. The fort of Mandawa was founded in the 18th century situated in the middle of the town, the Mandawa Fort has been converted into a heritage hotel. Thakur Nawal Singh, son of Shardul Singh, founded the fort in Vikram Samvat 1812 (1755 AD). The fort dominates the town with a painted arched gateway adorned with frescoes of Lord Krishna and his cows. Built as per a medieval theme, the castle of Mandawa is adorned with beautiful frescoes. Rooms in the palace are decorated with paintings of Lord Krishna, exquisite carvings and amazing mirror work. The palace's Durbar Hall houses a number of antiques and paintings. Water and sewer pipeline are proposed in the cities. None of the project components are located in or close to the protected sites. Therefore, no impacts envisaged. Although none of the components are located in the areas demarcated by archaeological agencies, risk of uncovering archaeological remains during the excavations cannot be ruled out completely. More detailed Heritage Impact Assessment is referred to in Appendix 11. Construction contractors therefore should follow the below measures in conducting any excavation work:

(i) Strictly follow the protocol for chance finds in any excavation work;
(ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;
(iii) Stop work immediately to allow further investigation if any finds are suspected;
(iv) Inform local Archeological Department/Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ.

174. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU and consultant contractor will follow all the prescribed rules[25] during construction and adhering to following criteria (including but not limited to):

(i) The site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities;
(ii) Debris disposal site shall be at least 200 m away from surface water bodies;[26]
(iii) No residential areas shall be located within 100 m downwind side of the site;
(iv) The site is minimum 250m away from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies; and

[25] Construction and Demolition Waste Management Rules 2016 (refer Appendix 8).
[26] In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the Construction Manager.

(v) The local governing body and community shall be consulted while selecting the site.

175. **Night works.** Most of the construction works shall be undertaken only during day hours. Night works are required only in the extreme conditions such as road having heavy traffic in daytime and/or no alternate access can be provided for the road users, extreme climatic conditions (extreme hot during summers), religious fairs/celebrations in daytime etc. Contractors are required to take prior approval from PIU and concerned town authorities for night works. Contractors are required to adhere following conditions for night works including those prescribed by concerned authorities:

(i) Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers;
(ii) Contractors should have handheld noise level meter for measurement of noise during night hours;
(iii) Contractors should have handheld lux meter for the measurement of illumination during night hours;
(iv) Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available;
(v) Sound level should not increase as prescribe by CPCB; and
(vi) Illumination should be as follows:

Minimum illumination (lx)	Areas to be illuminated	Type of work activity
54	Illumination throughout the work area	General work area lighting, and performance of visual tasks of large size, or medium contrast, or low require accuracy
108	Illumination of work area and areas adjacent to equipment	Performance of visual tasks of medium size, or low to medium contrast, or medium required accuracy
216	Illumination of task	Performance of visual tasks of small size, or low contrast or high required accuracy or fine finish

(vii) As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site;
(viii) All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime;
(ix) Workers engaged in night works should have adequate rest/sleep in daytime before start of night works;
(x) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night;
(xi) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. , should be available with fluorescent/retro-reflective arrangements;
(xii) Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests;
(xiii) Horns should not be permitted by equipment and vehicles;
(xiv) Workers should not shout and create noise;
(xv) First aid and emergency vehicles should be available at site;
(xvi) Emergency preparedness plan should be operative during night works;

(xvii) Old persons and pregnant women and women having small kids should not work in nighttime;
(xviii) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise;
(xix) All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works;
(xx) PIU/CMSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations;
(xxi) Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement;
(xxii) After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians;
(xxiii) Drivers and workers should be alert and responsive during night works;
(xxiv) All the wages to workers working in night hours should be as per the applicable labor acts;
(xxv) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours; and
(xxvi) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

G. Operation and Maintenance Impacts

176. Water Supply System. Operation and maintenance of the water supply system will be carried out by DBO contractor for 10 years and then by Mandawa Municipality directly or through and external operator. The water supply system is intended to deliver potable water meeting drinking water standards (Appendix 21) to the consumers at their homes. This must be ensured.

177. The system has a design life of 30 years, during which shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

178. Recurrence of pipe bursting and leakage problems in water supply system will be managed by the leak detection and water auditing surveys. The operating agency will be required to ensure that the leak detection and rectification time is minimized.

179. It is proposed to use chlorine for disinfection of water, therefore there is a safety risk due to handling of large quantities of chlorine at the strategic locations such as CWR. . Likely impacts will be negligible if the various measures are suggested safety features and equipment to meet with any accidental eventuality are included in the design and development of the facility. During the operation phase, it is necessary that the facility is operated by trained staff as per the standard operating procedures.

180. Following measures are suggested for implementation/compliance during the operation phase:

(i) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative information;

(ii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only;and

(iii) Implement emergency response system (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 22.

181. Sewerage System. O & M of the sewerage system will be carried out by DBO contractor for 10 years and then by Mandawa Municipality directly or through an external operator. The sewerage system is intended to collect, convey, treat and dispose the sewage from the town areas safely. Operation will involve collection and conveyance of wastewater from houses to STP; treatment of sewage at STP to meet the disposal standards; and final disposal of treated wastewater, and treatment and disposal of sludge.

182. Treated wastewater is proposed to be utilized in reuse applications following the Sewerage and Wastewater Policy 2016 of Rajasthan, and accordingly reuse plan will be prepared by the DBO contractor during the detailed design phase. As stated previously, subproject will be implemented under DBO, and the successful bidder/DBO contactor will carry out detailed designs, therefore at present the subproject is designed in outline only. The treated wastewater if utilized for reuse purposes as per the reuse plan there will be no negative impacts, and in fact it will enhance environmental benefits in the form of water savings. Various measures to safeguard environment and health environment in utilizing the treated wastewater, including required quality for various process will be established in the reuse plan and will be implemented accordingly. All necessary safety, mitigation and monitoring measures as suggested in the reuse plan shall be implemented. The excess/ surplus/unused treated wastewater, if any will be discharged into nearby drain/depression. Considering the existing status of discharge point and the degree of treatment proposed, no significant impact envisaged.

183. STP operational procedures will be firmed up during the detailed design phase, including the amount of automated or manual operation. It must be ensured that the facility is operated with standard operating procedures and only by trained staff. Ensuring uninterrupted power supply with back-up facility is a must. Standard operating procedures and operation manual will be prepared by the DBO contractor. Besides routine operation, this should cover all necessary items such as preventive maintenance, periodic maintenance and emergency maintenance, replacement of pumps, motors, and other electro-mechanical parts as per the design life to optimize energy use and system efficiency etc. Adequate resources – technical and financial, has been taken into consideration in the project design. Manual will also include safety awareness and mock drills for worker safety.

184. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a sludge sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements and prepare sludge management plan. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil

conditioner" and it requires DBO contractor "to conform to the regulations of public health and environment protection norms". The norms for safe use of processed sludge as fertilizer and soil conditioner are discussed in Para 129 of this IEE. This follows the Sewerage and Wastewater Policy, 2016, which suggests "use of sludge produced from the treatment as fertilizer and soil conditioner after processing". A sludge disposal site will be identified during the detailed design phase to dispose unutilized dried sludge in reuse applications. The updated IEE will include the details of disposal site. If the sludge is managed accordingly, there will no impacts.

185. During the operation phase, it is necessary that the facility is operated by trained staff as per the standard operating procedures. Following measures are suggested for implementation/ compliance during the operation phase:

(i) Ensure that treated wastewater meets the established discharge standards all times; conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards;
(ii) Ensure implementation of reuse plan, and ensure intended quality for each direct reuse;
(iii) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan;
(iv) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, Fertilizer Control Order (FCO), 1985, amendments in 2009 and 2013. It shall not be used for food crops;
(v) Ensure valid consent to operate (CTO) from RPCB for operation of STP;
(vi) Ensure that all conditions/standards prescribed by RPCB are compiled duly;
(vii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only;
(viii) Implement emergency response system (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 22;
(ix) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility;
(x) Operate and maintain the facility following standard operating procedures of operational manual;
(xi) Undertake preventive and periodic maintenance activities as required;
(xii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations;
(xiii) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RPCB.

186. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to

implement rapid and effective repairs where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should inter alia be followed:

(i) Establish regular maintenance program, including:
  (a) Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas;
  (b) Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration.
  (c) Monitoring of sewer flow to identify potential inflows and outflows; and
  (d) Conduct repairs on priority based on the nature and severity of the problem;
  (e) Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g., pump station failures, sewer line ruptures, or sewer line blockages).

(ii) Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;

(iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system;

(iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers;

(v) Develop an ERS for the sewerage system leaks, burst and overflows, etc.;

(vi) Provide necessary health & safety training to the staff;

(vii) Provide all necessary personnel protection equipment;

(viii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works:
  (a) As far as possible use remote/CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose;
  (b) As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose;
  (c) Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision;
  (d) Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers/manholes prior to maintenance process;
  (e) Provide suitable personal protective equipment that may include waterproof/abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important;
  (f) Provide adequate welfare facilities, including clean water, soap, nail

brushes, disposable paper towels, and where heavy contamination is foreseeable, showers;
(g) For remote locations portable welfare facilities should be provided;
(h) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities;
(i) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings;
(j) Make effective arrangements for monitoring the health of staff; and
(k) Keep emergency preparedness plan ready before starting the work of sewage system cleaning.

187. Biological hazards are among the environmental risks that may adversely impact the health and wellness of the workers and the community. Breakouts of diseases such as diarrhea, flu or pandemics such as the coronavirus disease (COVID-19) shall be avoided. Designs and implementation of treatment systems shall ensure that disease-causing pathogens or viruses are disinfected and will not cause any health issues. The World Health Organization has released an interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID-19 virus (see Appendix 19). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

188. **Operation of FSSM.** About 9% of total households will be covered with FSSM system wherein which septage from individual septic tanks at houses will be collected via mobile/vehicle mount tankers with suction equipment, transport and discharged into STP for safe treatment and disposal. Although system will be completely mechanized, given the very harmful nature of septage, following precautionary measures shall be implemented:

(i) Create awareness program on the FSSM in general public;
(ii) Implement health and safety plan for FSSM;
(iii) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment and ensure their usage;
(iv) Ensure that the system is operated completely mechanically, with least involvement of workers; there shall be no direct contact of septage to any worker or staff;
(v) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places;
(vi) Conduct regular health checks; and
(vii) Ensure that tankers cleaning is done mechanically, and in the demarcate area at STP, and the wastewater generated in the process shall be discharged into STP.

189. In Mandawa, at present people depend on septic tank for discharge of sewage. Once the sewerage system is operational, these septics will be decommissioned; and the wastewater outlets from the houses will be connected to sewers. Contractor should prepare a decommissioning plan for all septic tanks.

H. Cumulative Impacts

190. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of a project or activity when added to other existing, planned, and/or reasonably anticipated future ones. The subproject aims to improve urban water supply and sewerage in Mandawa Town, by rehabilitating, augmenting, and creating required new infrastructure.

191. Both water supply and sewerage works are proposed to be taken up simultaneously in Mandawa Town, which is a small town congested with people, traffic and activities. There are sensitive places like hospitals, schools, and religious places. Works will be spread over entire town, covering all the roads and streets. Although no other notable public works are anticipated during the project implementation on public roads, there will be usual construction activities, such as building construction, as Mandawa is a developing town. Given dry and windy weather conditions, dust generation from cumulative construction activities may be significant, and this may increase the particulate matter concentration in ambient air. Dust control measures suggested in the EMP aim to minimize the dust generation from the subproject construction activities. Suggested trenchless method, by avoiding excavation, will also help in reducing the overall dust generation from the subproject activities. If there are any road improvement works proposed to be implemented in Mandawa, scheduling of works needs to be coordinated with the respective road agency (ULB or Public Works Department [PWD]) so that improved roads are not subjected for excavation. There is also a need to streamline water and sewer line works to avoid repeated excavations in the same road/street. The increase in road traffic, disturbance to traffic, public safety and worker safety issues, damage to existing utilities, influx of outstation workers, etc. , due to various simultaneous construction works will be notable. However, the measures suggested in the EMP will minimize these impacts greatly, and therefore effective implementation of EMP must be ensured. Thus, the net impacts are unlikely to be significant.

192. **Project Benefits.** The citizens of the Mandawa will be the major beneficiaries of the improved water supply and sewerage system, as (i) they will be provided with a constant supply of better quality water, piped into their homes at an appropriate pressure; and (ii)the human waste from the homes will be removed rapidly, which otherwise would flow in open drains. This should improve the environment, should deliver major improvements in individual and community health and well-being. The project will improve the over-all health condition of the town as water borne diseases will be reduced. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

193. The active participation of stakeholders including local community, NGOs/CBOs, and the media in all stages of project preparation and implementation is essential for successful implementation and as well as operation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB SPS, 2009.

194. A three-tier consultation process has been adopted for RUIDP: focus group discussions, primary household sample surveys and a town-level public consultation workshop. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided, and government and utility agencies responsible for provision of services, Mandawa Nagar Palika Mandal, Public Health Engineering Department, and Rajasthan Pollution Control Board. Secondary stakeholder are: NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, the executing and implementing

agencies (LSGD and RUIDP), Government of India and the ADB.

B. Public Consultation

195. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction. During project/IEE preparation stage, public consultations were done near two proposed STP sites, SPS and CWR locations and other locations of proposed sewerage and water supply network to access the awareness of general public, present water supply situations, environmental and health conditions in town, their opinion about the proposed project and suggestions. Local residents, businesspersons (vendors, hawkers, shopkeepers etc.), Government officials, women and residents were consulted during public consultations in July 2018 and October 2018. The proposed Water supply and STP facilities will cover the entire Mandawa town and the people consulted were all residents of Mandawa and are direct beneficiaries. Public consultations were also done at nearest habitations of sub-project locations. Details of public consultations done are given in Appendix 23).

1. Consultation during Project Preparation

196. Institutional consultations were conducted with the Governmental Departments such as Local Self Government Department, Public Works Department, Pollution Control Board, Public Health Engineering Department, Mandawa Nagar Palika Mandal, etc. The project proposals are formulated in consultation with PHED and Mandawa Nagar Palika Mandal and the proposals are finalized after certification of EO Mandawa NP that the proposals suit the requirements of the ULB.

197. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. Public consultation had been conducted to assess the impact of proposed civil work on the livelihood of the people, local environmental set up and also to prepare Initial Environmental Examination (IEE). The site verification reveals that, all the components of the sewerage works are either located on vacant government land or along the existing right-of-way (ROW) of the town. The subproject details have been explained in detail to the people who are involved in public consultation and also asked their suggestions and willingness to complete the proposed civil work. It is observed that people shown their willingness in favour of the sewerage and water supply project at Mandawa. They are agreed to take up house service swear and water connections. Few environmental issues like availability of access during construction, generation of dust & noise are for short period and not a major concern for villagers. Report of public consultations are attached in Appendix 23 with this report. Main issues discussed are**:**

(i) Awareness and extent of the project and development components
(ii) Benefits of Project for the economic and social Upliftment of Community
(iii) Labour availability in the Project area or requirement of outside labour involvement
(iv) Local disturbances due to Project Construction Work
(v) Necessity of tree felling etc. at project sites
(vi) Water logging and drainage problem if any
(vii) Climatic Conditions
(viii) Drinking water problem
(ix) Sewerage system
(x) Forest and sensitive area nearby the project site
(xi) Movement of wild animal etc.

(xii) Pollution level during construction period specially dust and and noise pollution
(xiii) Health and Hygiene
(xiv) Safety of residents during construction phase
(xv) Solid waste disposal system
(xvi) Reuse of treated effluent
(xvii) Disposal of treated effluent in natural waterbody; and
(xviii) Requirement of enhancement of other facilities.

198. It was observed that people are willing to extend their cooperation as the proposed activities are proposed to enhance the infrastructure service levels and the living standard of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place, especially for sewerage system, for its best functioning and to have the maximum health and aesthetic benefits.

199. The old city area is very congested and traffic is mostly light vehicle. The proposed project is a need to this town. Locals are very much in favor of the project and they wants that this should be completed as early as possible. These local people are suffering from present water supply, sewerage and solid waste disposal management in this town. People are ready to extend all types of support to during execution of the project.

200. Consultations were also carried out during preparation of IEE in October 2018 also and will continue throughout the subproject cycle. During Preparation stage, public consultations were done near different locations of water supply & sewerage works to access the awareness of general public, present water supply situations, environmental and health conditions in town, their opinion about the proposed project and suggestions (if any). It was found that water supply in the town is unreliable and water is supplied once in two days for 0. 5-1. 0 hour. The sanitation conditions are very poor and no sewerage system exists in town. Most of the households are dependent on individual septic tanks and dispose their sewer directly in to drains, which ultimately mix with river through municipal nallas. Details of consultations during design stages are given in Appendix 23.

201. City Level Committee: CLC) consultation meeting was also conducted at Jhunjhunu on 02. 01. 2018 to discuss various issues like land availability, scope of works etc. under the chairmanship of District Collector, Jhunjhunu, in which representatives of primary and secondary stakeholders were invited. The feedback and concerns of the stakeholders were taken into consideration in detail designs of the project. Approval was taken from CLC. Executive Engineer PIU, RUIDP (Jhunjhunu) has prepared /issued the Minutes of the Meeting and circulated among all concerned officials and Government departments. Minutes of CLC meeting and photographs of CLC meeting is given in Appendix 24.

2. Consultation during construction

202. Prior to start of construction, Nagar Palika Mandawa and PIU with the assistance of PMCBC and CSMC/CAPPC will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/ prominent citizens to encourage the participation of the people to discuss various environmental issues. At each ward/neighborhood level, focus group meetings will be conducted to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a

mechanism through which stakeholders can participate in project monitoring and evaluation.

203. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Nagar Palika Mandawa / PIU with the help of Community Awareness and Public Participation Consultant (CAPPC) will organize public meetings and will appraise the communities about the progress on the implementation of EMP. Meeting will also be organized at the potential hotspots/sensitive locations before and during the construction.

C. Information Disclosure

204. Executive summary of the IEE will be translated in the local language and made available at the offices of Nagar Palika Mandal Mandawa, RUIDP PMU and PIU. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Hindi will be placed in the official website of the Nagar Palika Mandawa/RUIDP after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

205. Public information campaigns via newspaper/radio/TV, to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction site for the information of general public.

206. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, public consultations etc.

207. Project related information shall be disclosed through public consultation and making relevant documents available in public locations. PMU and PIUs shall provide relevant safeguards information in a timely manner, in an accessible place and in a form and languages understandable to affected person and other stakeholders. For illiterate people, other suitable communication methods will be used.

208. At minimum, the following documents shall be made available at the offices of project agencies - PMU, PIU and Block level offices for public reference, and shall also be uploaded on respective websites.

(i) Summary of project and draft IEE (in Hindi and English)
(ii) Draft IEE Report (in English)
(iii) Final IEE Report (in English)
(iv) Updated/amended IEE (in English)
(v) Corrective action plan prepared during project implementation (English); and
(vi) Semi-annual Environmental Monitoring Reports (SEMRs) - (English)

209. A concise summary of project and draft IEE report (in Hindi), providing all necessary details of proposals, implementation arrangements, subproject locations, likely issues and mitigation and monitoring measures and grievance redress mechanism, shall be made available to the stakeholders at consultation meetings. This should also provide contact information of

project agency. This summary shall also be displayed at the notice boards of PMU, PIU and other public places. During project implementation, relevant information about any major changes to project scope will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders. The following documents will be submitted to ADB for disclosure on ADB website. PMU will send written endorsement to ADB for disclosing these documents:

(i) Final IEE;
(ii) Anew or updated IEE and corrective action plan prepared during project implementation, if any; and
(iii) Environmental monitoring reports

VIII. GRIEVANCE REDRESS MECHANISM

A. Project Specific Grievance Redress Mechanism

210. A project-specific, three-tier grievance redress mechanism (GRM) covers both environment and social issues. The GRM will be established to receive, evaluate, and facilitate the resolution of affected persons' concerns, complaints, and grievances about the social and environmental performance at project level. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns related to the project. Assessment of the GRM designed and implemented for Rajasthan Urban Sector Development Program (RUSDP)[27] the system was effective in timely resolution of grievances in a transparent manner.[28] The multichannel, project-specific, three-tier GRM is functional at RUSDP, hence the design of GRM for RSTDSP takes into account the proposed institutional structure for RSTDSP and the positive features and learnings from the previous GRM.[29]

211. **Common Grievance Redress Mechanism.** A common GRM will be in place for social, environmental, or any other grievances related to the project; the resettlement plans (RPs) and IEEs will follow the GRM described below. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.

[27] The procedures followed for grievance redress during implementation of RUSDP Phase III included the project GRM and the pilot GRM software application (smart check) in Pali, the Sampark portal of Government of Rajasthan, and the Chief Minister's helpline. Complaints received through various channels were mostly minor and pertained to damage to existing water supply pipelines and disruption of water supply during construction, delays in road restoration, and pending new connections. Complaints related to damage to private property (compound walls/steps, etc.) were less in number. The grievances were mostly possible to resolve in coordination with the contractors. Complaints received were immediately referred by the CAPPC/PMDSC supervision staff to the PIU Nodal officer (safeguards) and concerned engineer at PIU, who advised them on further action. Follow up with the contractor on complaint resolution was undertaken by PIU Nodal officer CAPPC and PMDSC and final feedback sought from complainant upon resolution. Complaints requiring inter-departmental coordination were referred to the PMU for resolution, and feedback provided to complainant. The PMU kept regular track of grievances through WhatsApp and email alerts, ensuring registration and follow-up until resolution.

[28] Town-level grievance registration data indicates that a large number of grievances were registered, pointing to the effectiveness of the multi-channel GRM. No major grievance was received for RUSDP Phase III. The GRM helped smoothen the process of project implementation, hence the proposed architecture for the RSTDSP GRM remains similar, with some refinement, taking into account the changes in institutional setup proposed for project implementation.

[29] Continued logistics support at field level will be key to successful management of grievance redress under RSTDSP. The target date for establishment of the first level (PIU level) and second level (Zonal level) of GRM is before loan negotiation.

212. Public awareness campaigns within entire ULB/ Municipal area will ensure that awareness on grievance redress procedures is generated. The nodal officer- social/environment at field level through community awareness and public participation consultant (CAPPC) will conduct ULB/ Municipal area-based awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Contractors will provide pamphlets to communities prior to start of works and billboards during construction. The pamphlets and billboards will include relevant environmental and social safeguards, GRM information, and contact details of key personnel from PIU and contractors.

213. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaint/suggestion boxes that will be installed by project PIUs or by e-mail, by post, or by writing in a complaints register in ULB offices/complaints register at contractor's work site[30] or by sending a WhatsApp message to the PIU[31] or by dialling the phone number of town level PIU/CAPPC or by dialling a toll-free number.[32] Any aggrieved person can also avail the facilities of online grievance monitoring system 'Rajasthan Sampark' portal to register their grievances which is a parallel mechanism of grievance registration, in addition to the project GRM.[33] Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken and feedback provided to the complainant on action/decision taken. The Safeguard and safety officer of town/city level PIU will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, with the assistance of project consultants. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and officials of PIU with assistance from CMSC and CAPPC on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact numbers and names of the concerned PIU safeguard and safety officer, contractors, CAPPC and CMSC personal will be posted at all construction sites at visible locations.

(i) **1st level grievance**. The contractors, PIU executive engineer/assistant engineer designated as safeguard and safety officer (social and environment), CMSC (safeguard staff) and CAPPC can immediately resolve issues on-site, in consultation with each other and will be required to do so within 7 days of receipt of a complaint/grievance. If required, city level monitoring committee (CLMC)[34] will be involved in resolution of grievances at the 1st level;

(ii) **2nd level grievance**. All grievances that cannot be redressed within 7 days at field/PIU level will be brought to the notice of Zonal PIU headed by Additional Chief Engineer (ACE). The ACE at zonal PIU will resolve the grievance within 7 days of

[30] RUSDP piloted an online application based live GRM counter for resolution of public grievances over and above the usual process of grievance registration and redressal. This app based GRM - "RUIDP Smart Check" is available at Google play store (free of cost) and is operational. The RUIDP Smart Check "app" was launched in Pali town in July 2017 and is proposed to be scaled up in RSTDSP project towns. For persons without access to the application, the traditional channels will continue to be available.

[31] It is suggested for each PIU to have a dedicated WhatsApp group for registration of grievances and receipt of quick feedback, to be followed by more formal communication.

[32] Project contractors in all project towns will have a toll-free number with specific working hours for registration of grievances related to RSTDSP.

[33] http://www. sampark. rajasthan. gov. in/RajSamWelcome. aspx

[34] The CLMC has been formed at the town/city level for planning and monitoring of work, resolve issues related to departmental coordination etc. It is headed by Commissioner/Executive Officer ULB (Chairman) and city engineer of public health engineering department (PHED), public works department (PWD) and head of PIU acting as Member Secretary.

receipt of compliant/grievance in discussion with the ASO, field level PIU, CMSC, CAPPC and the contractor; and

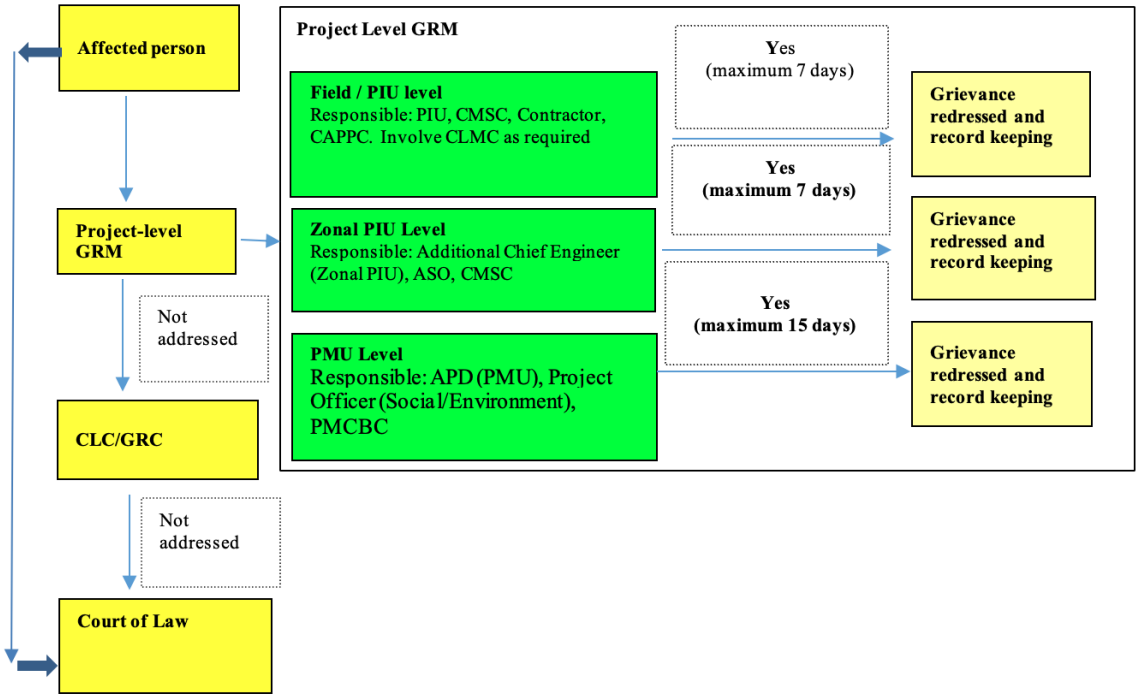
(iii) **3rd level grievance**. All the grievances that are not addressed by Zonal PIU within 7 days of receipt will be brought to the notice of the PMU. Depending on the nature of grievance, the project officer (social/environment) at PMU will resolve the grievance within 15 days of receipt of grievance with necessary coordination of Zonal PIU and CMSC and guidance/instruction of additional project director (APD-PMU).

(iv) Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the CLC/GRC, which has been set up.[35] In its role as a GRC, the CLC will meet whenever there is an urgent, pending grievance. Other grievances can be discussed during its regular meetings. Zonal PIU will inform the CLC regarding any grievances required to be resolved urgently. The GRC will resolve the grievance within 15 days of receiving the complaint. In case of any indigenous peoples impacts in subprojects, the CLC/GRC must have representation of the affected indigenous people community, the chief of the tribe or a member of the tribal council as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous people groups.

(v) The multi-tier GRM for the project is outlined below (Figure 23), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration.

[35] City Level Committee (CLC)/grievance redress committees (GRCs) has been constituted for each town/city under the Chairmanship of District Collector to provide overall subproject guidance and “to sort out issues and remove hindrances, if any”. CLC formed at city-level/district level with members composed of: District Collector as Chairperson, and following as members: ULB Commissioner/Mayor/Chairman; Deputy Mayor/Vice Chairman ULB; Chairman/Secretary Urban Improvement Trust (UIT); Head of Zonal/field level PIU as Member Secretary; one representative each from relevant government departments as appropriate (PWD/PHED/Town Planning Department etc.). All CLCs in their role as GRCs will have at least one-woman member/chairperson. In addition, for project-related grievances, representatives of affected persons, community-based organizations (CBOs), and eminent citizens will be invited as observers in GRC meetings. The concerned Member of Parliament (MP) and Member of Legislative Assembly are also part of the CLC.

Figure 23: Grievance Redress Mechanism-RSTDSP



APD = Additional Project Director, ASO = Assistant Safeguards Officer, CAPPC = community awareness and public participation consultant, CMSC =construction management and supervision consultants, CLC = city level committee, CLMC = city level monitoring committee, GRC = grievance redress committee, PIU = project implementation unit, PMU = program management unit, PMCBC = project management and capacity building consultant.

214. The project GRM notwithstanding, 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. In case of grievance related to land acquisition, resettlement and rehabilitation, the affected persons will have to approach a legal body/court specially proposed under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARRA), 2013.[36]

215. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[37]

216. **Record-keeping**. The PIU of each town/city will keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance,

[36] The Authority admits grievance only with reference to the Land Acquisition and R&R issues under the RFCTLARRA, 2013.
[37] Accountability Mechanism. http://www. adb. org/Accountability-Mechanism/default. asp.

agreed corrective actions and the date these were affected and final outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMU office, PIU offices, and on the web, as well as reported in monitoring reports submitted to ADB on a semi-annual basis. The sample grievance registration format is attached as Appendix 28 and the officer order establishing the GRM is attached as Appendix 29.

217. **Periodic review and documentation of lessons learned.** The PMU Project Officers (Social and Environment) will periodically review the functioning of the GRM in each town and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

218. **Costs.** Contractors are required to allocated budget for pamphlets and billboards as part of the EMP. Costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the concerned PIU at town level while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

219. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable level and monitoring the same. This is presented in the following tables, which show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

220. 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 assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

221. A copy of the EMP must always be kept at work sites. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The 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.

222. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate budget for compliance with these EMP measures, requirements and actions.

223. The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) 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 SEP;

and (iv) budget for SEP implementation. No works can commence prior to approval of SEP.

224. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 13: Design Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Sewage Treatment Plant (STP)	Odour nuisance and aesthetics	(i) Provide a green buffer zone of 10-20 m wide all around the STP with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation. (ii) Develop layout plan of STP such that odour generating units (such as sludge / solids handling facilities) are located away from the surrounding area with future development potential.	DBO Contractor / PIU	Project costs
All work sites	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP and CWR or any other site with trees (ii) Obtain prior permission for tree cutting at STP and CWR site or at any other site that may require tree cutting finalized during detailed design (iii) Plant and maintain 3 trees for each tree that is removed	DBO Contractor / PIU	Project costs
Design of water supply and sewerage system	Non-compliance or non-adherence with the environmental considerations proposed in preliminary designs during detailed design:	Ensure compliance with the following during the detailed design: (i) Adopting conjunctive use approach water source; utilizing feasible surface water sources and groundwater source optimally thereby reducing the existing groundwater abstraction to the extent possible (ii) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically). (iii) Recovering wash water from treatment process to optimise the water use (iv) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage (vi) Avoiding usage of asbestos containing materials	DBO Contractor / PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(vii) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies (viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources (ix) Adopting a combined approach of sewerage system and fecal sludge and septage management to cover 100% population of the town with safe collection, conveyance and treatment of sewage generated in the town (x) Provision of appropriate personal protection equipment to the workers and staff		
Seismic sensitivity	Damage to infrastructure and potential risks: project area in partly moderate earthquake risk zone (Zone III) and Low earthquake risk (Zone II)	(i) Designs of project component structures shall comply with relevant codes of design such as Bureau of Indian Standard (BIS) specifications for earthquake resistant design (IS: 1893: Criteria for earthquake resistant design of structures).	DBO Contractor/PIU	Project costs
Groundwater source	Source sustainability and over exploitation of groundwater	(i) Prepare a groundwater harvesting and artificial recharge plan; (ii) Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect. (iii) Household level artificial recharge (like roof top rainwater harvesting) should be encouraged. (iv) Groundwater regulation – options to close / discontinue all the tube wells in houses used for domestic purposes in Mandawa in a phased manner once the project is implemented.	DBO Contractor/PIU	Project costs
	Groundwater contamination	(i) Prepare a source protection plan for tube wells and open wells (ii) Prevent flow of untreated wastewater in the drains (iii) Ensure proper construction of tube wells including casing pipes to prevent water contamination from well spaces, and due to flooding	DBO Contractorand ULB/PIU	Project costsand ULB costs

<table>
<tr><th>Field</th><th>Anticipated Impact</th><th>Mitigation Measures</th><th>Responsible for Implementation/ Monitoring</th><th>Cost and Source of Funds</th></tr>
<tr><td></td><td></td><td>(iv) Measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines).
(v) Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality</td><td></td><td></td></tr>
<tr><td>CWR and STP</td><td>Hazardous / harmful chemicals</td><td>(i) Reduce the use of chemicals in the treatment process to the extent possible (water treatment); provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives.
(ii) Establish proper handling/ storage / application system according to the relevant standards, safety precautions and prevent accidental release / spill
(iii) Provide leak/spill detection, collection / capture and safe disposal facilities such as chlorine absorption and neutralization facility
(iv) Provide ventilation, lighting, entry and exit facilities; visibleand audible alarm facilities to alert chemical/chlorine leak
(v) Facility for isolation in the event of major leakages
(vi) Eye washand shower facility
(vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc. ,)
(viii) Provide training to the staff in safe handling and application of chemicals, material safety, and standard operating procedures and emergency responses
(ix) Develop emergency response procedures</td><td>DBO Contractor/PIU</td><td>Project costs</td></tr>
<tr><td>Sewage Treatment Plant (STP)</td><td>Inefficient sewage treatment, treated effluent characteristics not satisfying the CPCB/RSPCB standards</td><td>(i) Ensure that the selected process in appropriate for the town and meets discharge standards and facilitate reuse
(ii) Treated effluent should meet the criteria set by RSPCB/CPCB or the following bid specified parameters, whichever are stringent:
<table>
<tr><td>Parameter</td><td>Standards</td></tr>
<tr><td>BOD, mg/l</td><td>10</td></tr>
<tr><td>TSS, mg/l</td><td>20</td></tr>
<tr><td>COD, mg/l</td><td>50</td></tr>
</table></td><td>DBO Contractor / PIU</td><td>Project costs</td></tr>
</table>

<table>
<tr><th>Field</th><th>Anticipated Impact</th><th>Mitigation Measures</th><th>Responsible for Implementation/ Monitoring</th><th>Cost and Source of Funds</th></tr>
<tr><td></td><td></td><td><table><tr><td>Nitrogen-Total, mg/l</td><td>10</td></tr><tr><td>Phosphorus- Total, mg/l</td><td>1</td></tr><tr><td>Faecal Coliform (MPN/ 100 ml)</td><td>100 (Desirable) 230 (Permissible)</td></tr></table></td><td></td><td></td></tr>
<tr><td>Change in raw sewage quality</td><td>Mixing of industrial effluent with sewage</td><td>(i) No industrial wastewater shall be allowed to dispose into municipal sewers
(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers
(iii) Ensure that there is no illegal discharge through manholes or inspection chambers
(iv) Conduct public awareness programs; in coordination with RSPCB and CLC.
(v)Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards</td><td>DBO Contractorand PIU / PMU</td><td>Project Costs</td></tr>
<tr><td>STP</td><td>Use of treated wastewater for reuse applications</td><td>Develop wastewater reuse plan for Mandawa town in consultation with CLC as per the Sewerage and Wastewater Policy, 2016. The Reuse Plan shall inter alia include the following:
(i) Identify potential reuse application in Mandawa, and establish quality criteria for each of the use
(ii) For applications that use treated wastewater directly (e. g. , agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured;
(iii) Prepare a reuse plan for agriculture, if that is the priority use or one of the applications as per the CLC in Mandawa, clearly indicating the limits (geographical / crops / type of application / type of soils etc. ,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.
(iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e. g. , Agricultural Department,</td><td>DBO Contractor / PIU</td><td>Project costs</td></tr>
</table>

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		District Collectorate) (v) Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse		
STP	Treated effluent discharge into water channel/drains and associated impacts on river water and downstream users	(i) Obtain of consent of RSPCB for discharge of treated wastewater into drains (ii) Conduct a baseline water quality assessment of receiving water body (iii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards (iv) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan	DBO Contractor/PIU	Project Costs
STP	Sludge management and reuse	(i) Prepare a sludge management plan (ii) Prepare a dried Sludge utilization plan for Mandawa within the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner (iii) Plan should clearly various potential uses and demand in Mandawa and surroundings (iv) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc. ,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations. (v) Identify a landfill / suitable site for disposal of surplus dried sludge (vi) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO (vii) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)	DBO Contractor/PIU	Project costs
Sewer network – collection and conveyance	Poor design leading to overflows, blockages,	(i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
	and creating nuisance, pollution	(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) (iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation (viii) Take necessary precautionary measures to protect sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers from the time it is constructed to the start of operation phase		
FSSM	Occupational health and safety issues, and impact on STP process	(i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses (ii) Create awareness program on the FSSM from collection to treatment system that will be adopted (iii) Design the sewage treatment process duly considering mixing of septage (iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers (v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP (vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		personal protection equipment (vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places (viii) Conduct regular health checks (ix) Prepare Health and Safety Plan for FSSM		
Physical Cultural resource	Encroachment/ damage to protected monuments and chance finds	(i) consult Department of Archaeology and Museums to obtain an expert assessment of the archaeological potential of the site; (ii) consider alternatives if the site is found to be of high risk; (iii) include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and (iv) develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve: • Having excavation observed by a person with archaeological field training; contractor should employee a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities • Conduct awareness training to contractor & supervision staff prior to start of excavation; • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ	PIU	
Asbestos cement (AC) pipes in existing water supply system:	Health impacts due to air borne asbestos if handled unsafely, cut,	(i) Develop ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in	DBO Contractor/PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
clearing, transfer and disposal; work in narrow streets, and interventions in existing AC pipelines	drilled or broken into pieces	Appendix 16. Adhere to the workflow process suggested in Figure 22. (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (v) Identify risk of intervention with existing AC pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods. (vi) Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to (vii) Maintain records of AC pipes as per the AMP		
Asbestos materials stored in existing campus	Health impacts due to air borne asbestos if handled unsafely, cut, drilled or broken into pieces	(i) Conduct survey and inventory of existing asbestos materials on site (ii) Conduct risk assessment to determine extent of asbestos materials currently on-site (ii) Coordinate and provide support to the asbestos management service provider on the requirement of sampling, testing and disposing existing asbestos materials (iii) Ensure the selected area for temporary storage is suitable for safe storage of asbestos materials (iv) Incorporate international and national standards considered in designing the temporary storage (v) Ensure that handling and disposal of asbestos materials are carried out by specially trained service provider/s following Government of India requirements, or in their absence, internationally recognized procedures Refer to the requirements of the Asbestos Management Plan (Appendix 16) and instructions of the Asbestos Expert	DBO Contractor/PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Preparation of plans and protocols	Various impacts	(i) Preparation of ACM Management Plan (ii) Prepare traffic management plan (iii) Prepare occupational health and safety plan (iv) Prepare spoils management plan	DBO Contractor and PMCBC (for ACM plan)	Approval of plans by PIU

Table 14: Environmental Management Plan of Anticipated Impacts during Pre-Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Compliance with environmental subproject selection criteria	Environmental impacts due to subproject	Compliance with environmental subproject selection criteria	DBO Contractor, PIU and Mandawa Nagar Palika Mandal	PMU	No costs required
Environmental monitoring of baseline conditions of air, noise, water and soil	To establish base line environmental conditions	Environmental monitoring through NABL accredited laboratory	Construction contractor	Consultants/PIU	Contractor
Legal compliance	Environmental legal noncompliance may attract legal actions Failure to obtain necessary consents Permits, NOCs etc. can result to design revisions and /or stoppage of works	(i)Obtain all consents, clearances (CTE/CTO from RPCB), permits NOCs etc. before start of construction works Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (ii)Following consents are required- Tree cutting-local authority Storage, handling and transport of hazardous materials- RPCB Sand mining, quarries, borrow areas- Department of mines and Geology	PIU/Consultants in coordination of Nagar Palika	PMU	Cost of obtaining all consents, permits, clearance, NOCs etc. prior to start of civil works responsibility of PIU.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		Traffic diversion/road cutting- local authority, traffic police (iii)Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc. (intake works) (iv)Include in detailed design drawings and documents all conditions and provisions; if necessary			
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils management plan (Appendix 17) and traffic management plan (Appendix 18)	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 17), and traffic management plan (Appendix 18).	No cost required. Mitigation measures are part of TOR of PMU, PIU and Consultant
Physical Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	• Develop a protocol for use by the construction contractors in conducting any excavation work, to	DBO Contractor and PIU	Heritage Impact Assessment and Chance Finds Protocol	No cost required. Mitigation measures are part of TOR of PIU and Consultant

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	Encroachment/ damage to protected monuments and chance finds	ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved. • consult Department of Archaeology and Museums to obtain an expert assessment of the archaeological potential of the site; • consider alternatives if the site is found to be of high risk; • include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and • develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve:			

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		• Having excavation observed by a person with archaeological field training; contractor should employee a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities • Conduct awareness training to contractor & supervision staff prior to start of excavation; • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ			
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas;	Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.			
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Department of Mines and Geology (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and	Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PIU.			
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents (including CTE for STP from RSPCB), permits, clearance, NOCs, etc. prior to award of civil works. Following consents are required- Tree cutting- local authority Storage, handling and transport of hazardous materials- RSPCB Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary	DBO Contractor and PIU and Consultant	Incorporated in final design and communicated to contractors.	No cost required. Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU. Mitigation measures are part of TOR of PIU and Consultant

Table 15: Environmental Management Plan of Anticipated Impacts during Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
EMP Implementation	Irreversible impact to the environment, workers, and community	(i) Contractor is required to depute a qualified and experienced EHS officer/supervisor for monitoring of EMP implementation measures (ii) Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labor laws, applicable environmental laws, etc.	Construction Contractor	(i) Certificate of Completion (Safeguards Compliance Orientation) (ii) Posting of Certification of Completion at worksites (iii) Posting of EMP at worksites	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU. Other costs responsibility of contractor.
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials (ii) Damp down exposed soil and any stockpiled material on site by water sprinkling; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; (iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site (v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel (vi) Fit all heavy equipment and machinery with air pollution control devices which are operating	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Certification that vehicles are compliant with Motor Vehicle Rules	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		correctly, contractor's vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site (vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers and DG Set etc. if specifically established for this project. (viii) If contractor procures any material (such as ready mix concrete, asphalt/macadam, aggregates etc. ,) from third party agencies, contractor shall ensure that such agencies have all necessary clearances / permissions as required under the law; these include CTE/CTO from RSPCB, environmental clearance, etc. , ; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted (ix) Conduct air quality monitoring according to the Environmental Management Plan (EMP).			
Surface water quality	Works in rains/ Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of pipelines can	(i) Prepare and implement a spoils management plan (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies;	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	contaminate nearby surface water quality.	designated disposal areas; (iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall (v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall (ix) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (x) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (xi) Dispose any wastes generated by construction activities in designated sites; and (xii) Conduct surface quality inspection according to the		(iii) Records of surface water quality inspection; (iv)Effectiveness of water management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		Environmental Management Plan (EMP).			
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU/Consultant so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10m or more from the vehicle/s. (v) Conduct noise quality monitoring as per EMP	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and nighttime noise levels (see Appendix 9 of the IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Landscape and aesthetics	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants,	(i) Prepare and implement spoils management plan (Appendix 17); (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with ULB/PIUfor beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy:	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iiv) Worksite clear of any excess excavated earth, excess construction materials, and	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	and other similar items.	reuse, recycling and disposal to designated areas; (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (vii) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.		solid waste such as removed concrete, wood, packaging materials, empty containers	
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PIU the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	Construction Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit from the Revenue Department; and (iii) Plant three native trees for every one that is removed as per RUIDP Circular.	Construction Contractor	PIU to report in writing the no of trees cut and planted.	Cost for implementation of mitigation measures responsibility of contractor.
Land use	Environmental Issues due to land use change	The impact due to change in land use will be negligible due to this project.	Not applicable	Not applicable	Not applicable
Accessibility	Traffic problems and conflicts near project locations and haul road	i) Plan water and sewer line works to minimize traffic disturbance / blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations (ii) Prepare and implement a Traffic Management Plan (Appendix 18) (ii) Duly consider and select sections for trenchless method of	Construction Contractor	(i) Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite (Appendix 18);	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		pipelaying based on traffic conditions (iii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) Schedule transport and hauling activities during non-peak hours; (v) Locate entry and exit points in areas where there is low potential for traffic congestion; (vi) Keep the site free from all unnecessary obstructions; (vii) Drive vehicles in a considerate manner; (viii) Coordinate with Traffic Police for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (ix) Notify affected sensitive receptors 1-week in advance by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. (x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (xi) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.		(ii) Complaints from sensitive receptors; (iii) Number of signages placed at project location.	
Socio-Economic – Income.	Impede the access of residents and	(i) Prepare and implement spoils management plan (Appendix 17). Contractor to Implement RP and to	Construction Contractor	(i) Complaints from sensitive receptors;	Cost for implementation of mitigation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	customers to nearby shops	follow mitigation measures prescribed (ii) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. (vi) Notify community/ water users in advance about likely interruptions in water supply. (vii) Provide alternate sources of clean water until water supply is restored.		(ii) Spoils management plan (iii) Number of walkways, signages, and metal sheets placed at project location.	measures responsibility of contractor.
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force, or to the maximum extent possible (ii) Comply with labor laws	Construction Contractor	(i) Employment records; (ii) Records of sources of materials (iii) Compliance to labor laws (see Appendix 10 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (see Appendix 10 of this IEE); Following	Construction Contractor	(i) Site-specific OH&S Plan;	Cost for implementation of mitigation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		best practice health and safety guidelines: IFC's General EHS Guidelines[38] and Sector Specific (Water and Sanitation) Guidelines[39] (ii) Develop and implement site-specific occupational health and safety (OH and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OHS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1. 5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3. 5 m by adopting trenchless technology (iv) Ensure that qualified first aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the		(ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment out fitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices and lines, service	measures responsibility of contractor.

[38] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES
[39] https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		site; (v) Provide medical insurance coverage for workers; (vi) Secure all installations from unauthorized intrusion and accident risks; (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following: (a) work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM); (b) provide appropriate shade near the workplace; allow periodic resting and provide adequate water, and (c) provide necessary medicine and facilities to take care of dehydration related health issues (viii) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (ix) Provide HS orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (x) Provide visitor orientation if visitors to the site can gain access to areas where hazardous		rooms housing high voltage equipment, and areas for storage and disposal. (xii) Compliance to core labor laws (see Appendix 10 of this IEE)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xii) Ensure moving equipment is outfitted with audible back-up alarms; (xiii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; (xiv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. (xv) Conduct regular health check-ups for workers (xvi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites (xviii) Provide proper solid and liquid waste management system in			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites.			
Occupational and Community Health and Safety.	Hazardous working conditions due to presence of asbestos containing material / AC Pipes in work sites: clearing, transfer and disposal; work in narrow streets, and interventions in existing AC pipelines Health impacts due to air borne asbestos if handled unsafely, cut, drilled or broken into pieces	(i) Implement the ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 16. Adhere to the workflow process suggested in Figure 22. (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (v) Identify risk of intervention with existing AC pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods. (vi) Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to (vii) Maintain records of AC pipes as per the AMP	Construction Contractor	(i) Asbestos management plan preparation and implementation (iii) quantity and characteristics of asbestos containing material removed/handled and disposed safety	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i)Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned (ii) All trenches deeper than 1. 5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3. 5 m by adopting trenchless technology (iii) Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works (iv) Provide prior information to the local people about the (v) Plan routes to avoid times of peak-pedestrian activities. (vi) Liaise with PIU/ULB in identifying high-risk areas on route cards/maps. (vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or	Construction Contractor	(i) Traffic Management Plan; (ii) Complaints from sensitive receptors	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		premature failure. (viii) Provide road signs and flag persons to warn of on-going trenching activities.			
Safety of sensitive groups (children, elders etc.) and others pedestrians in narrow streets	Trench excavation in in narrow streets will pose high risk to children and elders in the locality	(i) Provide prior information to the local people about the nature and duration of work (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches	Construction Contractor	Complaints from neighborhood and monitoring of accidents	Cost for implementation of mitigation measures responsibility of contractor.
Night Works	Public inconvenience due to traffic diversion, disturbance due to excessive noise and access loss, occupational health and safety issues etc.	Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers; Contractors should have handheld noise level meter for measurement of noise during night hours Contractors should have handheld lux meter for the measurement of illumination during night hours Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available Sound level should not increase as prescribe by CPCB	Contractor	Night work plan / protocol submitted by contractor and approved by PIU/Consultant	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		Illumination should be as prescribed in protocol As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime Workers engaged in night works should have adequate rest/sleep in daytime before start of night works Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests Horns should not be permitted by equipment and vehicles Workers should not shout and			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		create noise First aid and emergency vehicles should be available at site Emergency preparedness plan should be operative during night works Old persons and pregnant women and women having small kids should not work in night-time All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works PIU/DSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations. Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians Drivers and workers should be alert and responsive during night works All the wages to workers working in			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		night hours should be as per the applicable labour acts Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.			
Work in narrow streets	will pose high risk to children and elders in the locality	(i) Conduct awareness program on safety during the construction work (ii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iii) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (iv) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned			Responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Construction camps and worker facilities	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with PIU before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation facilities for employees; (iv) Provided temporary rest and eating area at all work sites (v) Ensure conditions of livability at work camps are always maintained at the highest standards possible; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc. , shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12. 5 cubic meters (volume) or 4 to 5. 5 square meters (surface) per worker, a minimum ceiling height of 2. 10 meters; a reasonable number of workers are allowed to share the same room – (standards range	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation facilities for employees	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 20) (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vii) Recover used oil and lubricants and reuse or remove from the site; (viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (ix) Ensure unauthorized persons specially children are not allowed in any worksite at any given time.			
Physical cultural resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii)Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform local Archeological Department / Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Monsoon preparedness	Disruption of utilities and water logging in trenches	(i) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (ii) if open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (iii) keep emergency response system ready before monsoon/heavy rain fall	Construction Contractor	Monsoon preparedness plan	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be	Construction Contractor	PIU/Consultant report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O & M are removed; and (iv) worksite clean-up is satisfactory.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		ripped, all imported materials removed, and the area shall be top soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.			

Table 16: Environmental Management Plan of Anticipated Impacts during Operation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Sewerage system operation: treatment discharge of treated wastewater, sludge	Environmental and health issues due to operation	(i) Ensure that treated wastewater meets the established discharge standards all times; Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards; (ii) Conduct baseline water quality assessment of receiving water body prior to start of operation (iii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse (iv) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan (v) Conduct periodic testing of dried	O and M contractor for 10 years and then Nagar Palika	Mandawa Nagar Palika	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops. (vi) Ensure valid consent to operate (CTO) from RSPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by RSPCB are compiled duly (viii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only (ix) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 22 (x) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility; (xi) Operate and maintain the facility following standard operating procedures of operational manual; (xii) Undertake preventive and periodic maintenance activities as required; (xiii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		place; periodically check the equipment, and conduct mock drills to deal with emergency situations; (xiv) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RSPCB: (xv) Conventional and centralized water treatment that use filtration and disinfection that inactivates disease-causing vectors (xvi) Final disinfection step considered if treatment plant technologies are not able to destroy pathogens and remove viruses (xvii) Workers should wear appropriate PPE which includes protective outerwear, gloves, boots, goggles or a face shield and a mask (xviii) Perform hand hygiene frequently, avoid touching eyes, nose, mouth with unwashed hands			
Sewerage system operation: collection and conveyance	Environmental and health issues due to operation of sewer network	(i) Establish regular maintenance program, including: • Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. • Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity;	O and M contractor for 10 years and then Nagar Palika	Mandawa Nagar Palika	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		and suspected infiltration or exfiltration; and • Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e. g. pump station failures, sewer line ruptures, or sewer line blockages); (ii) Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed; (iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system. (iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc. (vi) Provide necessary health and safety			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		training to the staff (vii) Provide all necessary personnel protection equipment (viii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works. • As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose • As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose • Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision. • Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process • Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important. • Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers. • For remote locations portable welfare facilities should be provided. • Areas for storage of clean and contaminated equipment should be			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		segregated and separate from eating facilities. • Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings. • Make effective arrangements for monitoring the health of staff. Keep emergency preparedness plan ready before starting the work of sewage system cleaning			
Repair and maintenance activities of water supply and sewerage Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 26.	O and M contractor for 10 years and then Nagar Palika	Mandawa Nagar Palika	O and M cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of O and M Manual	O and M contractor for 10 years and then Nagar Palika	Mandawa Nagar Palika	O and M cost of contractor

Table 17: Environmental Monitoring Plan of Anticipated Impacts during Construction Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Construction disturbances, nuisances, public & worker safety,	All work sites	Implementation of dust control, noise control, traffic management, & safety measures. Site inspection checklist to review implementation is appended at Appendix 26	Weekly during construction	Supervising staff, EHS officer and safeguards specialists	No costs required
Tree cutting and plantation	STP, SPS, CWR and pipe laying sites	Obtain permission from concerned authority for any tree cutting and plant trees in the ratio of 1:3 as per RUIDP Circular	Weekly during construction	Supervising staff and safeguards specialist	Contractors cost
Ambient air quality	5 locations (STP, SPS, CWR and Pipe laying site within the town preferably near sensitive receptor, All Construction camp/storage yards/ Workers Camps	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO	Once before start of construction and quarterly (yearly 4-times) during construction except in Monsoon season	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ambient noise	5 locations (STP (1nos.), SPS, CWR, Pipe laying site within the town preferably near sensitive receptor, Construction camp/storage yards/ Workers Camps	Day time and night time noise levels	Once before start of construction and quarterly	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ground Water Quality	3 locations (STP-1nos. , SPS-1 no. and workers camps/storage yard	pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Suplhate,	Once before start of construction and	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
		Nitrate, Fluiride, Hg, Cadmium, Cr^{+6}, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound	quarterly (yearly 4-times) during construction		
Soil quality	4 locations (STPs- 1 nos, SPS-1 no. , Pipe laying site-1 no. within the town and construction camp/storage yards/workers camps	pH, Elect. Conductivity (at 25^0C), Moisture (at 105^0C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO4), Potassium (as K), Organic Matter, oil and grease	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor (as per Appendix 27)
Construction, Labour Camp, storage yard Management	Construction, Labour Camp, storage yard Management	As per EMP	Weekly	EHS officer, Environment Specialist of consultant	contractor
Solid waste management	Construction, Labour Camp, storage yard Management	As per EMP	Weekly	EHS officer, Environment Specialist of consultant	contractor
Construction and demolition waste management	All construction site	As per EMP and applicable rules and regulations	Weekly	EHS officer, Environment Specialist of consultant	contractor
Consent to establish of STPs, batching plants, crusher, hot mix plant. DG sets etc.	STP, batching plants, crusher, hot mix plants& DG set etc	Consents are taken as per table 5 & 6	Periodically	EHS officer, Environment Specialist of consultant	No cost required for monitoring cost for obtaining CTE/CTO from PMU and for others from Contractor

Table 18: Environmental Monitoring Plan for Operation Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Monitoring of raw sewage quality	Inlet of the STP	Suspended solids, pH, Temperature Oil and grease, Total residual chlorine, Ammonical nitrogen (as N), BOD, COD, Nitrate Nitrogen The values should be within the limit specified by STP design inlet values	Monthly once	O andM contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika Mandawa
Sludge quality (STP) and suitability as manure	Dried sludge	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) Arsenic - 10. 00 Cadmium - 5. 00 Chromium - 50. 00 Copper- 300. 00 Lead - 100. 00 Mercury- 0. 15 Nickel - 50. 00 Zinc- 1000. 00 PH - 5. 5-8. 5	Yearly twice	O and M contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika Mandawa
Treated water quality	CWRs	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika Mandawa
Monitoring of quality of water supplied to consumers	Consumer end-random sampling in all zones	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika Mandawa
Consent to operate (CTO) from RSPCB	STPs	CTO should be renewed before expired	As per RSPCB	O and M contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika Mandawa
Sludge quality (STP) and suitability as manure	Dried sludge	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) Arsenic - 10. 00 Cadmium - 5. 00 Chromium - 50. 00	Yearly twice	O and M contractor for 10 years and then Nagar Palika	O&M Contractor/ Nagar Palika, Mandawa

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
		Copper- 300. 00 Lead - 100. 00 Mercury- 0. 15 Nickel - 50. 00 Zinc- 1000. 00 PH - 5. 5-8. 5			
Reduction of NRW	Pipeline networks	As per RUDSICO-EAP norms	Daily/when required	O&M Contractor	DBO contractorCost

B. Institutional Requirements

225. The Local Self Government Department (LGSD) is the executing agency which will be responsible for the overall strategic guidance and ensure the compliance with ADB loan covenants. RUDSICO is the implementing agency responsible for the technical supervision and project implementation. The RUDSICO Board (under the chairmanship of the Honorable Minister), the LGSD and the City Level Monitoring Committees (CLMCs, under the chairmanship of their respective commissioner/executive officer) is proposed to monitor the project implementation. The PMU is at state-level and headed by a dedicated Project Director. The PIUs have two zonal offices (1 in Jaipur and 1 in Jodhpur). Each zonal office will be headed by an additional chief engineer. Urban Local Bodies (ULBs) will be the final custodian and user of the created infrastructure. As primary stakeholders, the ULBs will be involved and engaged in the day-to-day monitoring and implementation.

226. At the PMU level, the Project Director shall be supported by Additional Project Director (Chief Engineer-level) and a Chief Engineer, who shall then be supported by Dy Project Director and a financial advisor. There shall be one project officer for Social and another project officer for Environmental aspects of the project.

227. The PMU shall be supported by the Project Management and Capacity Building Consultants (PMCBC). The PMCBC shall manage preparation/vetting design documents, tendering of contracts, implementation of resettlement, environmental management and gender action plans; setting and managing project performance monitoring systems, planning and managing implementation of training and capacity building as well as institutional strengthening activities besides preparing reports as per ADB requirements. PMCBC shall engage a social safeguard specialist and environmental safeguard specialist at the PMU level for managing all social and environmental safeguard related support services as envisaged in its scope of work. They will be assisted by concerned field level safeguard support staffs of CMSCs and PIU.

228. PMCBC shall be joined by the following specialists to address site-specific environmental requirements as below:

(i) **Environment Specialist Consultant**. Responsibilities include the review and refinement of the IEEs and the EMPs and ensure inclusion in the bid documents and during construction, monitor the implementation of the EMPs and support in the reporting and documentation requirements;

(ii) **Asbestos Management Specialist**. Provides training and awareness on the risks and safe handling and management of asbestos-containing materials (ACMs) and to coordinate with the Asbestos Management Service Provider in the implementation of the Asbestos Management;

(iii) **Heritage Management Specialist**. Provides guidance on the ADB SPS, 2009 requirement on Physical Cultural Resources in the RSTDSP towns including the conduct of Heritage Impact Assessment, provides support on the statutory clearances to be obtained and the documentation and reporting on the implementation of mitigation measures;

(iv) **Biodiversity Expert**. Provides guidance on the ADB SPS, 2009 requirement on Biodiversity Conservation and Critical Habitat Assessment including the conduct preliminary screening (e. g. IBAT assessment reports), on-site verifications and consultations, recommend specific measures and provide supervisor support during the planning and construction periods; and

(v) **Architect**. Assists the team leader and structural expert for review and approval of all drawings from architectural and heritage perspective; review and approve the detailed architectural drawings prepared by the contractor and promptly address ant site-specific issues regarding architectural and heritage aspects.

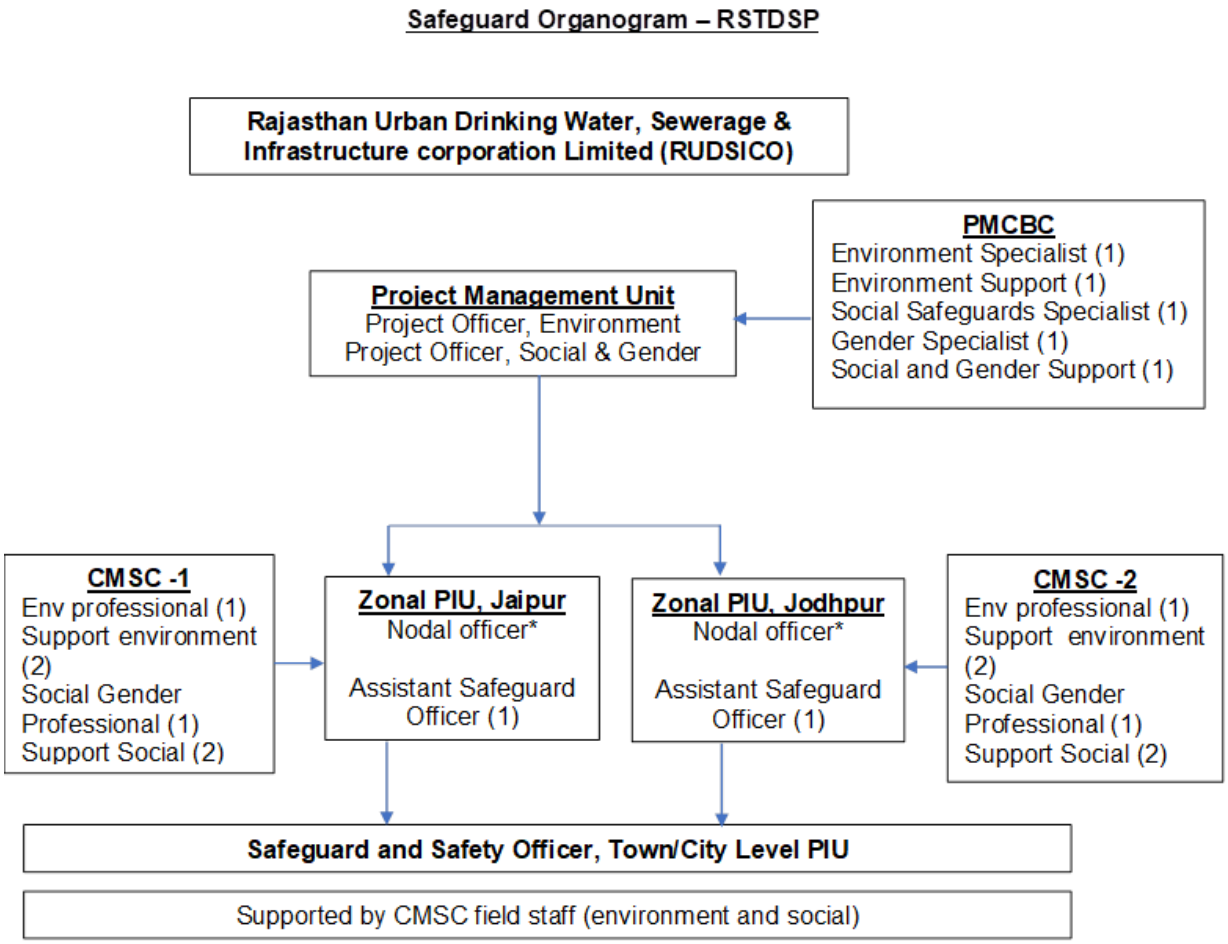
229. There will be two zonal PIUs and a PIU at every town. PIUs at the town-level shall be headed by a Superintending Engineer / Executive Engineer, who shall work as Project Manager and shall sign the contract documents, manage the contract and disburse payments as Drawing and Disbursing Officer.

230. Construction management and supervision consultants - 2 nos. catering to Jaipur and Jodhpur units. They shall directly support PIUs in day to day contract management, construction supervision including quality management of ongoing works etc. This shall include work measurement, quantities, verification of bills of contractors etc. In compliance with the EMP, the CMSC shall develop a strategy to overcome the difficulties of construction/traffic management in narrow streets and also prepare detailed plans for detour of traffic during excavation for pipe laying. The CMSC will propose and implement mechanism for coordination among all stakeholders such as traffic police, roads department, user committees, etc. , for smooth construction execution. Adequate measures shall be taken for working near physical cultural resources involving close coordination with the Department of Archaeology. The CMSC will lead design of surveys and investigations required for the protection of archaeological sites/heritage areas and prepare Archaeological Impact Assessments, or other agreed upon document to be approved by the Department of Archaeology for the archaeologically sensitive locations;

231. Community awareness and public participation consultants (CAPPC) will closely work in the field (with PIUs) to facilitate creation of project awareness and ensuring public participation for all project works at the community level. This shall mainly involve house connections for water supply, sewerage and metering. CAPPC shall also undertake various IEC activities to promote and pursue health and hygiene among the communities.

232. Table 19, 20 and figure 24 summarize the institutional responsibility of environmental safeguards implementation at all stages of the project.

Figure 24: Safeguards Implementation - RSTDSP



*Zonal PIU will be led by a nodal officer of the rank of assistant chief engineer who will also be the nodal person for safeguards and gender compliances in project implementation by town level PIUs. S/he will be supported by ASO in execution of these responsibilities.

233. **Project Management Unit.** RUDSICO will establish a state-level PMU, headed by dedicated project director, and housed in EAP division of RUDSICO. For the purpose of project implementation, 2 Zonal project implementation units (Zonal PIUs), at Jaipur and Jodhpur, headed by additional chief engineers (ACE) will be established. At PMU, there will be two dedicated project officers (i) project officer (Environment) and (ii) project officer (Social and Gender), who will be responsible for compliance with the environmental, social safeguards and gender in program implementation. Key responsibilities of the project officer (Environment) are as follows:

(i) Review REA checklists and assign categorization based on ADB SPS, 2009 and EARF;
(ii) Submit IEE to ADB for approval and disclosure in ADB website;
(iii) Ensure approved IEEs are disclosed in RSTDSP/PMU websites and summary posted in public areas accessible and understandable by local people;
(iv) Ensure EMPs are included in the bid documents and contracts;
(v) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the project implementation on (a) ADB SPS, 2009; (b) Government of India national,

state and local environmental laws and regulations; (c) core labor standards; (d) OHS; and (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. ;

(vi) Assist in addressing any grievances brought about through the GRM;
(vii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
(viii) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements;
(ix) Assist PMU, PIUs, and project consultants to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE and EMP;
(x) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE;
(xi) Review monthly monitoring reports submitted by PIUs, and prepare and submit to ADB semi-annual monitoring reports;
(xii) If necessary, prepare corrective action plan and ensure implementation of corrective actions to ensure no environmental impacts;
(xiii) Review and submit corrective action plans to ADB;
(xiv) Coordinate with national and state level government agencies; and
(xv) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented.

234. The PMU will be supported by 3 institutional consultants under the supervision and control of PD, PMU: (i) the project management and capacity building consultants (PMCBC) will support the PMU; (ii) 2 CMSC will support the 2 zonal PIUs and town-level PIUs; and (iii) CAPPC, will support the zonal PIUs and town-level PIUs.

235. Zonal Project implementation units (Zonal PIUs). There will be 2 zonal level PIUs at Jaipur and Jodhpur. Under each zonal PIU, there will be city/town level PIUs, for ease of day-to-day monitoring and management at local level. The additional chief engineer at each Zonal PIU will serve as the Nodal Officer, Safeguards and Gender. Each Zonal PIU will be staffed with an assistant safeguards officer (ASO Environmental and Social Safeguards) who will assist PMU project officer (environment/social) in implementation of the environmental/social safeguards and GESI action plan in PIUs under its jurisdiction. Zonal PIUs will undertake internal monitoring and supervision and record observations throughout the project period to ensure that the safeguards and mitigation measures are provided as intended.

236. The zonal level ASO will oversee safeguards implementation by the city/town level PIUs, coordinate public consultations, information disclosure, regulatory clearances and approvals, implementation of resettlement plans, EMP implementation, and grievance redressal. Key safeguard tasks and responsibilities of the zonal PIU ASO (Environment) are as follows:

(i) Coordinate updating/revision of IEEs updated based on detailed design and technical studies (asbestos management, heritage impact assessment, and/or biodiversity assessment);
(ii) Review and submit approved updated/revised IEE to PMU;
(iii) Ensure relevant information in the IEE is disclosed to stakeholders;

(iv) Obtain all necessary clearances, permits, consents, no objection certificates (NOCs), etc. Ensure compliance to the provisions and conditions;
(v) Ensure EMP requirements for pre-construction regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. , are complied and communicated by town-level PIUs to contractors in a timely manner;
(vi) Support town-level PIUs in supervising contractor EMP implementation. If necessary, organize an induction course upon mobilization of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
(vii) Coordinate actions required for obtaining ROW in timely manner;
(viii) Take corrective actions when necessary to ensure no environmental impacts;
(ix) Consolidate monthly environmental monitoring reports by town-level PIUs and submit to PMU;
(x) Formulate timebound corrective actions for non-compliances;
(xi) Conduct continuous public consultation and awareness;
(xii) Address any grievances in a timely manner as per the GRM; and
(xiii) Issue clearance for contractor's post-construction activities as specified in the EMP.

237. **Town/City Level Project Implementation Unit.** The town-level PIUs shall be responsible for the quality of works executed under the project and will be guided by the zonal PIUs. The city/town PIUs will be responsible for implementation of the IEE. The town-level PIUs will be headed by a project manager (executive engineer or assistant engineer) and supported by CMSC field staff. Environment specialist of CMSC will assist PIU in implementation of environmental safeguard. At each PIU, the Assistant Project Manager will be given additional responsibilities of safeguard tasks and will be designated as safeguard and safety officer (SSO). The SSO will be assisted by the social and gender specialist and environment specialist of CMSC in reviewing updated/revised IEEs, etc. They will also be responsible for coordination of field level activities related to safeguards conducted by the DBO contractor and CMSC. Key responsibilities of the town-level environment specialist are as follows:

(i) Prepare REA Checklists, No Mitigation Checklists, baseline environmental surveys to support screening and categorization per EARF;
(ii) Submit proposed subproject categorization to Zonal PIU and coordinate with PMCBC the preparation of IEE and technical studies;
(iii) Coordinate the conduct of technical studies such as but not limited to inventory of asbestos materials in subproject sites, heritage impact assessment and/or biodiversity assessment;
(iv) Ensure IEEs are updated/revised based on detailed design and recommendations of technical studies;
(v) Oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations;
(vi) Take necessary action for obtaining ROW;
(vii) Take corrective actions when necessary to ensure no environmental impacts;
(viii) Submit monthly environmental monitoring reports to Zonal PIUs;
(ix) Conduct continuous public consultation and awareness;
(x) Address any grievances in a timely manner as per the GRM; and
(xi) Issue clearance for contractor's post-construction activities as specified in the EMP.

238. Contractors. The contractor will be required to update the IEE and will be responsible for providing final design (including pipe alignments) to the supervision consultant for finalization/updating of resettlement plan. The contractor shall appoint an environment, health and safety (EHS) engineer who will be responsible on a day-to-day basis for (i) ensuring implementation of EMP, (ii) coordinating with the town-level PIUs and environment specialists of project consultant teams; (iii) community liaison,[40] consultations with interested/affected people, (iv) field-level grievance redress; and (iv) reporting.

239. The Contractor will be required to submit to RUDSICO, for review and approval, a SEMP including (i) proposed sites or 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 per SEMP; (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP.

240. 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 the IEEs specify responsibilities in EMP implementation during design, construction and O&M phases.

241. RUDSICO will ensure that bidding and contract documents include specific provision 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 (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS, to employees and local communities surrounding the project sites.

Table 19: Safeguards Management Roles and Responsibilities

Implementation Arrangements	Roles and Responsibilities
Executing Agency: LSGD through RUDSICO	• Negotiate, sign, and execute the program. • Allocate and release government counterpart funds on time. • Facilitate obtaining timely Government-level approvals for smooth implementation of the program. • Monitor program implementation progress and ensure timely actions for completion of the project. • Plan, implement, and monitor public relations activities; gender mainstreaming initiatives and community participation activities, with the support of PIUs.

[40] Reasonable size social outreach team (SOT) to be appointed by contractor to facilitate community liaison, consultations and R&R implementation (including resolution of grievances). Requirement of SOT will be included in bid document.

Implementation Arrangements	Roles and Responsibilities
RUDSICO Board (like SLEC) Chairman: Minister of Urban Development Department, GOR Members: • Hon'ble Minister, LSGD • Secretary, LSGD – Vice Chairman • Principal Secretary, PHED -Director • Principal Secretary, PWD -Director • Secretary, Finance (Budget) Department - Director • Director, Department of Local Bodies • Executive Director, RUDSICO • Project Director, RUDSICO • Independent Director • Independent Director	• Provide strategic guidance. • Provide policy decisions to support smooth program implementation. • Facilitate inter-departmental coordination and cooperation. • Support RUDSICO with government/ministerial level approvals. • Overall project review (physical, financial, safeguards) • Approvals/Decisions as per approved SOP (Standard Operating Procedures – laying delegation of powers, Administrative and Financial Approval of works and services).
RUDSICO (with approval of RUDSICO board, as needed)	• Required support to review and monitor the physical and financial progress of the subprojects. • Provide additional technical support from RUDSICO Office (along with PMCBC) to PIUs for speedy resolution of implementation related issues such as variations, deviations, time and cost control, among others. • Provide backup technical support for review and finalization of DPRs, bid documents, bidding and award of contracts. • Review, appraise and put up matters to RUDSICO Board for approval, as described under "Delegation of Powers" • Overall Liaison, Monitoring and Reporting to DEA and ADB as per agreed requirements • Pursue GOR, through LSGD for approval of Policy, Rules, Guidelines, Government Orders for use in the state
Program Management Unit • Program Director: Project Director, RUDSICO • Additional Project Director, RUDSICO • PMU Staff • 2 Zonal Additional Chief Engineers (Jaipur and Jodhpur). The Office of ACE to have Two EE, Two AE, Computer Operator, Support staff • Dy. PD(T) (Procurement, Tendering, Contracts,	• Program and Financial Management • Overall responsibility of the investment program and financial management and administering program procedures and guidelines. • Oversee design of all projects (in individual tranches as needed). • Finalize the DPRs for ULBs/implementing agencies and obtain approval from ADB and government. • Establish project management and monitoring systems (Command and Control Center) • Undertake project appraisals based on technical, financial, economic and safeguards compliance as agreed by GOR/RUDSICO and ADB. • Provide overall technical and implementation guidance to the PIUs as required. • Facilitate approval of various implementation related requests from the Project Implementation management and Field Units

Implementation Arrangements	Roles and Responsibilities
Consultancies) at RUDSICO HQ • Dy. PD(A) (Administration, Institutional) at RUDSICO HQ • SE's (Asset Management, NRW, Safeguards, Resettlement) at RUDSICO HQ • Financial Advisor at RUDSICO, Jaipur HQ • Senior Accounts Officer at RUDSICO, Jaipur HQ PMU at HO supported by: • Project Officers (7 Nos. EE level with POs for Procurement and contracts; NRW Reduction; Contract Management and O&M, Social Safeguards, Environmental Safeguards, Capacity Building etc.) • Accounts officers • Assistant Project Officers – on each with PO – AE level, Assistant Account Officer • IT Cell (project Management and Monitoring, GIS, MIS etc.) with MIS Expert • Statistical Unit • Legal Unit • Administration and Establishment	• Sign key documents including withdrawal applications and audit reports. • Timely submission of any withdrawal applications. • Act as focal point for communication with the ADB. • Ensure compliance with loan covenants, ADB's guidelines, procedures and policies. • Facilitate ADB program review missions. • Represent the program at Tripartite Review Meetings. • Safeguards compliance • Review and monitor safeguards compliance by PIUs and support corrective actions as necessary. • Submit semi-annual safeguard monitoring reports to ADB • Guide PIUs as and when necessary on safeguards compliance, and arrange capacity building for PIUs Capacity Building and Institutional • Allocate funds for capacity building and arrange required disbursements • Approve and Monitor Capacity Building Plan • Pursue reforms with GOR • Supervise and Monitor PMCB Consultants and approve their invoices.
Project Implementation Units • 2 zonal PIUs (1 in Jaipur, 1 in Jodhpur) • PIU Staff • Project Manager (SE level) • Executive Engineer / Assistant Engineer (2 or 3) at each town for monitoring and supervision support • Assistant Accounts Officer • Computer Operator • Support Staff Supported by • Contract Management Officer (SE/EE of cluster shall invariably function as	Project Management • Responsible for implementation management of sub-projects. • Responsible for day-to-day implementation, monitoring and reporting. • Safeguards Compliance (with CAPPC) • Ensure compliance with safeguard frameworks and plans • Facilitate consultation with stakeholders and disclose program information in consultation with PMU. • Address grievances (may be through Grievance Redressal Mechanism) Coordinate land acquisition actions, if required. • Submit quarterly safeguard monitoring reports to PMU. • Advance Project Preparation • Prepare/supervise and monitor preparation of DPRs and bidding documents for future tranches.

Implementation Arrangements	Roles and Responsibilities
contract management officer) - No new position – • CMSC and CAPP Consultants (2 support engineers of CMSC at each town as per CMSC consultancy, 2 community mobilizers for each town – as per CAPP consultancy) besides required consultancy professionals reporting to EE)	
ULBs	• Nodal Officers to be a part of PIU and discharge the assigned functions and part of project planning and implementation • Establish liaison with local communities, resolve local grievances for smooth implementation of the project • Support CAPPC in awareness creation, connection modalities to household consumers etc.
Asian Development Bank	• Approve and monitor safeguards documents and implementation compliance. • Field review missions. • Facilitate knowledge sharing. • Provide training in program management and ADB procurement procedures to PMU/PIU staff. • Support LSGD, RUDSICO, PIUs etc. through various capacity building activities.

Table 20: Institutional Roles and Responsibilities for Environmental Safeguards Implementation

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
PMU (Project Officer; Environment),	(i) Review REA checklists and assign categorization based on ADB SPS 2009 (ii) Review and approve EIA/IEE (iii) Submit EIA/IEE to ADB for approval and disclosure in ADB website (iv) Ensure approved IEEs are disclosed in RSTDSP/PMU websites and summary posted in public areas accessible and understandable by local people. (v) Ensure environmental management plans (EMPs) are included in the bid documents and contracts (vi) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the	(i) Over-all environmental safeguards compliance of the project (iii) Monitor and ensure compliance of EMPs as well as any other environmental provisions and conditions. (i) Review monthly monitoring report (ii) Prepare and submit to ADB semi-annual monitoring reports (iv) If necessary, prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts; (iii) Review and submit Corrective Action Plans to ADB	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH&S, (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (vii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (viii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (x) Assist PMU, PIUs, and project NGOs to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE. (xi) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE.	(iv) Organize capacity building programs on environmental safeguards (iv) Coordinate with national and state level government agencies (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (ix) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented	
PIU, Assistant Safeguard Officer	(i) Ensure IEE is included in bid documents and contract agreements. Ensure cost of	(i) oversee day-to-day implementation of EMPs by contractors, including compliance with all	(i) Conducting environmental monitoring, as specified in the EMP.

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	EMP implementation is provided. (iv) Disclose of approved EIAs/IEEs. (v) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions. (vi) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. (vii) Organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.	government rules and regulations. (ii) take necessary action for obtaining rights of way; (iii) oversee implementation of EMPs, including environmental monitoring by contractors; (iv) take corrective actions when necessary to ensure no environmental impacts; (v) submit monthly environmental monitoring reports to PMU, (vi) conduct continuous public consultation and awareness; (vii) address any grievances brought about through the grievance redress mechanism in a timely manner as per the IEEs; and	(ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.
Consultant – 1. PMCBC-Environmental Safeguard Specialist – 1 no. Asbestos Expert – 1no. Heritage Expert – 1no. Biodiversity Expert – 1no.	(i) Review IEE/EMP submitted by CMSC and revise report to submit to PMU (ii) Assist PMU and PIU in obtaining all necessary clearances, permits, consents, NOCs, etc. Ensure provisions and conditions are incorporated in the IEE and detailed design documents. (iii) Assist in ensuring IEE is included in bid documents and contract agreements. (iv) Assist in determining adequacy of cost for EMP implementation. (v) Assist in addressing any concern related to IEE and EMP. (vi). Conduct specific assessment requirements	(i) Monitor EMP implementation (ii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.	
Consultant- 2. CMSC- 2 nos. Environmental safeguards professional	(i) Update initial environmental assessment for proposed project using REA checklists and submit to PIU/PMCBC	Monitoring of Implementation of EMP at site by contractor Recommend corrective action measures for non-compliance by contractors	(i) Assist in the inspection and verification of contractor's post-construction activities.

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	(ii) Assist in summarizing IEE and translating to language understood by local people.	Assist in the review of monitoring reports submitted by contractors (iv) Assist in the preparation of monthly monitoring reports conduct continuous public consultation and awareness;	
Contractors (EHS Engineer)	(i) Review the IEE and provide information about changes needed as per revised design and scope of works to ESS of PMCBC for final revision of IEE (ii)Prepare EHS plan and take approval from CMSC/PIU and Ensure EMP implementation cost is included in the methodology. (iii) Undergo EMP implementation orientation by ESS of supervision consultant prior to start of works (iv) Provide EMP implementation orientation to all workers prior to deployment to worksites (v) Seek approval for camp sites and sources of materials. (vi) Ensure copy of IEE is available at worksites. Summary of IEE is translated to language understood by workers and posted at visible places at all times.	(i) Implement EMP. (ii) Implement corrective actions if necessary. (iii) Prepare and submit monitoring reports including pictures to PIU (iv) Comply with all applicable legislation, is conversant with the requirements of the EMP; (v) Brief his staff, employees, and laborer about the requirements of the EMP and provide environmental awareness training to staff, employees, and laborers; (vi) Ensure any sub-contractors/ suppliers who are utilized within the context of the contract comply with all requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf; (vii) Bear the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions; (viii) Ensure that PIU and ACM/SO are timely informed of any foreseeable activities related to EMP implementation.	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from PIU

C. Capacity Building and Development

242. Executing and implementing agencies need to have a sustained capacity to manage and monitor environmental safeguards. Although specialist consultants support will be available to PMU and PIUs, it is necessary to mainstream safeguards in day-to-day working. Therefore, PMU and PIUs require capacity building measures for (i) a better understanding of the project-related environmental issues; and (ii) to strengthen their role in preparation of IEE, implementation of

mitigation measures, and subsequent monitoring. Trainings and awareness workshops are included in the project with the primary focus of enabling the PMU and PIU staff to understand impact assessments and carry out environmental monitoring and implement EMPs. After participating in such activities, the participants will be able to review environmental assessments, conduct monitoring of EMPs, understand government and ADB requirements for environmental assessment, management, and monitoring (short- and long-term), and incorporate environmental features into future project designs, specifications, and tender documents and carry out necessary checks and balances during project implementation.

243. PMCBC's ESS shall assess the capabilities of the target participants, customize the training modules accordingly and provide the detailed cost.

244. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply and wastewater projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. The proposed training project, along with the frequency of sessions, is presented in Table 21.

Table 21: Capacity Building Program on EMP Implementation

Sl. No.	Description	Target Participants and Venue	Cost and Source of Funds
1	Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement -EARF of RSTDSP -Government of India and Rajasthan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH&S, etc. -Incorporation of EMP into the project design and contracts -Monitoring, reporting and corrective action planning	All staff, ULBs and consultants involved in the project At PMU, Jaipur	PMU cost
2	Treated Effluent Reuse Concepts, Design and Management	All staff at PMU and ULBs	PMU cost
3	Sludge Reuse Concept, Design and Management	All staff at PMU and ULBs	PMU cost
4	EMP implementation (2 days) -Roles and responsibilities -OH&S planning and implementation -Wastes management (water, hazardous, solid, excess construction materials, spoils, etc.) -Working in congested areas, - Public relations - Consultations - Grievance redress -Monitoring and corrective action planning -Reporting and disclosure -Post-construction planning	All staff and consultants involved in the subproject All contractors before start of construction works At PIU	PMU cost

Sl. No.	Description	Target Participants and Venue	Cost and Source of Funds
5	Plans and Protocols (1 day) -Construction site standard operating procedures (SOP) - Asbestos Management Plan -Heritage Impact Assessment -Biodiversity and Critical Habitat Assessment - Site-specific EMP -Traffic management plan -Spoils management plan -Waste management plan - Chance find protocol - O&M plans - Post-construction plan	All staff and consultants involved in the project All contractors before start of construction works or during mobilization stage. At PIU	PMU cost Contractors cost as compliance to contract provisions on EMP implementation
6	Experiences and best practices sharing - Experiences on EMP implementation - Issues and challenges - Best practices followed	All staff and consultants involved in the project All contractors All NGOs At PMU Jaipur	PMU Cost
7	Contractors Orientation to Workers on EMP implementation (OH&S, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the contractor prior to dispatch to worksite	Contractors cost as compliance to contract provisions on EMP implementation

D. Monitoring and Reporting

245. Prior to commencement of the work, the DBO contractor will submit a compliance report to PIU ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. PIU with the assistance of the SO and ESS of PMCBC, consultant will review the report and thereafter PMU will allow commencement of works.

246. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU and ACM, CMSC. Project officer (Environment) and ACM will review and advise contractors for corrective actions if necessary. Monthly report summarizing compliance and corrective measures taken will be prepared by safeguard officer with the assistance of ACM and submitted to PMU.

247. Quarterly report shall be prepared by CMSC and PIU and submitted to PMU for review and further actions.

248. Based on monthly and quarterly reports and measurements, PMCBC will draft semi-annual environmental monitoring reports and submit PMU for their review and further submission to ADB (Appendix 25). Once concurrence from the ADB is received the report will be disclosed in the Project website. ADB’s monitoring and supervision activities are carried out on an ongoing basis until a project completion report (PCR) is issued. Thus, semi-annual report, which may cover O&M of completed packages, will be submitted to ADB until PCR is issued.

249. ADB will review project performance against the project 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.

E. EMP Implementation Cost

250. Most of the mitigation measures require the contractors to adopt good site practice, which are part of their normal procedures. Mitigation that is the responsibility of PIU/ULB will be provided as part of their management of the project. Cost for the capacity building program is included as part of the project. Cost of environmental management are given in Table 22.

Table 22: Cost Estimates to Implement the EMP

	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	**Mitigation Measures**						
1	Compensatory plantation measures	Construction	Ha.	0. 15	137200	20580	Contractor
	Subtotal (A)					**20580**	
B.	**Monitoring Measures****						
1	Air quality monitoring	Pre-construction/Construction	per sample	44	4920	216480	Contractor
2	Noise levels monitoring	Pre-construction/Construction	Per sample	44	1980	87120	Contractor
3	Ground Water Quality	Pre-construction/Construction	Per sample	35	1560	54600	Contractor
5	Soil Quality	Pre-construction/Construction	Per sample	35	5880	205800	Contractor
	Subtotal (B)					**564000**	
C.	**Capacity Building**						
1.	Introduction and sensitization to environment issues	Pre-construction	lump sum			100, 000	PMU
2.	EMP implementation	Construction	lump sum			50, 000	PMU
3.	Plans and Protocols	Construction	lump sum			25, 000	PMU
			lump sum			25, 000	Contractor
4.	Experiences and best practices sharing	Construction/Post-Construction	lump sum			100, 000	PMU
5.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			25, 000	Contractor
	Subtotal (C)					**325, 000**	
D	**Civil Works**						
1	Water Sprinkling for dust suppression	Construction	KL	2000	111	222000	Contractor
2	Rain Water Harvesting for water conservation	Construction	Nos.	2	1000000	2000000	Contractor

	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
3	Barricading						Contractor
	Barricading using 40 mm dia M. S. pipe ("B" class) and fixing suitably with nuts and bolts	Construction	Mtr	18700	50	935000	
	Barricading using 40 mm dia M. S. pipe ("B" class) and fixing suitably two rows of 100mm wide PVC Tape	Construction	Mtr	113600	38. 50	4373600	
	Barricading with GI sheets	Construction	Sqm	33700	101	3403700	
	Sub Total (D)					**10934300**	
E	Grievance Redressal Mechanism Resolutions					350000	Civil works contract
F	Heritage Management					700000	Civil works contract
G	**Asbestos Management**	Inventory Testing Overall Supervision for Asbestos Removal Storage Transportation Disposal / Treatment Documentation and Reporting			Lump sum	7, 000, 000	Civil works contract under DBO Contractor
	Total (A+B+C+D+E+F)				**INR**	**19893880**	

* In preliminary design about 15 trees are estimated to be cut for which 45 trees will required to be planted, being DBO contract, contractor will be required to revise it.
**Monitoring for ambient air, noise, water and soil as per Appendix 27 and RUIDP SOR 2017

X. CONCLUSION AND RECOMMENDATION

251. The process described in this document has assessed the environmental impacts of all elements of the Mandawa water supply and sewerage subproject. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. During the construction phase, impacts mainly arise from the construction dust and noise, the need to dispose of large quantities of waste soil and import a similar amount of sand to support the sewer in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work.

252. Subproject components are located in Mandawa Town and in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at the proposed sites. No involuntary land acquisition of private land is anticipated for this project. The project sites are located in existing road right of way (ROW) and government-owned lands.

Construction site of STP with SBR technology is away from city area in the available vacant land not under any productive use. The land has donated by Thakur Durga Singh to Nagar Palika, Mandawa for proposed construction of STP. No habitation/sensitive receptors exist near the STP site. CWR and Treated Water Pumping Station will be undertaken in the unused land within existing campus of PHED JEN campus. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations. There are few trees of Neem, Pipal, Bargad and Bel exist. which needs to be cut for site clearance. During detail design all efforts should be done to reduce numbers of trees to be cut for construction works. Tree plantation will be carried out as per replacement ratio of 1: 3 as per RUIDP policy

253. Existing source of Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water Collected at CWR at JE office from 7 no. of tube well is transferred through 150 AC transmission line to ESR at JE office and 250 AC transmissions line to ESR at Ward no 4 ESR. Total water abstracted from Tube Wells is 1. 76 MLD (11 TW). Water is supplied for one and half hour daily @ 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0. 3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd.

254. Water demand of Mandawa town for year 2036 and 2051 are 4. 62 MLD & 5. 17 MLD respectively. Against demand of year 2036 & 2051 only 1. 76 MLD is available with existing TWs. Balance deficit demand will be supplied by Canal Water from “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” which is being executed by PHED. Water has been reached at Mandawa Town from Surface source. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Khumbha Ram Lift Canal”. The work of pipeline system from canal off take point to JE office has been completed. WTP of this scheme is at Malsisar Town around 50 Km from Mandawa. This will be a feasible source for water supply and the water allocation letter from the PHED Rajasthan is obtained.

255. Subproject includes rehabilitation of existing infrastructure like tube wells, CWRs and pumping station and OHSRs. Upon finalization of rehabilitation works during the detailed design phase for implementation, an environmental management plan specific to rehabilitation works will be prepared for implementation. The environmental audit conducted as part of this IEE concluded that there may be health, safety and environment related impacts arising from the rehabilitation works and the need to dispose construction debris, and waste generated. Presence of ACM, mainly asbestos cement pipes in the existing infrastructure is the main concern. Asbestos is recognized as a cause of various diseases and is considered health hazard if inhaled. It is normal practice in Rajasthan that existing asbestos cement pipes are left as it is in the ground and new pipes will be laid in a new alignment. However, complete avoidance of handling and disposal of asbestos cement pipes may not be possible. There are narrow lanes, where asbestos cement pipes may be encountered during the laying of new pipes. Some connections/inlet/outlet pipes at the existing CWRs are also of asbestos cement pipes. These will be removed and replaced with new non-asbestos cement pipes.

256. Asbestos cement pipe as such in not hazardous as it is in the cement bonded form, however, working with or handling asbestos cement pipes in manner that produces dust, fibers, air borne particles etc. , is very harmful and hazardous to the workers and general public around

the work sites. The condition of existing underground asbestos cement pipes is not known, however, as these are old, pipes may be in deteriorated conditions. Preparation and implementation of asbestos management plan (AMP) suggested to avoid any health hazards

257. There is no functional sewerage system in Towns. Presently the wastewater from kitchens and bathrooms is discharged into storm water drains culminating finally to the Pound, Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. Though septic tanks is an accepted onsite treatment, as the septic tanks are not designed and maintained properly, the effluent does not confirm to the standards. The effluent from the septic tanks is directly let into the open drains. In the absence of safe disposal system of sewage as mentioned above, the people of Mandawa are facing unhealthy and unhygienic environmental conditions therefore public representatives are also demanding facilities of sewerage system on priority basis. The town requires sound drainage and sewerage system.

258. There are no habitations exists upto 100 m distance from STP site. Nearest receptor in the form of houses are located at a distance of 185 m from STP near Bissau road. Some trees and shrubs are present at these sites. No wild fauna is found in these locations The excess/unused treated effluent can be discharged through pipeline, in the nearby drains. There is natural drain flowing beside the proposed STP site. The excess/unused treated effluent can be discharged in nearby drains through pipeline of about 326 meter distance from STP near Bissau Road. There are no environmentally or archaeologically sensitive areas within Mandawa town.

259. Mitigation measures to avoid smell and visual pollution shall be taken in consideration during design in Service Improvement Plan preparation period by DBO contractor. Dense plantation in the periphery of STP campus shall be done to avoid adverse impacts on aesthetics and reduce smell also. It is also worth to mention here that proposed SBR technology of STP will evolve low foul smell and smell generated can be mitigated through dense plantation around STP sites.

260. It is proposed to reuse the treated effluent for use of agriculture, horticulture, development of urban forestry etc. and remaining treated effluent is proposed to be discharged in to a nearby drains/depression. In order to safeguard the interest of downstream users it is proposed to apply technology/process to achieve very low BOD (BOD 10) and suspended solids in the treated effluent. Sequential batch reactor (SBR) technology has been adopted in RUIDP, Phase-IV Treated effluent shall be mostly reused for beneficial purposes for which proposal of construction of Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR) and Effluent Pumping Station (EPS) has been taken. Contractor will propose the best methods of reuse of treated effluent and sludge as per guidelines of CPHEEO and best international practices in consultation with RDUSICO and Nagar Palika and submit a plan in RUIDP for approval.

261. Contractor will propose the plan with best methods for reuse of treated effluent and sludge as per guidelines of CPHEEO and best international practices in consultation with RUDSICO and Nagar Palika and submit it in RUDSICO for approval. In order to aid preparation of a viable treated wastewater reuse and sludge reuse plan, an institutional and capacity building component shall be incorporated in the Project to enable the ULB staff to develop an understanding of the relevant Issues.

262. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the

operation and maintenance manual and standard operating procedures to be developed for all the activities.

263. Anticipated impacts of water supply and sewerage system during operation and maintenance will be related to repair of blocks, overflows, and leakages in sewers. Sewers are not 100% watertight and leaks can occur at joints. Faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Also, sewer pipes require regular maintenance as silt inevitably collects in areas of low flow over time. Necessary equipment for cleaning and removal of blockages in the sewers are included in the project.

264. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor raw and treated water quality, treatment efficiency of STP (raw and treated sewage quality), sludge at STP. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the EMP

265. In the project, in a large portion of the project town areas, the septic tank system in individual households is replaced with direct connections to the new sewerage network. The impacts and mitigation measures from the existing septic tank that need to be closed should be identified in the Operation Phase.

266. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU and ADB websites. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

267. The EMP will assist the project agencies and contractor in mitigating the environmental impacts and guide them in the environmentally sound execution of the proposed project. A copy of the updated EMP/SEP shall be kept on-site during the construction period at all times. The EMP shall 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 shall constitute a failure in compliance.

268. The citizens of Mandawa will be the major beneficiaries of the improved water supply and sewerage systems, as (i) they will be provided with a constant supply of better quality water, piped into their homes at an appropriate pressure; and (ii) the human waste from the homes will be removed rapidly, which otherwise would flow in open drains. This should improve the environment, should deliver major improvements in individual and community health and well-being. The project will improve the over-all health condition of the town as water borne diseases will be reduced. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

269. Therefore, as per ADB SPS, 2009 the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STP requires consent to establish (CTE) and consent to operate (CTO) from Rajasthan State Pollution Control Board (RSPCB). CTE will be obtained prior to construction, as the detailed design will be undertaken by the contractor.

270. Recommendations. The following are recommendations applicable to the subproject to ensure no significant impacts:

(i) Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design;
(ii) Include this IEE in bid and contract documents;
(iii) Update and implement the asbestos management plan per site-specific conditions;
(iv) Update and implement the recommendations from the heritage impact assessment (HIA), including the harmonization of architecture and design to the town's physical cultural resources' identity;
(v) Update and implement the recommendations from the biodiversity assessment report;
(vi) Secure permits for the abstraction of groundwater from additional wells;
(vii) Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
(viii) Conduct safeguards induction to the contractor upon award of contract;
(ix) Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendments) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
(x) Strictly supervise EMP implementation;
(xi) Ensure contractor appointed qualified environment, health and safety (EHS) officers prior to start of works;
(xii) Documentation and reporting on a regular basis as indicated in the IEE;
(xiii) Continuous consultations with stakeholders;
(xiv) Timely disclosure of information and establishment of GRM;
(xv) Involvement of contractors, including subcontractors, in first level GRM;
(xvi) Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

271. This IEE shall be updated by PMU during the implementation phase to reflect any changes, amendments and will be reviewed and approved by ADB.

Appendix 1: REA Check list

SEWERAGE TREATMENT

Instructions:
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. This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
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: India/Rajasthan Secondary Towns Development Sector Project (RSTDSP)/ Water supply and Sewerage Project in Mandawa Town, District-Jhunjhunu, Rajasthan

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area…			
Densely populated?	√		Subproject activities extend to the entire town including the densely populated areas. Old areas of city are densely populated while outskirt of old city is comparatively less dense. Pipe line works will be conducted throughout the entire municipal area. Proposed lands of STP is away from habitation, while SPS land is within 100 meters distance from population.
Heavy with development activities?	√		Mandawa is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas?		√	There are no any environmentally sensitive areas within or near to any proposed site

SCREENING QUESTIONS	Yes	No	REMARKS
Cultural heritage site	√		Mandawa is one of the heritage towns in RSTDSP. Heritage impact assessment (HIA) was conducted as part of the preparation of the IEE for sample subprojects. The HIA is included in the IEE and the recommendations are included in the preliminary design and EMP. The HIA will be updated during detailed design stage. The EARF and sample IEEs include chance find protocol. Statutory clearance from Archaeological Survey of India and/or Rajasthan Department of Archaeology and Museums shall be obtained prior to start of works. For physical cultural resources (PCRs) that are not legally protected, the EARF includes requirements and measures to be considered in the detailed design.
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	
Potential Environmental Impacts Will the Project cause…			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not anticipated.** No above-ground infrastructures will be built within or adjacent physical cultural resources (PCRs). Only pipe laying will be done outside and around physical cultural sites. Heritage impact assessments specify the requirements before and during construction to ensure that no loss or damage will be done on these PCRs.

SCREENING QUESTIONS	Yes	No	REMARKS
Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc. ?	√		**Anticipated during construction and operations but can be avoided and mitigated.** Sewage treatment plants' design include considerations to minimize, if not reduce, the nuisance to the nearby communities and comply with noise and odor standards. During construction, sewers will be laid underground and may interfere temporarily with access and other utilities. Coordination with the concerned agencies will be conducted in finalizing alignment and shifting of utilities, if necessary.
dislocation or involuntary resettlement of people	√		**Not anticipated.** Project does not involve any land acquisition. A Resettlement Plan will be prepared if there are any involuntary resettlement.
Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		√	**Not anticipated.** Contractors shall prioritize hiring local labor force. Some of the skilled workers may be brought from outside but numbers should not be so large to have impacts on social services.
Overflows and flooding of neighboring properties with raw sewage?		√	**Not anticipated.** Treated effluents from the STP will be utilized in agriculture or similar uses and comply with the State's Reuse policy.
Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		√	**Not anticipated.** Risks, climate change factors and forecasted demands are considered in the design and capacity of the sewerage systems.
Noise and vibration due to blasting and other civil works?		√	**Not anticipated.** Designs include sludge collection, handling, treatment and disposal. Standards are provided for the use of sludge as manure. Sewerage system design ensure no industrial effluent will be allowed into the network.

SCREENING QUESTIONS	Yes	No	REMARKS
risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	√		**Anticipated but temporary, site-specific and can be mitigated.** Blasting for underground works is prohibited in RUDSICO. Nuisance or disturbance due to noise may be experienced but minimized with mitigation measures specified in the EMPs. Scheduling of works and prior information with the affected people will be conducted.
Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	**Anticipated but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirements for an Occupational Health and Safety (OHS) plan. The contractor's OHS plan shall be reviewed and cleared by the PIUs prior to commencement of works.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	√		**Not anticipated.** Sewerage system only caters to domestic waters, no industrial wastewater is allowed into the system.
Road blocking and temporary flooding due to land excavation during the rainy season?		√	**Not anticipated.** STP will be isolated through boundary walls and dense plantations to avoid/minimize nuisance.
Noise and dust from construction activities?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** Road blocking for pipe laying works may be required and mitigation measures are required as per IEE/EMP. Underground construction works (sewer laying, foundations) should be carried out in non-monsoon period to avoid flooding.

SCREENING QUESTIONS	Yes	No	REMARKS
traffic disturbances due to construction material transport and wastes?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** No major noise-generating activities like rock blasting is anticipated. As the sewers will be laid on the road surface, cutting open of road surface using pneumatic drills will produce noise and dust. Temporary nuisance/disturbance due to noise and dust may be experienced by sensitive receptors. These impacts will be minimized with mitigation measures specified in the EMPs. During operations, noise may be experienced by sensitive receptors due to STP operations. This impact will be avoided by including noise barriers and enclosure of noise-producing components.
temporary silt runoff due to construction?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** Linear activities like sewer laying along the roads is likely to disrupt traffic. Vehicle movement for construction purpose will increase the traffic. Identification of alternate routes, allowing limited - at least one-way traffic, prior information about the works and alternative arrangements, providing information/sign boards etc. will reduce the impact.
hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirement for contractors to provide silt control measures.
deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		**Not anticipated.** Adequately trained staff and necessary equipment will be in place for regular operation and maintenance of the system. Proposed treatment system will be efficient and appropriate repair and maintenance procedure will be developed. Sufficient funds for operation will be ensured. Backup power supply system is part of project.

SCREENING QUESTIONS	Yes	No	REMARKS
contamination of surface and ground waters due to sludge disposal on land?	√		**Not anticipated.** STP designs include sludge handling and treatment facilities to state policy standards.
Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in sewage and sludge?	√		**Not anticipated.** STP designs include sludge handling and treatment facilities to state policy standards. O& M manual includes testing procedures and acceptable parameters for disposal on land.
large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		√	**Anticipated during operation but temporary, site-specific and can be mitigated.** Workers may be exposed during cleaning of blockages in sewerage network. However, O&M Manuals will include standard operating procedures. All necessary health and safety training and personal protection equipment will be given to workers and staff during operation of sewerage system. Implementation of contractors' H&S will be strictly enforced by the PIUs.
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 construction and operation?		√	**Not anticipated.** Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure.
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 decommissioning?	√		**Not anticipated.** Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure. No conflicts envisaged.

A Checklist for Preliminary Climate Risk Screening

Country/ Project Title: IND/ Rajasthan Secondary Towns Development Sector Project (RSTDSP) / Water supply and Sewerage Project in Mandawa Town, Distt. -Jhunjhunu
Sector: Urban Development
Subsector: Department: SARD/SAUW

Screening Questions		Score	Remarks [41]
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	
	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 hydro-meteorological parameters likely 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	

Options for answers and corresponding score are provided 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 a 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

[41] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Rapid Environmental Assessment (REA) Checklist

WATER SUPPLY

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.
(iii) 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: IND/Rajasthan Secondary Towns Development Sector Project (RSTDSP)-Water Supply and Sewerage Project, Mandawa, Jhunjhunu, Rajasthan
Sector Division: Urban Development

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA…			
Densely populated?	√		Subproject activities extend to the entire town including the densely populated areas. There are no major negative impacts envisaged, because pipeline will be located within ROW alongside the existing roads and can be constructed without causing any permanent impact to houses, and commercial establishments. STP site is sufficient away from habitations.
Heavy with development activities?	√		Mandawa is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas?		√	There are no any environmentally sensitive areas within or near to any proposed site
Cultural heritage site	√		Mandawa is one of the heritage towns in RSTDSP. Heritage impact assessment (HIA) was conducted as part of the preparation of the IEE for sample subprojects. The HIA is included in the IEE and the recommendations are included in the preliminary design and EMP. The HIA will be updated during detailed design stage. The EARF and

Screening Questions	Yes	No	Remarks
			sample IEEs include chance find protocol. Statutory clearance from Archaeological Survey of India and/or Rajasthan Department of Archaeology and Museums shall be obtained prior to start of works. For physical cultural resources (PCRs) that are not legally protected, the EARF includes requirements and measures to be considered in the detailed design.
Protected area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	
Potential Environmental Impacts Will the Project cause…			
Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff ?		√	**Not anticipated**. There is no wastewater or effluent discharge into the upstream sources and are thus not expected to induce pollution of raw water supply.
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not anticipated.** No above-ground infrastructures will be built within or adjacent to PCRs. Only pipe laying will be done outside and around PCRs. The HIA specify the requirements before and during construction to ensure that no loss or damage will be done on these PCRs.
Hazard of land subsidence caused by excessive ground water pumping?		√	**Not anticipated.** Any groundwater source (e. g. tube wells), will require permission from Rajasthan Ground Water Board and conduct of feasibility/source sustainability studies prior to consideration as a source.
Social conflicts arising from displacement of communities?		√	**Not anticipated.** Project does not involve any land acquisition. A Resettlement Plan will be prepared if there are any involuntary resettlement.
Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	**Not anticipated.** Water allocation letters from the Public Health Engineering Department (PHED) and Rajasthan Groundwater Department are required,

Screening Questions	Yes	No	Remarks
			and only allocated water shall be used for the water supply subprojects.
Unsatisfactory raw water supply (e. g. excessive pathogens or mineral constituents)?		√	**Not anticipated.** Efficient treatment technology and water quality laboratories are included in scope of water supply subprojects.
Delivery of unsafe water to distribution system?	√		**Not anticipated**.
Inadequate protection of intake works or wells, leading to pollution of water supply?		√	**Not anticipated.** Design specifications include protection of intake works.
Over pumping of ground water, leading to salinization and ground subsidence?		√	**Not anticipated.** Groundwater extraction shall be limited to the sustainable levels as indicated in the permits provided by the Groundwater Department.
Excessive algal growth in storage reservoir?	√		**Not anticipated.** Design specifications confirm maintenance requirements to ensure no algal growth in tanks and reservoir.
Increase in production of sewage beyond capabilities of community facilities?	√		**Not anticipated.** Sewerage systems and demand requirements are accounted for. The project will include improvement of sewerage and sanitation systems.
Inadequate disposal of sludge from water treatment plants?		√	**Not anticipated.** Facilities to manage sludge and solid wastes (grit) are included in the design. The IEEs and Operations and Maintenance (O&M) manuals will include handling and disposal procedures.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	√		**Not anticipated.** Low noise pumps and machineries will be used in pumping stations to alleviate noise to nearby areas.
Impairments associated with transmission lines and access roads?	√		**Anticipated during construction only.** Complete road closures are not expected, and traffic may be diverted with access ensured for pedestrians. Contractors are required to incorporate in the Traffic Management Plan as part of the site-specific EMP (SEMP).
Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	√		**Anticipated but can be mitigated.** Potential hazards during O&M phase are identified and mitigation measures in place. Chlorine will be handled by qualified personnel with the proper handling techniques and proper PPE.

Screening Questions	Yes	No	Remarks
			No other hazardous chemical will be maintained.
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?	√		**Anticipated but can be mitigated.** Potential hazards during O&M phase are identified and mitigation measures in place. Chlorine will be handled by qualified personnel with the proper handling techniques and proper PPE. No other hazardous chemical will be maintained.
Dislocation or involuntary resettlement of people		√	**Anticipated but can be mitigated.** Any involuntary resettlement is addressed by the resettlement framework.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	**Not anticipated.** Contractor is encouraged to hire workers from the local labor force.
Noise and dust from construction activities?	√		**Anticipated but temporary, site-specific and can be mitigated.** No blasting activities envisaged. Nuisance or disturbance due to elevated noise may be experienced during construction. All the machineries employed will comply with the noise emission standards of the Central Pollution Control Board. Dust suppression measures such as water sprinkling will be employed. These requirements and monitoring of effectivity should be included in the site-specific EMP.
Increased road traffic due to interference of construction activities?	√		**Anticipated but temporary, site-specific and can be mitigated.** Complete road closures are not expected, and traffic may be diverted with access ensured for pedestrians. Contractors are required to incorporate in the Traffic Management Plan as part of the site-specific EMP (SEMP).
Continuing soil erosion/silt runoff from construction operations?	√		**Anticipated but temporary, site-specific and can be mitigated.** Construction work during monsoon shall be carried out such that silt run off is prevented. SEMPs include requirement for contractors to provide silt control measures.
Delivery of unsafe water due to poor O&M treatment processes		√	**Not anticipated.** Water treatment plans are designed with on-site and timely

Screening Questions	Yes	No	Remarks
(especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?			monitoring to ensure the quality of treated water prior delivery to the households. The drinking water quality parameters and acceptable levels are included in the contract.
Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	**Not anticipated.** Treated water will be tested prior distribution.
Accidental leakage of chlorine gas?	√		**Not anticipated.** Proper Occupational Health and Safety (OHS) handling and storage of chlorine is included in the requirements
Excessive abstraction of water affecting downstream water users?		√	**Not anticipated.** Only water allocated by the Government will be used for the water supply services.
Competing uses of water?		√	**Not anticipated.** Water used for the project are specifically allocated by the Government for the project's purpose. Only the water allocated will be used.
Increased sewage flow due to increased water supply	√		**Not anticipated.** Sewerage systems and demand requirements are accounted for in the analysis. The project will include improvement of sewerage and sanitation systems.
large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	**Not anticipated.** Sewerage systems and demand requirements are accounted for in the analysis. Some subprojects also include new sewerage systems.
social conflicts if workers from other regions or countries are hired?		√	**Not anticipated.** Contractors shall prioritize hiring local labor force. Some of the skilled workers may be brought from outside but numbers should not be so large to have impacts on social services.
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?		√	**Not anticipated.** Contractors shall prioritize hiring local labor force. Some of the skilled workers may be brought from outside but numbers should not be so large to have impacts on social services.
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	√		**Anticipated but temporary, site-specific and can be mitigated.** Construction does not involve use of explosives. EMPs include measures and monitoring requirements on

Screening Questions	Yes	No	Remarks
the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?			occupational health and safety for chemical hazards.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: IND/Rajasthan Secondary Towns Development Sector Project (RSTDSP)/Water Supply and Sewerage Subproject, Mandawa, Distt. Jhunjhunu, Rajasthan
Sector: Urban Development
Subsector: Water Supply
Division/Department: SARD/SAUW

Screening Questions		Score	Remarks [42]
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	
	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 hydro-meteorological parameters likely 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	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

[42] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

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 a 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 risk

Other Comments: None

Appendix 2: Surface water allocation Letter from Executive Engineer, PHED

OFFICE OF THE EXECUTIVE ENGINEER, PROJECT DIVISION , KHETRI

S.No: 550 **Dated:** 11.03.2020

Chief Engineer
RUIDP, Jaipur

Sub: Surface water allocation for Mandawa town.

Sir,

In reference to the above cited subject Mandawa town is covered under Integrated Taranagar-Jhunjhunu-Sikar-Khetri, Drinking Water supply Project of Mandawa town and source of water is from IGNP canal. The project has been commissioned and Surface water starts getting in town. Water allocation for Mandawa town for year 2047 is 5.38 MLD.

Submitted for your information.

Executive Engineer,
Project Division
PHED, Khetri(Jhunjhunu)

Appendix 3: Compliance with Environmental Criteria for Subproject Selection

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
All subprojects			
	Subproject will avoid potentially significant adverse impacts that are diverse, irreversible or unprecedented (ADB SPS Category A for environment).		Being complied, the proposed components of subproject are proposed in already developed area and all impacts are predictable and mitigation measures are part of project design
	Comply with all requirements of ADB SPS 2009 and follow procedures set in this environmental assessment and review framework (EARF)		Being complied
	Comply with relevant national, and local laws, rules and regulations regarding EIA, environmental protection, pollution prevention (water, air, noise, solid waste, etc.) wildlife protection, core labor standards, physical cultural resources, health and safety, and other laws in specific sectors as indicated below		Being complied
	Does not include and/or involve any activities listed in ADB's Prohibited Investment Activities List[43]		Being complied
	Reflect inputs from public consultations	Refer to ADB SPS requirements on meaning consultations[44]	Being complied
Location	Avoid involuntary resettlement by prioritizing rehabilitation over new construction using vacant government land where possible, and taking all possible measures in	If cannot be avoided, prepare Resettlement Plan.	Being complied

[43] ADB SPS Appendix 5.

[44] Per ADB SPS, meaningful consultation is defined as "a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues"

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
	design and selection of site or alignment to avoid resettlement impacts		
	Avoid or minimize the cutting of trees	If tree is to be cut, consider 1:3 replacement	Being complied
Biodiversity	Avoid locating subprojects in critical habitats, such as, but not limited to, wildlife/bird sanctuaries, national parks, tiger reserves, elephant reserves, conservation reserves or core zone of biosphere reserves. Appendix 1 provides preliminary analysis using the International Biodiversity Assessment Tool (IBAT) key biodiversity areas, protected areas, IUCN red list species and likelihood of critical habitats per town. Should not directly affect environmentally protected areas, core zones of biosphere reserves and highly valued habitat	If criteria is not met, this is potential for Category A therefore alternate location should be considered. A Biodiversity Expert shall assess and confirm critical habitat qualification. Appendix 2 provides a Biodiversity Assessment Report prepared for a sample subproject (Abu Road water and sewerage subproject).	Being complied
	If work is proposed with the aim of improving the conservation or management of designated subproject sites (e. g. improved drainage), this must only be undertaken: (i) after a comprehensive study and development of management plans and criteria; and (ii) with the direct involvement and approval of national and local bodies responsible for the subproject site.		Being complied
Physical Cultural Resources	Should not result in the destruction/damage of or encroachment onto physical cultural resources (PCR)[45] such as	If location is within 300 m of notified protected monuments/ sites and there is no alternative, permissions from the ASI or State Department of	Being complied

[45] Physical cultural resources as defined as “movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
	archaeological monuments; heritage sites and movable or immovable objects, sites, structures, group of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance.	Archaeology to be obtained prior to finalization of detailed engineering design. If potential physical cultural resources are found within or adjacent to project sites, a Heritage Impact Assessment is required to be conducted by a competent expert.	
Existing Facilities to be rehabilitated or expanded	Conduct environmental audit of existing facilities[46] per ADB SPS	For non-compliances, provide corrective action for each area of concern including cost and schedule to be included in the subproject EMP.	Being complied
Associated Facilities[47]	Analyse environmental impacts and risks to be included in the IEE		Being complied
Asbestos-containing materials (ACM) including, but not limited to, pipes, roofing, ceilings, insulation materials, excess pipes stored in PHED campuses, walls, etc.	Avoid handling or removing any ACM. Ensure asbestos concrete (AC) pipes facilities containing asbestos will not be disturbed and left in-situ. Appendix 4 provides asbestos management plan.	If ACM is suspected, asbestos verification by a competent expert is required and an asbestos management plan (AMP) prepared. Appendix 4 provides a sample AMP prepared for a sample subproject (Sardarshahar water and sewerage subproject). RUDSICO-EAP shall include AMP in all contracts. Contractor should be certified to handle ACM.	Being complied
	When designing subproject infrastructure that involves excavation in urban areas the relevant authorities must be consulted to ascertain the location of any ACM prior to any subproject activity. Locations of new infrastructure must then be designed to avoid excavating or disturbing any ACM.		Being complied

be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level."

[46] ADB SPS Appendix 4 para 12 on Existing Facilities.

[47] ADB SPS Appendix 1 para 6 defines associated facilities as "not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project"

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
Right-of-way	Locate water supply pipelines within the right of way (ROW) of other linear structures (roads, irrigation canals) as far as possible, to reduce new land acquisition.		Being complied
	Ensure that pipelines ROW do not require land acquisition from individual farmers that is a significant proportion of their total land holding (>10%).		Being complied
Water Supply			
Sustainability	Utilize water sources at sustainable levels of abstraction only (i. e. without significant reductions in the quantity or quality of the source overall)	Water source sustainability or the relevant clearance from PHED should be provided in the subproject's IEE.	Being complied
Quality (raw water, treated water)	Ensure that water supply to consumers comply with the national drinking water standards at all times and confirm this by regular monitoring at WTPs and in domestic premises.		Being complied
	Avoid using water sources that may be polluted by upstream users	Baseline raw water quality to be included in the IEE.	Being complied
	Avoid water-use conflicts by not abstracting water that is used for other purposes (e. g. irrigation)	If there are other users, permits or clearance for the allocation should be provided in the IEE.	Being complied
Location	Locate all new facilities – As for as possible locate all new facilities – Water Treatment Plants (WTP), Tube Wells (TW), etc. away from houses, shops or any other premises used by people, thus establishing a buffer to reduce the effects of noise, dust and the visual appearance of the site.		Being complied
	Locate WTP at sites where there is no risk of flooding or other hazards that might impair functioning of the WTP or present a risk if damage to the WTP or the surrounding area		Being complied

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
Design	Ensure that the water supply system improvements are combined with improvements in sewerage to deal with the increased discharge of domestic wastewater.		Being complied
Sewage System			
Location	As far as possible, new Sewage Treatment Plants (STP) should be preferably 100m away from any inhabited areas, in locations where no urban expansion is expected in the next 20 years, thus establishing a buffer to reduce effects of odor, visual appearance or other nuisance of the site (this may be reviewed depending on the technology adopted for the treatment of effluent).	In case of non-availability of suitable sites due to land and technical design constraints in already developed areas, where 100m buffer is not available, following procedures shall be adopted and documented in order to finalize sites for implementation of project: (i) conduct alternate site analysis, justify the selected site; (ii) develop odor mitigation measures to prevent and control odor/air emissions – design measures, and operational practices that are feasible and practical in local conditions and include in IEE; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least three rows of trees within the STP compound); and (v) public information – consult local community, inform about the need, process adopted to select sites, its suitability, and measures adopted for odor prevention and control	Being complied
	As far as possible Sewage Pumping Stations (SPS) and wet wells should be located preferably 50m from any inhabited areas and from sites such as hospitals, schools, temples, etc. to minimize nuisance impacts from odor, rodents, etc.	In case of non-availability of suitable sites due to land and technical design constraints in already developed areas, where 50m buffer is not available, following procedures shall be adopted and documented in order to finalize sites for implementation of project: (i) conduct alternate site analysis, justify the selected site; (ii) develop odor mitigation measures to prevent and control odor/air emissions –	Being complied

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
		design measures, and operational practices that are feasible and practical in local conditions and include in IEE; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least three rows of trees within the pumping station compound); and (v) public information – consult local community, inform about the need, process adopted to select sites, its suitability, and measures adopted for odor prevention and control	
	Locate STP at sites where there is no risk of flooding or other hazards that might impair function of the STP or present a risk of damage to the STP or the surrounding area		Being complied
Quality	Ensure that sewage is treated at all times to national wastewater discharge standards and confirm this by regular monitoring of effluent from the STP.		Being complied
Treated Water	Ensure that no wastewater is discharged into a water course in which it could be a hazard to downstream users (e. g. a waterway that is used as a source of water for domestic or municipal supply)		Being complied
Sludge	Include measures to ensure the safe disposal of sewage sludge and if possible, to promote its safe and beneficial use as an agricultural fertilizer		Being complied
Right-of-way	Locate sewage pipelines within the right of way (ROW) of other linear structures (e. g. roads) wherever feasible, to reduce new land acquisition.		Being complied
	Ensure that routes of sewage mains do not		Being complied

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
	require land acquisition from individual farmers that is a significant proportion of their total land holding (10%)		

Appendix 4: Geographical position coordinates of all project sites

S. No.	Components	Latitude	Longitude
Water Supply			
1	CWR at PHED JEN CAMPUS	28° 2'50. 87"N	75° 9'0. 34"E
Sewerage			
2	S. P. S NEAR PHED OFFICE	28° 2'50. 17"N	75° 8'58. 93"E
3	S. T. P AT BISSAU ROAD	28° 3'58. 39"N	75° 9'15. 53"E

Appendix 5: Subproject Sites Photographs



Existing OHSR at Ward no. 4



Dilapidated condition of existing OHSR at PHED J. En. Campus



Existing building of pump house at PHED J. En. Campus



Condition of pumps at PHED J. En. Campus



Condition of existing CWR at PHED J. En. Campus



Proposed site for construction of SPS at Fatehpur Road



Proposed land for STP (3. 9 MLD) at Bissau Road



Tipper being used for carrying solid waste at Mandawa



Wide roads in Mandawa Town



Narrow lanes in Mandawa



Heritage Buildings in Mandawa



Old city narrow lanes with heritage buildings



Heritage wall paintings on a heritage building

Appendix 6: Details of land availability for Proposed Water Supply & Sewerage Subproject Components

Project Component	Location	Ownership	Area of government land available at the location (m²)	Area required (m²)	Khasra No.	Khata No.	Remarks	NOC Status	Photo of Land
Construction of 1 nos of STP of 3. 9 MLD and Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR)	Near Bissau Road	Nagar Palika	2200	1500	1396	219	Land donated by Thakur Durga Singh	Nagar Palika move letter to District collector for allotment of donated land to Municipal body (Ref Appendix 21 for STP	
Construction of 1 nos of Sewerage Pumping Station (0. 4 mld) near Fatehpur Road	near Fatehpur Road	Bus Stand, Nagar Palika	5500	1000	1219, 1220, 1221		Land available with Nagar Palika (Pre-owned land)	Land Revenue records are appended in Appendix 21	

Project Component	Location	Ownership	Area of government land available at the location (m^2)	Area required (m^2)	Khasra No.	Khata No.	Remarks	NOC Status	Photo of Land
Clear Water Reservoir (1200KL), CRMC, MCC, CCC	J. En. Campus	PHED	Sufficient Land Available	500			Vacant, unused Land available in the campus	Refer Appendix- 21 point no-5	

Paper Clip of land donation for STP

सीवरेज ट्रीटमेंट प्लांट के लिए मंडावा के ठाकुर दुर्गा सिंह ने जमीन पालिका को दान की



उप तहसील कार्यालय में ठाकुर दुर्गा सिंह ने नायब तहसीलदार सुनीता रैवाड़ व ईओ मनीष पारीक की उपस्थिति में अपनी भूमि नगर पालिका के नाम करवाने की कार्यवाही पूर्ण की।

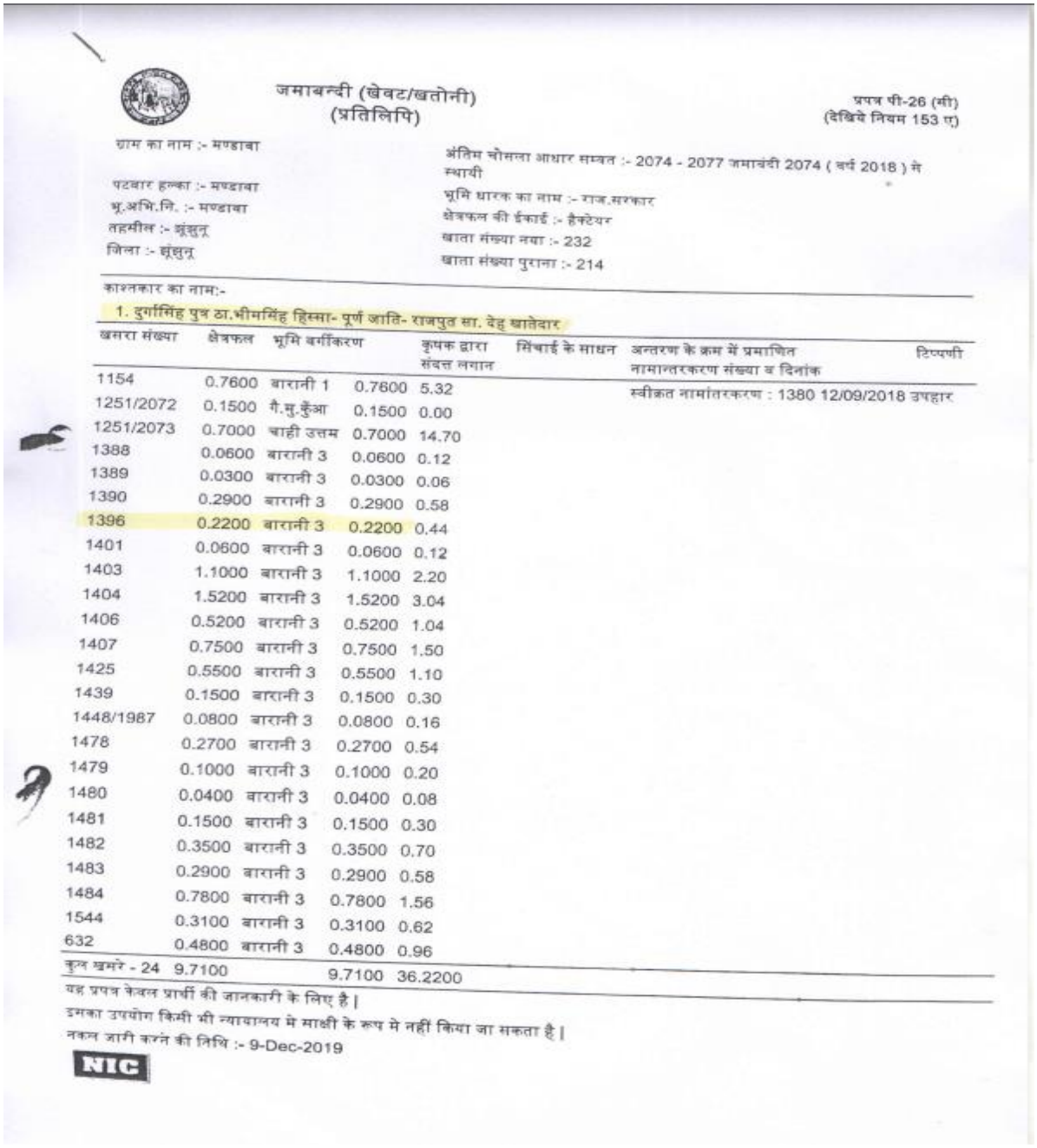
मंडावा, (निसं)। कस्बे की बहुप्रतीक्षित सीवरेज योजना जो कि अंतिम छोर जहां पर सारा गन्दा पानी एकत्रित होकर उसका ट्रीटमेंट प्लांट लगना था वो जगह पालिका के पास उपलब्ध न होने के कारण उक्त योजना रद्द होने के कगार पर आ गई थी। इसके लिए पूर्व पालिका अध्यक्ष सज्जन मिश्रा के नेतृत्व में कस्बे के लोग ठाकुर दुर्गा सिंह से मिले और उनसे उनके खातेदारी की जमीन नगर पालिका को इस योजना के लिये देने का आग्रह किया, जिसे उन्होंने सहर्ष स्वीकार करते हुए कस्बे के विकास के लिए नि:शुल्क भूमि देने के लिए राजी हो गए।

बिसाऊ रोड पर उक्त भूमि का समर्पण पत्र देने शुक्रवार को ठाकुर दुर्गा सिंह मंडावा उप तहसील कार्यालय में रजिस्ट्री करवाने के लिए आए। नायब तहसीलदार सुनीता रैवाड़, अधिशाषी अधिकारी मनीष पारीक, नगर पालिका के जेईएन व लिपिक पवन जोशी, पटवारी जितेंद्र कुमार ने भूमि नगर पालिका के नाम करवाने की कार्यवाही पूर्ण की। इस अवसर पर सज्जन मिश्रा के नेतृत्व में नगर कांग्रेस अध्यक्ष पार्षद नरेश सोनी, शशिकान्त सैनी, असगर रंगरेज, कमलेश मिश्रा, श्याम सुन्दर जांगिड़, नन्द किशोर यादव, कन्हैया लाल सैन, प्रदीप सोनी, शुभम थलिया, जेपी टेलर, बाबू शर्मा आदि ने उपतहसील पहुंच कर ठाकुर दुर्गा सिंह का कस्बे के विकास में सहयोग करने के लिए आभार जताया व धन्यवाद दिया।

> ■ पालिका के पास भूमि उपलब्ध न होने के कारण सीवरेज योजना रद्द होने के कगार पर आ गई थी

सज्जन मिश्रा ने बताया कि पहले भी स्व. ठाकुर भीम सिंह ने भी अपनी बेशकीमती जमीन पॉवर हाउस बनाए जाने के लिए नि:शुल्क दी थी। अगर ऐसे भामाशाह आगे आकर सहयोग की भावना से काम करें तो क्षेत्र के विकास में किसी प्रकार की कमी नहीं रहेगी। वहीं दुर्गा सिंह ने भी भरोसा दिलाया की कस्बे के लिए आगे भी कभी मेरी कोई जरूरत हुई तो मैं हर सम्भव सहयोग देने के लिए तैयार रहूंगा।

Land owner details before donation of the land for STP



जमाबन्दी (खेवट/खतोनी)
(प्रतिलिपि)

प्रपत्र पी-26 (सी)
(देखिये नियम 153 ए)

ग्राम का नाम :- मण्डावा

पटवार हल्का :- मण्डावा
भू.अभि.नि. :- मण्डावा
तहसील :- झुंझुनू
जिला :- झुंझुनू

अंतिम चौसला आधार सम्वत :- 2074 - 2077 जमाबंदी 2074 (वर्ष 2018) से स्थायी
भूमि धारक का नाम :- राज.सरकार
क्षेत्रफल की ईकाई :- हैक्टेयर
खाता संख्या नया :- 232
खाता संख्या पुराना :- 214

काश्तकार का नाम:-

1. दुर्गासिंह पुत्र ठा.भीमसिंह हिस्सा- पूर्ण जाति- राजपुत सा. देह खातेदार

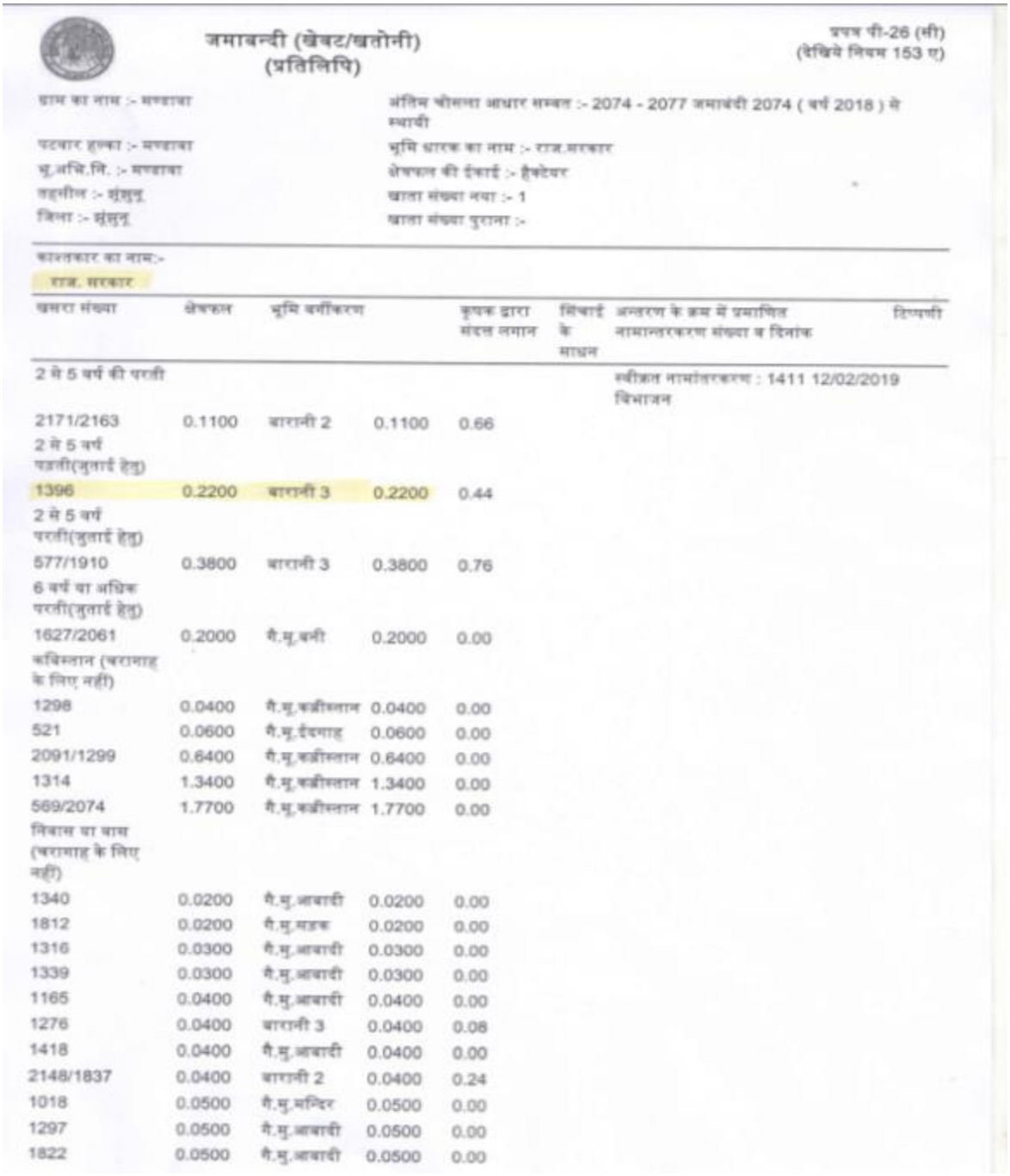
खसरा संख्या	क्षेत्रफल	भूमि वर्गीकरण	कृषक द्वारा संदत्त लगान	सिंचाई के साधन	अन्तरण के क्रम में प्रमाणित नामान्तरकरण संख्या व दिनांक	टिप्पणी
1154	0.7600	बारानी 1	0.7600 5.32		स्वीकृत नामांतरकरण : 1380 12/09/2018 उपहार	
1251/2072	0.1500	गै.मु.कुँआ	0.1500 0.00			
1251/2073	0.7000	चाही उत्तम	0.7000 14.70			
1388	0.0600	बारानी 3	0.0600 0.12			
1389	0.0300	बारानी 3	0.0300 0.06			
1390	0.2900	बारानी 3	0.2900 0.58			
1396	0.2200	बारानी 3	0.2200 0.44			
1401	0.0600	बारानी 3	0.0600 0.12			
1403	1.1000	बारानी 3	1.1000 2.20			
1404	1.5200	बारानी 3	1.5200 3.04			
1406	0.5200	बारानी 3	0.5200 1.04			
1407	0.7500	बारानी 3	0.7500 1.50			
1425	0.5500	बारानी 3	0.5500 1.10			
1439	0.1500	बारानी 3	0.1500 0.30			
1448/1987	0.0800	बारानी 3	0.0800 0.16			
1478	0.2700	बारानी 3	0.2700 0.54			
1479	0.1000	बारानी 3	0.1000 0.20			
1480	0.0400	बारानी 3	0.0400 0.08			
1481	0.1500	बारानी 3	0.1500 0.30			
1482	0.3500	बारानी 3	0.3500 0.70			
1483	0.2900	बारानी 3	0.2900 0.58			
1484	0.7800	बारानी 3	0.7800 1.56			
1544	0.3100	बारानी 3	0.3100 0.62			
632	0.4800	बारानी 3	0.4800 0.96			
कुल खसरे - 24	9.7100		9.7100 36.2200			

यह प्रपत्र केवल प्रार्थी की जानकारी के लिए है।
इसका उपयोग किसी भी न्यायालय मे साक्षी के रूप मे नहीं किया जा सकता है।
नकल जारी करने की तिथि :- 9-Dec-2019

NIC

Khasra No-	Khata No	Owner	Total land (In hec)	Date of Transfer
1396	214	Thankur Durga Singh s/o Bhim Singh	0. 22 hec	1380 12/09/2008 (Gift)

Land donated to state government for STP



जमाबन्दी (खेवट/खतोनी)
(प्रतिलिपि)

प्रपत्र पी-26 (सी)
(देखिये नियम 153 ए)

ग्राम का नाम :- मण्डावा
पटवार हल्का :- मण्डावा
भू.अभि.नि. :- मण्डावा
तहसील :- झुंझुनू
जिला :- झुंझुनू

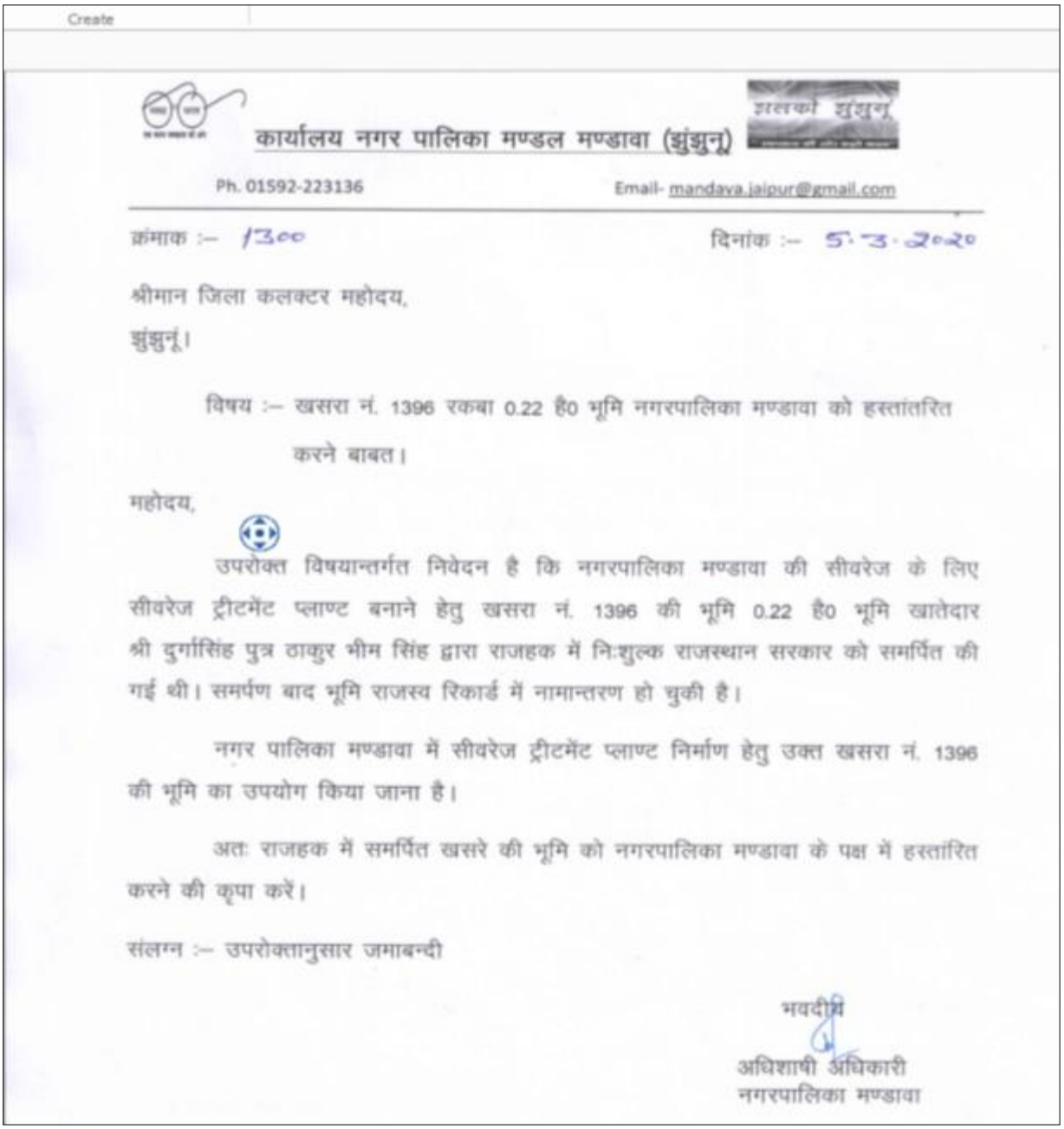
अंतिम चौसला आधार सम्वत :- 2074 - 2077 जमाबंदी 2074 (वर्ष 2018) से स्थायी
भूमि धारक का नाम :- राज.सरकार
क्षेत्रफल की ईकाई :- हैक्टेयर
खाता संख्या नया :- 1
खाता संख्या पुराना :-

काश्तकार का नाम:-
राज. सरकार

खसरा संख्या	क्षेत्रफल	भूमि वर्गीकरण		कृषक द्वारा संदत्त लगान	सिंचाई के साधन	अन्तरण के क्रम में प्रमाणित नामान्तरकरण संख्या व दिनांक	टिप्पणी
2 से 5 वर्ष की परती						स्वीकृत नामांतरकरण : 1411 12/02/2019 विभाजन	
2171/2163	0.1100	बारानी 2	0.1100	0.66			
2 से 5 वर्ष पडती(जुताई हेतु)							
1396	0.2200	बारानी 3	0.2200	0.44			
2 से 5 वर्ष परती(जुताई हेतु)							
577/1910	0.3800	बारानी 3	0.3800	0.76			
6 वर्ष या अधिक परती(जुताई हेतु)							
1627/2061	0.2000	गै.मु.बनी	0.2000	0.00			
कब्रिस्तान (चरागाह के लिए नहीं)							
1298	0.0400	गै.मु.कब्रीस्तान	0.0400	0.00			
521	0.0600	गै.मु.ईदगाह	0.0600	0.00			
2091/1299	0.6400	गै.मु.कब्रीस्तान	0.6400	0.00			
1314	1.3400	गै.मु.कब्रीस्तान	1.3400	0.00			
569/2074	1.7700	गै.मु.कब्रीस्तान	1.7700	0.00			
निवास का वास (चरागाह के लिए नहीं)							
1340	0.0200	गै.मु.आबादी	0.0200	0.00			
1812	0.0200	गै.मु.सडक	0.0200	0.00			
1316	0.0300	गै.मु.आबादी	0.0300	0.00			
1339	0.0300	गै.मु.आबादी	0.0300	0.00			
1165	0.0400	गै.मु.आबादी	0.0400	0.00			
1276	0.0400	बारानी 3	0.0400	0.08			
1418	0.0400	गै.मु.आबादी	0.0400	0.00			
2148/1837	0.0400	बारानी 2	0.0400	0.24			
1018	0.0500	गै.मु.मन्दिर	0.0500	0.00			
1297	0.0500	गै.मु.आबादी	0.0500	0.00			
1822	0.0500	गै.मु.आबादी	0.0500	0.00			

Khasra No-	Khata No	Owner	Total land (In hec)	Date of Transfer
1396	214	State Government	0. 22 hec	1411 12/02/2019

Letter move to District Collector for allotment of donated land to Municipal body for the construction of STP



Create

कार्यालय नगर पालिका मण्डल मण्डावा (झुंझुनू)

Ph. 01592-223136 Email- mandava.jaipur@gmail.com

क्रमांक :– 1300 दिनांक :– 5.3.2020

श्रीमान जिला कलक्टर महोदय,
झुंझुनूं।

विषय :– खसरा नं. 1396 रकबा 0.22 है0 भूमि नगरपालिका मण्डावा को हस्तांतरित करने बाबत।

महोदय,

उपरोक्त विषयान्तर्गत निवेदन है कि नगरपालिका मण्डावा की सीवरेज के लिए सीवरेज ट्रीटमेंट प्लाण्ट बनाने हेतु खसरा नं. 1396 की भूमि 0.22 है0 भूमि खातेदार श्री दुर्गासिंह पुत्र ठाकुर भीम सिंह द्वारा राजहक में निःशुल्क राजस्थान सरकार को समर्पित की गई थी। समर्पण बाद भूमि राजस्व रिकार्ड में नामान्तरण हो चुकी है।

नगर पालिका मण्डावा में सीवरेज ट्रीटमेंट प्लाण्ट निर्माण हेतु उक्त खसरा नं. 1396 की भूमि का उपयोग किया जाना है।

अतः राजहक में समर्पित खसरे की भूमि को नगरपालिका मण्डावा के पक्ष में हस्तांरित करने की कृपा करें।

संलग्न :– उपरोक्तानुसार जमाबन्दी

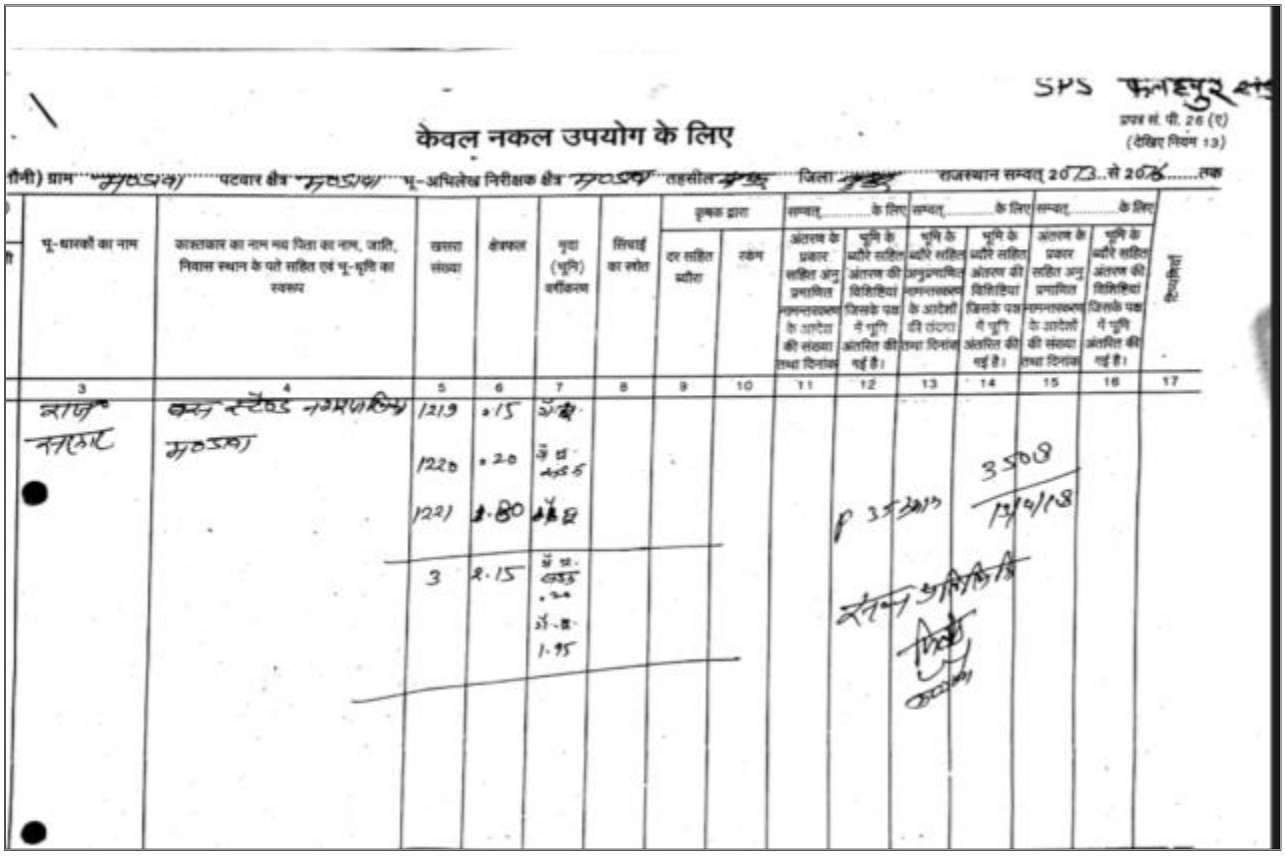
भवदीय

अधिशाषी अधिकारी
नगरपालिका मण्डावा

Transcript
To District Collector, Jhunjhunu
Sub: Regarding allotment of 0. 22 hec land under khasra no-1396 to municipal body
Sir,
With the above cited subject, Thakur Durga singh s/o Bhim singh has been donated 0. 22 hec land to state government for construction of STP near Bissau Road, Mandawa. Please allot this land to Municipality, so STP can be constructed.

Executive Officer, Municipality

Land Revenue Record of proposed SPS Land-Fatehpur Road

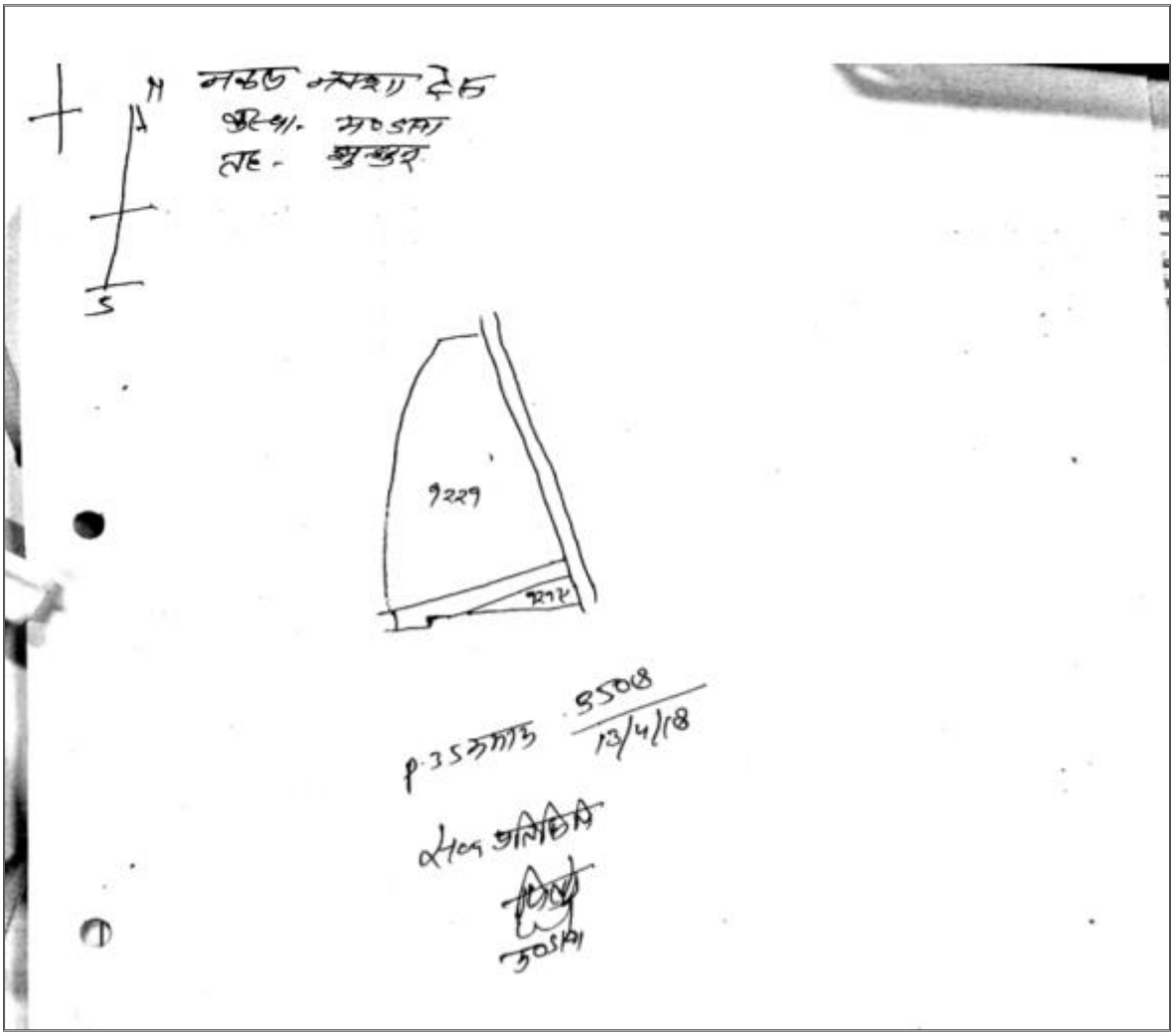


केवल नकल उपयोग के लिए

Transcript
Khatauni Village-Mandawa Patwar Halka-Mandawa, Tehsil- Mandawa, Dist-Jhunjhnu

New	Old	Name of Landowners	Khasra No	Area (Bigha)	Ownership
		State Government	1219, 1220, 1221	2. 15	Bus stand, Nagar Palika

Land Revenue Record of proposed SPS Land



Confirmation of availability of land in Existing PHED campus for construction of CWR (See Last Para of Point No. -C)

RUIDP

Rajasthan Urban Drinking Water, Sewerage and Infrastructure Corporation Limited
(External Aided Project)
AVS Building, Jawahar Circle, JLN Marg, Jaipur - 302017
Tel No.: 141 2721966, Fax No.: 141 2721919,
email : mailruidp@gmail.com, mail.ruidp@rajasthan.gov.in;

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1673 Dated 07.03.2018

Minutes of meeting held on 27.02.2018 under the chairmanship of Addl Project Director, RUIDP with PHED officers for discussion and finalization of DPR's for the RUIDP, Phase-IV towns.

A meeting was held on 27.02.2018 under the chairmanship of Additional Project Director, RUIDP for discussion and finalization of draft DPR's for the RUIDP, Phase-IV towns of Khetri, Mandawa, Shahpura (Jaipur), Rajgarh (Churu) and Kuchaman (Nagaur) with PHED officers & representative of consulting firms who are preparing DPRs. Consultants have given the power point presentation of DPRs & discussions were held in detail. List of officers who were present in the meeting are enclosed as **Annexure-A**.

Following were discussed/decided.

(A) General:

(1) **Operation and Maintenance:** It was appraised to PHED that operation and maintenance cost under water supply sector of RUIDP Ph-IV towns during 10 year O&M period shall be borne by the PHED.

(2) **Material for pumping main:** It was appraised to PHED that all pumping mains to ESRs & CWRs will be of DI K-9 only and gravity mains will be of DI K-7.

(3) **Water allocation from PHED Project:** Availability of water from different sources of project town were reconfirmed during presentation by the concerned EE,PHED.

(B) Khetri:

Year	Stage	Population	Water Demand (MLD)	TWs (7 Existing) and PHED (Project)
2021	Base Year	18816	3.25	1.12 + 3.10 = 4.22 MLD
2036	Intermediate Year	27597	4.23	

- Source of water is existing TWs and Canal water from Integrated Taranagar- Jhunjhunu-Sikar-Khetri Water Supply Project of PHED.
- It was informed by EE, PHED, Khetri that water from PHED project has been received at Khetri.
- DI K-7 pipe has been considered for distribution network due to rocky strata in the town and EE,PHED, Khetri agreed the same.
- It is proposed to construct a new pump house, CWR and Control Room cum Office in the existing A.EN campus and another online pumping station at existing JEN pump house of Khetri Town. These are only available appropriate space for the construction of new structures. It was confirmed that existing buildings are very old, damaged and decayed, and also some part of the building has already abandoned. Dismantling of these old buildings is required to create the space for new structures before construction. The

provision is being considered in DPR and EE,PHED, Agreed for the same. CE directed EE, PHED, Khetri to submit the request for the dismantling to PHED (HQ) for permission along with photographs and drawings with the date of construction of structures.

- There is no land issue. All new structures have been proposed at PHED AEN campus and online booster pump at PHED JEN campus.

(C) **Mandawa:**

Year	Stage	Population	Water Demand (MLD)	TWs (11 Existing) and PHED (Project)
2021	Base Year	26543	4.21	1.76+2.45 = 4.21 MLD
2036	Intermediate Year	30840	4.73	1.76+2.97= 4.73 MLD

- Source of water is existing TWs and Canal water from Integrated Taranagar- Jhunjhunu-Sikar-Khetri Water Supply Project of PHED.
- EE, PHED requested to add demand of the tourists as floating population because Mandawa is tourist place.
- There is no land issue. All structures have been proposed in PHED JEN campus where enough space is available.

(D) **Shahpura (Jaipur):**

Year	Stage	Population	Water Demand (MLD)	TWs (11 Existing+20 at Sabi River and 11 at Bishangarh Proposed)
2021	Base Year	41110	6.31	2.84+3.6+1.98=8.42 MLD
2036	Intermediate Year	52193	8.01	

- Source of water is TWs.
- EE, PHED was requested to allocate the land for 11 Nos. TWs, Pump house and CWR at Bishangarh and land for CWR at Bidara Village.
- EE, PHED confirmed that land for the construction of CWR and Pump house at Sabi River, Ker Ki Chowki are available in Khasra no. 1857 and 4901.

(E) **Rajgarh (Churu):**

Year	Stage	Population	Water Demand (MLD)	Canal Water from PHED Project
2021	Base Year	67360	10.31	9.551 MLD
2036	Intermediate Year	76900	11.77	

- Source of water is Canal water from Bungi Rajgarh Water Supply Project of PHED.
- Service level will be 100 lpcd and EE, PHED confirmed that there is no other source available.
- Land is available at Matamandi PHED headwork for the construction of proposed CWR and Pump House.

(F) **Kuchaman (Nagaur):**

Year	Stage	Population	Water Demand (MLD)	TWs (7 Existing) and PHED (Project)
2021	Base Year	74040	11.33	1+12.05=13.05 MLD
2036	Intermediate Year	92900	14.22	1+14.73=15.73 MLD

- Source of water is existing TWs and Canal water from Nagaur Lift Water Supply Project of PHED.
- EE, PHED appraised that water from NLWSP will be received in April-May-2018 at Kuchaman.
- EE, PHED requested to include the education Institutional demand since Kuchaman is education centre of Nagaur District, RUIDP agreed for the same.
- EE, PHED confirmed that land is available for the construction of CWR and Pump House at Old JEN campus, Makrana H/W, Panchawa Road H/W & AEN office campuses.

Meeting ended with vote of thanks to the chair.

(Akhil Kumar Jain)
Chief Engineer, RUIDP

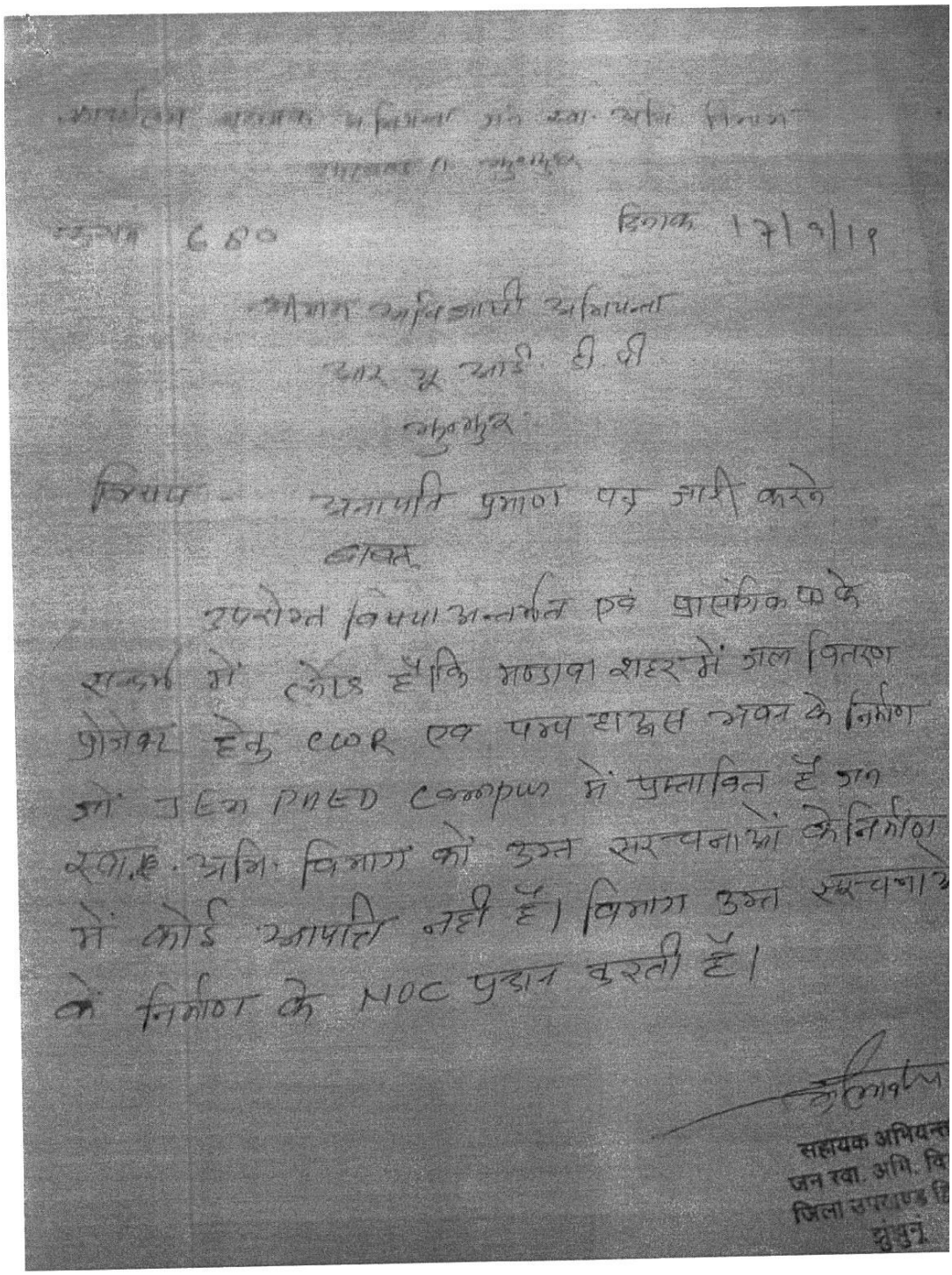
No. F3 (301)(50)/RUIDP/PMU/Ph-IV/ 16704-16 Date: 07.03.2018

Copy to the following for information & necessary action please:

1. PA to Project Director, RUIDP, Jaipur.
2. Additional Project Director, RUIDP, Jaipur.
3. Financial Advisor, RUIDP, Jaipur.
4. Chief Engineer, RUIDP, Jaipur.
5. Chief Engineer (HQ), PHED, Jaipur.
6. Chief Engineer (Spl Project), PHED, Jaipur
7. SE, PHED, Circle, Jhunjhunu/Jaipur/Nagaur/Churu.
8. SE(WS)/ SE(WW)/SE(Ph-IV), PMU, RUIDP, Jaipur
9. EE,PHED, Division Khetri/Mandawa/Shahpura (Jaipur)/ Rajgarh(Churu)/ Kuchaman(Nagaur)
10. EE,IPIU, RUIDP, Jhunjhunu/ Nagaur/ Churu
11. M/s Exceltech Consultancy and Projects Pvt Ltd., email: excelprojects06@gmail.com, excel.projects@rediffmail.com
12. M/s Creative Computers and Creative Technocrat Pvt Ltd. email:- jdullar@gmail.com
13. ACP, RUIDP for email to the concerned.

Superintending Engineer (WS)

NOC for proposed CWR and Pump Houses at PHED J. En. Campus, Mandawa



क्रमांक 680 दिनांक 17/9/19

सेवा में अधिशासी अभियन्ता
आर यू आई डी बी
झुन्झुनूं

विषय :- अनापत्ति प्रमाण पत्र जारी करने
बाबत्

उपरोक्त विषयान्तर्गत एवं प्रासंगिक पत्र के सन्दर्भ में लेख है कि मण्डावा शहर में जल वितरण प्रोजेक्ट हेतु CWR एवं पम्प हाउस भवन के निर्माण जो J.E.N. PHED Campus में प्रस्तावित है पर स.अ.अभि. विभाग को उक्त संरचनाओं के निर्माण में कोई आपत्ति नहीं है। विभाग उक्त संरचनाओं के निर्माण के NOC प्रदान करती है।

सहायक अभियन्ता
जन स्वा. अभि. वि
जिला सपरा एवं वि
झुंझुनूं

Appendix 7: Ambient Air Quality Standards, Emission limits for New DG sets, Stake Height Requirement of DG sets & Vehicle Exhaust Emission Norms

Table 1: Ambient Air Quality Standards

Parameter	Location [a]	India Ambient Air Quality Standard ($\mu g/m^3$)[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[e] ($\mu g/m^3$)
			Global Update [c] 2005	Second Edition 2000	
PM_{10}	Industrial Residential, Rural and Other Areas	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
	Sensitive Area	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
PM_{25}	Industrial Residential, Rural and Other Areas	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)		10 (Annual) 25 (24-hr)
SO_2	Industrial Residential, Rural and Other Areas	50 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	50 (Annual) 20 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
NO_2	Industrial Residential, Rural and Other Areas	40 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	40 (Annual) 80 (24-hr) 200 (1-hr)
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)
CO	Industrial Residential, Rural and Other Areas	2, 000 (8-hr) 4, 000 (1-hr)	-	10, 000 (8-hr) 100, 000 (15-min)	2, 000 (8-hr) 4, 000 (1-hr) 100, 000 (15-min)
	Sensitive Area	2, 000 (8-hr) 4, 000 (1-hr)	-	10, 000 (8-hr) 100, 000 (15-min)	2, 000 (8-hr) 4, 000 (1-hr) 100, 000 (15-min)
Ozone (O_3)	Industrial Residential, Rural and Other Areas	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0. 5 (Annual) 1. 0 (24-hr)		0. 5 (Annual)	0. 5 (Annual) 1. 0 (24-hr)

Parameter	Location [a]	India Ambient Air Quality Standard ($\mu g/m^3$)[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[e] ($\mu g/m^3$)
			Global Update [c] 2005	Second Edition 2000	
	Sensitive Area	0. 5 (Annual) 1. 0 (24-hr)		0. 5 (Annual)	0. 5 (Annual) 1. 0 (24-hr)
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
Benzene (C_6H_6)	Industrial Residential, Rural and Other Areas	5 (Annual)			5 (Annual)
	Sensitive Area	5 (Annual)			5 (Annual)
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0. 001 (Annual)			0. 001 (Annual)
	Sensitive Area	0. 001 (Annual)			0. 001 (Annual)
Arsenic (As)	Industrial Residential, Rural and Other Areas	0. 006 (Annual)			0. 006 (Annual)
	Sensitive Area	0. 006 (Annual)			0. 006 (Annual)
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0. 02 (Annual)			0. 02 (Annual)
	Sensitive Area	0. 02 (Annual)			0. 02 (Annual)

Sensitive area refers to such areas notified by the India Central Government.

[b] Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009

[c] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006

[d] Air Quality Guidelines for Europe Second Edition. WHO 2000.

[e] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 2: Emission limits for New DG sets up to 800 KW (As per Environment (Protection) (Third Amendment) Rules, 2013)

TABLE

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m^{-1})
	NOx +HC	CO	PM	
Upto 19 KW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 KW upto 75 KW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 KW upto 800 KW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Note:

1. The abbreviations used in the Table shall mean as under: NO_x – Oxides of Nitrogen; HC – Hydrocarbon; CO – Carbon Monoxide; and PM – Particulate Matter.
2. Smoke shall not exceed above value throughout the operating load points of the test cycle.
3. The testing shall be done as per D2 – 5 mode cycle of ISO: 8178- Part 4.
4. The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies.
5. Every manufacturer, importer or, assembler (hereinafter referred to as manufacturer) of the diesel engine (hereinafter referred to as 'engine') for genset application manufactured or imported into India or, diesel genset (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with COP of their product(s) for the emission limits which shall be valid for the next COP year or, the date of implementation of the revised norms specified above, whichever earlier.

   Explanation.- The term 'COP year' means the period from 1st April to 31st March.
6. Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines.

Table 3: Stake Height Requirement of DG sets

DIESEL GENERATOR SETS : STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula :

H = h+0.2x ÖKVA
H = Total height of stack in metre
h = Height of the building in metres where the generator set is installed
KVA = Total generator capacity of the set in KVA
Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

Source : Evolved By CPCB
[Emission Regulations Part IV:COINDS/26/1986-87]

Table 4: Vehicle Exhaust Emission Norms

1. Passenger Cars

Norms	CO (g/km)	HC+ NOx (g/km)
1991 Norms	14. 3-27. 1	2. 0(Only HC)
1996 Norms	8. 68-12. 40	3. 00-4. 36
1998 Norms	4. 34-6. 20	1. 50-2. 18
India stage 2000 norms	2. 72	0. 97
Bharat stage-II	2. 2	0. 5
Bharat Stage-III	2. 3	0. 35(combined)
Bharat Stage-IV	1. 0	0. 18(combined)
Bharat Stage-VI (Petrol)	1. 0	0. 16 (Combined)

2. Heavy Diesel Vehicles

Norms	CO (g/kmhr)	HC (g/kmhr)	NOx (g/kmhr)	PM (g/kmhr)
1991Norms	14	3. 5	18	-
1996 Norms	11. 2	2. 4	14. 4	-
India stage 2000 norms	4. 5	1. 1	8. 0	0. 36
Bharat stage-II	4. 0	1. 1	7. 0	0. 15
Bharat Stage-III	2. 1	1. 6	5. 0	0. 10
Bharat Stage-IV	1. 5	0. 96	3. 5	0. 02
Bharat Stage-VI (Diesel)	0. 5	0. 17 (HC+NOx)		0. 0045

Source: Central Pollution Control Board

CO = Carbon Monoxide; g/kmhr = grams per kilometer-hour; HC = Hydrocarbons; NOx = oxides of nitrogen; PM = Particulates Matter

Appendix 8: Effluent Discharge Standards for STPs by NGT order Dated 30. 04. 2019

Sl. No.	Parameters	Parameters Limit
1	pH	5. 5-9. 0
2	BOD (mg/l)	Not more than 10 mg/l
3	COD (mg/l)	Not more than 50 mg/l
4	TSS (mg/l)	Not more than 20 mg/l
5	P-Total (mg/l)- for discharge into ponds/lakes	Not more than 1. 0 mg/l
6	N-Total (mg/l)	Not more than 10 mg/l
7	Fecal Coliform (MPN/100ml)	Desirable- 100 MPN/100ml Permissible- 230 MPN/100ml

Appendix 9: Ambient Air Quality Standards in Respect of Noise and Noise Limits for DG Set

Table 1: Standards of Noise

Receptor/ Source	India National Noise Level Standards[a] (dBA)		WHO Guidelines Value For Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)		Applicable Per ADB SPS[c] (dBA)	
	Day	**Night**	**07:00 – 22:00**	**22:00 – 07:00**	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial area	65	55	70	70	65	55
Residential Area	55	45	55	45	55	45
Silent Zone	50	40	55	45	50	40

[a] Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.
[b] Guidelines for Community Noise. WHO. 1999
[c] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 2: Noise Limits for DG Set

(Noise Limit for Generator Sets run with Diesel were notified by Environment (Protection) second Amendment Rules vide GSR 371(E), dated 17th May 2002 at serial no.94 and its amendments vide GSR No 520(E) dated 1st July 2003; GSR 448(E), dated 12th July 2004; GSR 315(E) dated 16th May 2005; GSR 464(E) dated 7th August 2006; GSR 566(E) dated 29th August 2007 and GSR 752(E) dated 24th October 2008; G.S.R. 215 (E), dated 15th March, 2011 under the Environment (Protection) Act, 1986)

Noise Limit for Generator Sets run with Diesel

1. Noise limit for diesel generator sets (upto 1000 KVA) manufactured on or after the 1st January, 2005

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.

The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

The implementation of noise limit for these diesel generator sets shall be regulated as given in paragraph 3 below.

2. Noise limit for DG sets not covered by paragraph 1.

Noise limits for diesel generator sets not covered by paragraph 1, shall be as follows:-

2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.

2.4 These limits shall be regulated by the State Pollution Control Boards and the State Pollution Control Committees.

2.5 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-

01. The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
02. The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.
03. Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
04. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

3.0 Limits of Noise for DG Sets (upto 1000 KVA) Manufactured on or after the 1st January, 2005

3.1 Applicability

01. These rules apply to DG sets upto 1000 KVA rated output, manufactured or imported in India, on or after 1st January, 2005.

02. These rules shall not apply to –

a) DG sets manufactured or imported for the purpose of exports outside India; and

b) DG sets intended for the purpose of sample and not for sale in India.

3.2 Requirement of Certification

Every manufacturer or assembler or importer (hereinafter referred to as the "manufacturer") of DG set (hereinafter referred to as "product") to which these regulations apply must have valid certificates of Type Approval and also valid certificates of Conformity of Production for each year, for all the product models being manufactured or assembled or imported from 1st January, 2005 with the noise limit specified in paragraph 1.

3.3 Sale, import or use of DG sets not complying with the rules prohibited

No person shall sell, import or use of a product model, which is not having a valid Type Approval Certificate and Conformity of Production certificate.

Appendix 10: Salient Features of Major Labor Laws Applicable to Establishments Engaged in Construction of Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8. 33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8. 33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3, 500/- per month or less. The bonus to be paid to employees getting Rs. 2, 500/- per month or above up to Rs. 3, 500/- per month shall be worked out by taking wages as Rs. 2, 500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central

Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) **Construction and Demolition Waste Management Rules 2016-** This Rule stipulate that-

- Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities
- Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.
- Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodelling work,
- Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,
- Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;

(xvi) **Solid Waste Management Rules 2016- As per this Rule:** responsibility of Solid Waste Generator is as below-

- segregate and store the waste generated in three separate streams namely bio-degradable, nonbiodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and
- No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.

(xvii) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety

measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government. Salient features of this Act are given below-

Employer shall-

- Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets
- Provide sufficient urinals and latrines at convenient place, easily accessible by workers
- Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as pre-conditions after completing the construction works
- Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty female workers are engaged
- Provide first aid facilities in all construction sites

For safety of workers employer shall provide-

- Safe access to site and work place
- Safety in demolition works
- Safety in use of explosives
- Safety in operation of transporting equipments and appoint competent person to drive or operate such vehicles and equipments
- Safety in lifting appliance, hoist and lifting gears
- Adequate and suitable lighting to every work place and approach
- Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in work place and confined space
- Safety in material handling and stacking/un stacking
- Safeguarding the machinery with fly-wheel of moving parts
- Safe handling and use of plants operated by compressed air
- Fire safety
- Limit of weight to be lifted by workers individually
- Safety in electric wires, apparatus, tools and equipments
- Provide safety net, safety sheet, safety belts while working at height (more than 1. 6 m as per OSHA)
- Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required
- Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials
- Provide and maintain medical facilities for workers
- Any other matters for the safety and health of workers

Appendix 11: Mandawa Heritage Impact Assessment and Chance Find Protocol

MANDAWA HERITAGE IMPACT ASSESSMENT

The Mandawa Heritage Impact Assessment (HIA) incorporates identifying, predicting, evaluating and communicating the probable effects of current or proposed development policy or action on cultural life, institutions and communities, then integrating the findings and conclusions with planning and decision-making, to mitigate the adverse impacts and enhance positive outcomes.

1. 0. Introduction

Physical cultural resources (PCRs) increasingly face several challenges due to either neglect or as a result of new development impacting their fabric, conservation and/or management. Heritage Impact Assessment focusses on protecting the values and effectively identifies the threats posed by some of the developmental challenges. Cultural resources may be private or publicly managed, with distinct stakeholders thereby creating a unique impact on the place. It is important, therefore, that informed decisions minimize the impact on cultural physical resources. This exercise also elaborates the significance of each baseline component and how proposed development may alter/impact that resource.

A Heritage Impact Assessment is required to determine the impacts to cultural resources in Mandawa while undertaking the proposed water and sewerage infrastructure. The process includes identification of all resources, providing an evaluation of the significance and outlining the impact and proposing recommendations through mitigative measures that would minimize the impact on the resources. The entire process helps with informed decision making related to the identified physical cultural resources. A property doesn't have to be nationally or state-protected to be a part of Heritage Impact Assessment. This study is intended to assist developers and consultants to ensure that all the information is complete and comprehensive before action on the ground. HIA, as a process is especially important to study the details of tangible and intangible resources in Mandawa, in the context of minimising damage to the identity of the town at the hands of infrastructure schemes.

2. 0. Proposed Infrastructure Scheme

Mandawa Town water supply and sewerage subproject are one of the subprojects proposed in RSTDSP. It is one of the project towns selected for implementation of the ADB-funded subprojects. Under the investment component of the project, it is proposed to improve the water supply and sewerage system in Mandawa town. Water supply is currently intermittent and suffers from huge losses and quality issues. At present no sewerage system exists in the town. Due to lack of sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town.

In the absence of a safe disposal system of sewage as mentioned above, the people of Mandawa are facing unhealthy and unhygienic environmental conditions, therefore, public representatives are also demanding facilities of a sewerage system on a priority basis. The town requires sound drainage and sewerage system.

3.0. Project Area Studies

3.1. Background

Mandawa is a Tehsil headquarter and a municipal town in Jhunjhunu district of the Indian state of Rajasthan. It is located 190 km towards the north from the state capital, Jaipur. The City of Mandawa was made a *thikana* in the middle of the 18th century. There have been earlier references to Mandu Jat as the founder of the Mandawa village. He first established a *dhani* (hamlet) and dug a well here in approximately 1740 AD.

Initially, the area was known as 'Mandu ki dhani', 'Mandu ka bas' or 'Manduwas' which changed to 'Manduwa', 'Mandwa' and finally 'Mandawa', Mandawa was a trading outpost for the ancient caravan routes that stopped here from China and the Middle East. Thakur Nawal Singh, the Rajput ruler of Nawalgarh and Mandawa, built a fort in 1755 to protect this outpost and the township that grew around the fort soon attracted a large community of traders to settle here.[48]

The community of wealthy traders proceeded to decorate their mansions (*Haveli*s) inside and out with paintings depicting both classical Rajasthani scenes (elephants, Shiva, bulls) and imported inspirations (George V, and even trains!). Sadly, with the decline of the land trade routes, Mandawa's fate was sealed and it fell into a steady decline. Most of the tradesmen and their families left to seek better opportunities in other parts of the country, leaving their former grand *Haveli*s to decay with the passing of years.

The town is decorated with the images and paintings of Lord Krishna. Thakurji Temple is one of the significant religious shrines in Mandawa and is located on the main street as it runs uphill beyond a gateway. The temple is dedicated to Lord Krishna and displays a beautiful convergence of art and spirituality.

Referred to as an "open-air art gallery", Mandawa, along with some other towns in the Shekhawati region offers a unique glimpse of what once was, in the form of deteriorating frescoes and built features.

[48] https://en.wikipedia.org/wiki/Mandawa#cite_note-2

3.2. Regional Setting

The town lies between latitude 28° 06' in the North and longitude 75° 20' in the East. Jhunjhunu district is surrounded by Churu District on the north-western side, Hissar and Mahendragarh District of Haryana State in the north-eastern part and by Sikar District towards the west and south. It is well connected by road to the capital city Jaipur, and other parts of Rajasthan and Haryana states. The nearest airport is at Jaipur.

Buses are the major source of transport in Mandawa. There is no rail connectivity in Mandawa. The nearest railway station is Mukundgarh situated on Jaipur Loharu Meter Guage approximately 35 kms. from Mandawa.

3.3. Demography

The Mandawa Municipality has a population of 23, 335 of which 11, 682 are males while 11, 653 are females as per report released by Census of India 2011, nearly a decade ago.
Mandawa Municipality administers over approximately 3, 708 houses supplying basic amenities like water and sewerage. It is also authorized to build roads within Municipality limits and impose taxes on properties coming under its jurisdiction.
The town has been growing steadily since 1981 with phenomenal expansion during 1991-2001 when there was an influx of immigrants. However, thereafter the growth remained erratic. The average decadal increase is indicated as 40% though the last decadal (2001-2011) growth figures are half of that at approximately 20. 3%.

3.4. Socio-cultural context

Mandawa is known for its *havelis* and forts. A fortified town, now only a few of the fort walls remain and only one gate survives. The town grew around the main bazaar street near the fort that was located on raised ground forming the historic core. The town has many beautiful *havelis*, shops and temples with a collection of some of the most exquisite frescoes.

3.5. Ecological context

Mandawa experiences arid, dry climate characterized by hot summers, cold winters and low rainfall during the south-west monsoon period with mean annual rainfall of approximately 550 mm. The summer seasons are long, extending from March to June-July. The maximum temperature during the summer months soars above 44 degrees C frequently and during winter months hovers around 3. 6 degrees C.

Mandawa falls under the desert plain at an altitude of around 316 m above the mean sea level (MSL). Large extents of Jhunjhunu district are characterized by sand dunes that form part of the Great Thar Desert. The shifting and active dunes serve as hazards to cultivation. Soils are yellowish-brown, sandy to sandy loam, loose, structureless, well-drained with high permeability. Part of Jhunjhunu district is also covered by red desert soil. These are pale brown to reddish-brown, structureless, loose and well-drained having texture from sandy loam to sandy clay loam. They are suitable for agriculture but suffer from adverse climatic conditions. As stated above, the major part of the district is covered by blow sand. A small area in the eastern part of the district is occupied exclusively by the rocks of Delhi supergroup represented by quartzite, phyllite/ schist, gneisses, limestone and granites, pegmatite and amphibolite of Post Delhi.

Most of the Jhunjhunu district is drained by Kantli River, while the southeastern part is drained by Singhana River and a small area in the southwestern corner of the district is drained by Budhi Nala. The south and east hill ranges in Mandawa area are drained by Dohana River. Being mostly deserted terrain, the northern part of the district has inland drainage and the rainwater is mostly collected in depressions. All the rivers/nalas are ephemeral and flow in response to heavy precipitation during the monsoon. Due to lack of sewerage system, wastewater from the Mandawa town flows in open drains and accumulates in these depressions at several places. There are no

surface water sources in the vicinity of any of the proposed sites under this project.

3.6. Infrastructure and Economy

Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED. Remaining area which is newly developed and newly added to the municipality area remains unconnected with the piped scheme. There are no major industries in Mandawa town. Small scale industries like tourism, tie and dye, school bags and other handicrafts are few small scale industries present in the town.

3.7. Tourism

Mandawa is one of the finest of the residential communities in Shekhawati making it among the main tourist spots in Rajasthan preferred by domestic and international visitors set up with appropriate tourism infrastructure. This small 18th-century settlement is still a pleasant base for *haveli* explorations providing a commercial rationale for conserving building and environments which otherwise may be lost in time.

4.0. Physical Cultural Resources

While undertaking construction and operational work within Mandawa town, the PCRs may be understood as being the following:

Cultural significance is the importance of a property to the history, architecture, archaeology, engineering or culture of a community, region or nation. In selecting a building as a heritage structure, particular attention should be paid to the following:

i. Association with events, activities or patterns
ii. Association with important personalities or representing the work of a mastercraftsman (*Haveli*s)
iii. Distinctive physical characteristics of architectural style, design, construction or form (like forts & palaces)
iv. Potential to yield important information, such as illustrating architectural, social or economic history, for eg. *havelis*, royal stables, town halls, goshala, clubs, markets, waterworks etc.
v. Technological innovations in construction or building typologies viz. dams, bridges etc.
vi. Town planning features like gateways, squares, streets, avenues.
vii. All structures related to water such as wells, stepwells, *baoris* or *kunds*, natural drainage systems, water harvesting systems and any other traditional water collecting, disseminating structure is to be considered as a Physical Cultural Resource. Khetri streetscape continues to showcase facades (complete or in a state of disrepair) of houses, shops, temples and structures that may have retained their original use or adopted another function.

4.1. Description and listing

4.1.1. Natural heritage

- Aravalli hills (location of the Mandawa Fort). [9]
- The Shekhawati landscape supports dry deciduous vegetation. Different areas show dominance of different plant species, of trees, herbaceous or shrub species, etc.
- Some areas of Jhunjhunu are characterised by thorny, small trees or others such as Acacia sp. The hilly regions like Harshnath, Shakambhari etc. are characterised by herbaceous species. Plain areas at places are characterised by large trees like Mangifera indica (mango), etc.
- Soil types of the region are sandy loam, noncalcic brown, desert soil and alluvium. The soil is sandy and infertile in some areas.
- The vegetation of the desert part of the Shekhawati region consists mainly of trees and shrubs. Acacia nilotica, C. decidua, Calligonum polygonoides, Leptadenia, Prosopis cineraria, Salvadora persica and Zizyphus sp. may be found here. Some areas of the Shekhawati region are characterized by Acacia-Capparis species, such as Rasheedpura, Sanwloda, some parts of Nagaur, etc. [10] Other trees present are kikar or Khejdi tree, [11] Prosopis juliflora bush. [12]
- The most prolific vegetation seen in the arid zones of this State is *Kejri* or Prosopis cineraria. Shaped like abean this is known as *sangria*. It is not only used as fodder but also consumed as vegetable andconsidered a delicacy.

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[9] https://www. rajasthantourplanner. com/Monuments-Citywise/Mandawa-Fort. html

[10] Study Area 25 - Shodhgangashodhganga. inflibnet. ac. in

[11] https://www. outlookindia. com/outlooktraveller/explore/story/46932/the-colours-of-shekhawati

[12] http://oneindiaonepeople. com/shekhawati-a-desert-bloom/

- Another popular desert vegetable is *ker*. *Akaro* (scientific name- Calotropis precera) are also found in abundance. Most of th evegetaiton is xerophytic.

Natural heritage

Mandawa is well known for its wall paintings as part of the 19th and 20th-century architecture but Shekhawati region is equally renowned for its rich natural heritage. Though largely part of plains, Mandawa has a rugged topography with an average elevation of 316 m above mean sea level, with a general slope towards West and South.

Physiographically, peri urban areas have dunes and low lying mounds. The dunes are comprised of non-calcareous soils, sandy to loamy sand, are loose, structureless and well-drained. Mandawa falls mainly within Shekhawati basin. The area is drained largelyby Kantli river but some areas of Mandawa are also drained by ephemeral *nalas* carrying excess runoff during heavy precipitation during monsoons. The aquifer below Mandawa are unconfined and belong to the quaternary upper alluvium group. The thickness of the alluvium lies between 60 m to 100 m and groundwater occurs in the weathered mantle.

The agriculture activity is spread over both Kharif and rabi cultivation with the latter dependent on groundwater. The Shekhawati towns displayed a deep understanding of water management systems respecting natural heritage. . These water systems have been an integral part of the town planning, livelihoods, social values responsible for their survival in a semi-arid climate with lowavailability of water.

The change in the cropping pattern and land-use has significantly impacted the groundwater resources. An increase in cropping area hasreduced the fallow and grazing lands. The area under uncultivable wasteland has also declined. The region has shifted from low water consuming crops to high water-consuming crops which has lead to further lowering of groundwater resulting in drylands with salty ground water high in fluoride.

The *Havelis* demostrated good practice of water harvesting, use and conservation. The Seths and the rulers took care to ensure a steady and adequate – if not abundant – supply of drinking water, and where possible, irrigation water, for the community.

Wealthey merchants built small kuis (wells) within these traditional houses to ensure water for the family. At some places, they also constructed a tank asan underground storage chamber for drinking water. The reservoir would be lined with lime mortar and bricks, to minimise losses due to seepage and evaporation.

Some *tankas* (tanks) were communally owned with no restriction on people drawing water from these. Each tanka was protected by a small shrine or templeto ensure that the catchment area remained clean.

Talabs (ponds)like other water structures were the cornerstone of community life. . Used for bathing, washing clothes and feeding their animals these large spaces supported a comfortable microclimate due to the presence of water and khejri and peepal trees. The talab was built at a low

point to collect water at the convergence ofnatural gradients. Rainwater flowing along these gradients over gypsum layer or a rocky base prevented water percolation. Lime mortar lined these talabs. The catchment area of talab was much larger than the water body itself yet vital to its existence. With time and pressure for land, these open areas have been encroached and converted to dumps polluting the water and raising the fluoride content as is the case in Mandawa today.

This misuse and negligence has resulted in the disappearance of many of the *talabs*. Rampant emergence of tube wells for farming has resulted in further sinking of water tables. The community system of stewardship has declined with the advent of piped water and handpumps. This changing focus has meant that *tanka*s have lost their importance falling into disuse and eventually suffering a death knell with a change in land use. Community property, therefore, changes into private agricultural use in many cases. If appropriately restored, these traditional water structures could supply a fair percentage of the town's water needs reducing the pressure on centralised piped systems.

Water harvesting reinforces the state of natural heritage. As a philanthropic activity it is the responsibility of the community to repair abandoned wells, *tankas* and *johads* to minimise the crisis that awaits us. The conservation of built structures needs to go beyond the *Havelis* as has been undertaken recently, to recognise the significance of stand-alone water structures in the landscape.

4.1.2. Archaeological Landscape

Archaeological landscapes to be updated after field visits and verifications.

4.1.3. Cultural heritage (Built Heritage)

Mandawa Fort, located in the town & a classic example of Rajput architecture. Adorned by beautiful paintings & frescoes this has now been converted into a heritage hotel.

Mansions (*Haveli*)

Sewaram Saraf *Haveli* - This 100-year-old *Haveli* is famous for its architecture and paintings. [13]

Ram Pratap Nemani *Haveli* - This has been recently converted into a Heritage Hotel showcasing frescos dating back to the 18th century. Vivaana Culture Hotel is a captivating twin *haveli* is a century-old structure restored and renovated maintaining the old world charm.

Hanuman Prasad Goenka *Haveli* - This is well-known for its beautiful artwork produced by local artists from a couple of centuries ago. The paintings of Lord Shiva on his Nandi Bull, Indra Dev on

[13] en. wikipedia. org/wiki/Mandawa

an elephant and other mythological characters here showcase the strong religious beliefs of the Rajputs.

Goenka Double *Haveli* - This *haveli*, built in 1890, with two gates, has a monumental façade decorated with elephants and horses. The outer walls, projecting balconies, alcoves and overhanging upper stories are replete with traditional patterns and paintings, ranging from conventionally attired Rajasthani women and religious motifs to Europeans with stylish hats and Victorian finery.

Murmuria *Haveli* - The paintings of trains, cars, George V, and Venice were executed on the walls of this *haveli* during the 1930s by Balu Ram, one of the last working artists of the region. In pictures
- like Lord Krishna with his cows in the English courtyard and a young Nehru on a horseback, holding the national flag, this *haveli* use a unique theme blending the East with the West. The *haveli* also features a long frieze depicting a train with a crow flying above the engine and much activity at the railway crossing.

Jhunjhunwala *Haveli* - The *haveli* features a striking gold leaf painted room located to the right of the main courtyard. [14]

Mohan Lal Saraf *Haveli* - The Mohan Lal Saraf *Haveli* is well known for its beautiful collection of portraits and paintings. The carved archways and the walls of the palace are decorated with stunning frescoes. The sprawling halls and the latticed windows give this place an otherworldly, medieval aura. The elaborate courtyard also makes a fine excursion spot for tourists. [15] A picture of a Maharaja stroking his moustaches is part of the artwork here. [16]

Gulab Rai Ladia *Haveli* - This *haveli*, buit in 1870, is located towards the south of the town, with the finest decoration of both the outer and inner walls. Blue washes betray twentieth-century censorship of the erotic scenes that had been commonly accepted a century earlier. The Bansidhar Newatia *Haveli*, Lakshminarayan Ladia *Haveli* and Chokhani Double *Haveli* are some of the other painted *Haveli*s in the area. Murals in the Thakurji temple, located opposite the Goenka Double *Haveli* and the Murmuria *Haveli*, include depictions of the horrors of the Mutiny of 1857. Further west are located a few *chhatris*, and a step-well, that continues to be used till date bearing paintings inside its decorative corner domes.

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14 en. wikipedia. org/wiki/Mandawa
15 https://www. rajasthantourplanner. com/blog/mandawa-feel-the-architecture-of-rajasthan/
16 en. wikipedia. org/wiki/Mandawa

Aakharam ka *Haveli* - This more than 100-year-old *haveli* is located in the main market of the town, near Sonthaliya Darwaza. [17]

The Bansidhar Newatia *Haveli* - Bansidhar Newatia *Haveli* was built in 1921 in the Shekhawati region of Mandawa - a small town in the Jhunjunu district of Rajasthan. Bansidhar Newatia *Haveli* is well-known for its paintings which are a unique blend of art, traditions and, technology advancements over a while.
Some of the paintings include a boy using a telephone, Wright Brother's maiden flight being watched by women in the sari, a strongman hauling along a car and, a European woman in a chauffeur-driven car. [18]

Lakshminarayan Ladia *Haveli* - Lakshminarayan Ladia *Haveli* is one of the most picturesque *Haveli*s in this fairytale town of Mandawa. Nestled amidst the Aravallis, this stupendous architectural marvel reflects the glory of the majestic Rajput era. From the excellent paintings done in the blue wash to the amazing murals and frescoes depicting Hindu mythological themes, the place has plenty to keep you occupied for hours. [19]
This *haveli* (traditional, ornately decorated residence) features a faded picture of a man enjoying a hookah and a good procession frieze on its western wall. Other pictures include that of Rama slaying Ravana (demon king of Lanka, now Sri Lanka). [20]

Chokhani Double *Haveli* - The grand Chokhani Double *Haveli*, dating from 1910, is so-called because it was built in two adjoining wings for the families of two brothers. The paintings inside include floral arabesques and peacocks above the archways, as well as the Krishna legends and some mournful British soldiers. [21]

Ancestral Houses

Please add

Forts

Mandawa Fort - The Mandawa Fort, built-in 1755[22], is one of the most famous forts in Mandawa. It is located amid Aravalli Hills in Rajasthan. The fort of Mandawa was founded in the 18th century. Thakur Nawal Singh founded the fort in 1812.

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[17] en. wikipedia. org/wiki/Mandawa
[18] http://www. saidaytours. com/India/Attraction/Bansidhar-Newatia-*Haveli*-Mandawa. html
[19] https://www. rajasthantourplanner. com/blog/mandawa-feel-the-architecture-of-rajasthan/
[20] https://www. indianholiday. com/tourist-attraction/rajasthan/*haveli*s-in-rajasthan/lakshminarayan-ladia-*haveli*-mandawa. html
[21] https://www. lonelyplanet. com/india/rajasthan/mandawa/attractions/chokhani-double-*haveli*/a/poi-sig/1446298/1329262 [22] https://www. travelrajputana. com/shekhawati/

Beautiful frescoes depicting Lord Krishna with his cows adorn the walls of this enchanting establishment. The Palace's Durbar Hall houses several antiques and paintings. Exquisite mirror work enhances its striking beauty.

In recent times, it has also been converted into a heritage hotel by the royalty of Mandawa. [23] The fort is now run as a hotel by the Rajasthan Tourism Department. [24]

Wells

Harlaka Well - This is a destination that is just a few steps away from the *haveli* of Murmuria. The well is very deep and is still filled with enough water in it.

Religious Sites

Raghunath Temple - Dedicated to Lord Raghunath, this temple has stunning architecture and frescoes on the walls and ceilings; looks spectacular during sunset.

Festivals and their cultural routes :

Teej - Teej is a fasting festival for Hindu women. It takes place on the third day of the Shukla Paksha of the Sawan month of the Hindu which normally falls between late July to early September. This festival is dedicated to Goddess Parvati and celebrates her return to Lord Shiva. Teej is in praise of marital bliss and the well-being of spouse and children. Falling in the Hindu month of Bhado, Teej also celebrates the arrival of the long-awaited monsoon after a brutally hot summer. The festival is a three-day celebration which includes both rigid fasting and scrumptious feasting. [25] According to Hindu mythology, after the self-immolation of Sati, Lord Shiva became grief-stricken and went into a meditative state. It is believed, it took Sati 108 subsequent births to bring Lord Shiva out of his meditative state. Her 108th birth was in the form of Parvati. Thus, married women seek the blessings of Goddess Parvati on Teej Festival for marital bliss.

On the occasion of Teej Festival, women observe a fast and pray through the night. In the morning, they bathe and dress in red sarees and fine jewellery to worship Goddess Parvati. The major attractions of Teej Festival are the swings that are fixed to the branches of large trees, on which the women take turns to enjoy swinging. Special songs are sung, and the women decorate their hands with henna. Married daughters are presented with sweets and clothes by their mothers. The girls engaged to be married receive gifts of henna, bangles, clothes, and sweets from the in-laws.

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[23] https://www. hellotravel. com/india/mandawa-fort
[24] https://en. wikipedia. org/wiki/Mandawa_Fort
[25] http://www. cozynuk. com/fairs-festival-india-teej-festival-of-women. shtml

Every year, the festival of Teej is celebrated in August and September in Rajasthan and other north Indian destinations. [26]

Lohri - Lohri marks the culmination of winter and is celebrated on the 13th day of January in the month of Paush or Magh, a day before Makar Sankranti. Lohri celebrates fertility and the spark of life. People gather around bonfires, throw sweets, puffed rice and popcorn into the flames, sing popular songs and exchange greetings.

On this day children go from door to door to collect funds for community bonfires which are lit up in the evening. The gatherings and celebrations make Lohri a community festival.

An extremely auspicious day, Lohri marks the sun's entry into the 'Makar Rashi' (northern hemisphere). The period, beginning from 14 January lasting till 14 July, is known as Uttarayan. It is also the last day of the month of Maargazhi, the ninth month of the lunar calendar. The festival marks the winter solstice and is the day of celebrations. Astronomically after Lohri, the length of days starts increasing as the sun begins to progress northwards. The Bhagawad Gita deems it an extremely sacred and auspicious time when Lord Krishna manifests himself most tangibly.

The festival though connected to Punjabi roots is seen to widen its presence and is celebrated with all the joy and fervour in Rajasthan. It's a nice warm way to say goodbye to the harsh winters of North India**.** [27]

Makar Sankranti (**The Kite flying festival**) - Makara Sankranti is one of the few ancient Indian festivals that has been observed according to solar cycles, while most festivals are set by the lunar cycle of the lunisolar (चंद्र – सौर) Hindu calendar. Being a festival that celebrates the solar cycle, it almost always falls on the same Gregorian date every year (January 14/15), except in some years when the date shifts by a day for that year. "Makar Sankranti" or "Sakraat" in the Rajasthani language is one of the major festivals in the state of Rajasthan. The day is celebrated with special Rajasthani delicacies and sweets such as pheeni (either with sweet milk or sugar syrup dipped), til-paati, gajak, kheer, ghevar, pakodi, puwa, and til- laddoo.

Especially, the women of this region observe a ritual in which they give any type of object (related to household, make-up or food) to 13 married women. The first Sankranti experienced by a married woman is of significance as she is invited by her parents and brothers to their houses with her husband for a big feast. People invite friends and relatives (especially their sisters and daughters) to their home for special festival meals (called as "Sankrant Bhoj"). People give out small gifts such as til-gud (jaggery), fruits, dry khichadi, etc. to Brahmins or the needy ones.

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[26] https://www. tourmyindia. com/states/rajasthan/teej-festival. html
[27] https://www. ohmyrajasthan. com/lohri-festival-rajasthan

Vasant Panchami - Vasant Panchami is an important Indian festival celebrated every year in the month of Magh according to the Hindu calendar. Celebrated on the Fifth dag of Magh, the day falls somewhere in February or March according to the Gregorian calendar. The significance of the day lies in the worship of Goddess Saraswati, the symbol of wisdom and also the onset of the spring season. According to the popular belief, the origins of this festival lie in the Aryan period. Aryans came and settled in India through Khyber Pass, crossing the Saraswati River among many others. Being a primitive civilization, most of their development took place along the banks of the River Saraswati. Thus. River Saraswati began to be associated with fertility and knowledge. It is then that the day began to be celebrated. According to mythology, After Kalidasa was married off to a beautiful princess through trickery, the princess kicked him out of her bed as she learned that he was foolish. Following this, Kalidasa went to commit suicide, upon which Saraswati emerged from the waters and asked him to take a dip there. After taking a dip in the holy waters, Kalidasa became knowledgeable and began writing poetry. Thus, Vasant Panchami is celebrated to venerate Goddess Saraswati, the goddess of education and learning. In today's times. the festival is celebrated by farmers as the on-coming of the spring season. The day is largely celebrated in northern parts of India. Here, people offer food to the Brahmins and organize rituals in the name of Goddess Saraswati. The colour yellow is the predominant colour associated with the festival, the origins of which are supposed to be the fields of mustard which can be seen in Punjab and Haryana during this period. Kite Flying is also commonly associated with this Festival. Children, as well as adults, fly kites on this day to celebrate freedom and enjoyment. Another tradition associated with this day is that of initiating studies in the young. Young children often begin learning on this day, which is believed to be the reason why the school sessions start in March. Sweets with a yellow hue are also distributed on this day and people can also be seen donating books and other literary material to the poor.

Shekhawati festival - The Shekhawati region in Rajasthan, which comprises of various cities like Sikar, Nawalgarh, Churu and Jhunjhunu, hosts the famous Shekhawati Festival over three days and nights. It is marked by a variety of events, ranging from cultural programs, rural games, fireworks and *haveli* competitions. The festival also showcases the heritage and culture of the place and is held at various points around the city. Shekhawati Festival, organized by the State Department of Tourism, District administration of Sikar, Jhunjhunu and Churu and the M. R. Morarka- GDC Rural Research Foundation Shekhawati, is organized to promote tourism in this region. The various *Haveli*s and mansions dotting this region are adorned with lovely pictures which showcase the cultural heritage of the region. The frescoes of Shekhawati date back to several centuries and are admired for their exquisite beauty and artistic brilliance. The perfection displayed in these wall paintings is simply remarkable.

Shekhawati Festival is hosted every year in February to promote tourism in the region and showcase the rich cultural heritage that it is renowned for. Along with the frescoes, the murals and paintings on the fabulous *Haveli*s and mansions enchant the visitors by themselves. Various events and competitions including cultural programs and rural games entertain the tourists immensely. A unique aspect of this festival is the organic food which is served to all the spectators and participants at the festival for four days. [28]

Gangaur Festival - Gangaur is probably the most celebrated and colourful festival in the region and celebrated with great fervour and devotion especially by womenfolk to worship Goddess Gauri, the consort of Lord Shiva. This represents the celebration of spring, harvest and marital fidelity. It is especially meant for the women both married and unmarried. The word Gangaur is derived from two words. Gan meaning Shiva and Gauri meaning Parwati. The festival starts the day after Holi, the festival of colours (around March) and is celebrated for two weeks.

The Gangaur festival [29] commences with the custom of gathering ashes from the Holi Fire and burying the seeds of 'Barley' in it. The seeds are then watered everyday awaiting the germination. The ceremony takes place with the praiseful songs for Shiva and Gauri. The women decorate their hands with mehndi since it is considered auspicious. They carry painted earthen pots on their heads. They also make images of Gauri and Shiva with clay.

On the seventh evening after Holi, unmarried girls assemble and take out a procession with 'Ghudlia' (an earthen pot with holes around and a lamp inside) on their heads. This practice is repeated for ten days. Celebrated by women this involves fasting for 18 days partaking only one meal a day.

A large number of fairs are organized during this time. Women make images of Isar and Gauri in clay for the festival. In some Rajput families, permanent wooden images are used after painting them every year carried out by traditional painters called Matherans. The event culminates with the immersion of the idols in bawdis or johads (wells or water reservoirs), marking farewell to Goddess Gauri.

Fresco Paintings

Fresco wall paintings of Shekhawati are unique in themselves and the artists developed heavily on the traditional Indian subjects. This consisted of scenes from mythology, especially of Lord Krishna, local legends, animals and plants, daily lives of men and women, towns and the Shekhawat Rajas. The fresco painting artists were called chiteras, who belonged to the kumhars (potters) caste. They were also called as chejaras (masons) since they work both as painters and builders.

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28 https://www. indianholiday. com/fairs-and-festivals/rajasthan/shekhawati-festival. html
29 http://www. dsource. in/resource/gangaur-festival/traditional-attire-ritual

Frescoes were depicted in bright two-dimensional paintings. The colours used for the art were, kajal (lampblack), safeda (lime) for ehite, neel (indigo) for blue, geru (red stone powder) for red, Kesar (saffron) fro orange, pevri (yellow clay) for ochre. The colours remained vibrant as long as the building lasted.

5.0. Baseline Studies

5.1. The methodology of Heritage Impact Assessment

The effects on cultural heritage attributes from development or other changes may be either adverse or beneficial. It is necessary to identify all changes in all attributes. It is also important to identify the scale or severity of a specific change or impact on a specific attribute – as this combination is what defines the significance of the impact, otherwise called “significance of effect”. Impacts take many forms – they may be direct and indirect; cumulative, temporary and permanent, reversible or irreversible, visual, physical, social and cultural, even economic. Impacts arise as a consequence of proposed development. Each needs to be considered for its relevance to the HIA. Direct impacts are those that arise as a primary consequence of the proposed development or change of use. Direct impacts can result in the physical loss of part or all of an attribute, and/or changes to its setting - the surroundings in which a place is experienced, its local context, embracing the present and past relationships to the adjacent landscape. In the process of identifying direct impacts, care must be taken of the development technique of gaining approvals by just avoiding direct impact - impacts which just “miss” physical resources can be just as negative to a single resource, a pattern, ensemble, setting, spirit of place etc.

Direct impacts resulting in physical loss are usually permanent and irreversible; they normally occur as a consequence of construction and are usually confined within the development footprint. The scale or magnitude of these impacts will depend on the proportion of the attribute affected.

Direct impacts that affect the setting of an attribute may occur as a consequence of construction or operation of the development scheme and may have an effect

Assessment of impacts on setting refers to perceptible visual and aural (noise) effects that can be appreciated at a given time. Such impacts may be temporary or permanent, reversible or irreversible depending on the extent to which the cause of the impact can be removed. Impacts may also be transient where the occurrence is sporadic or of limited duration, for example, related to hours of operation or the frequency of passage of vehicles.

Indirect impacts occur as a secondary consequence of construction or operation of the development and can result in physical loss or changes to the setting of an asset beyond the development footprint.

Scale or severity of impacts or changes can be judged taking into account their direct and indirect effects and whether they are temporary or permanent, reversible or irreversible. The cumulative

effect of separate impacts should also be considered. The scale or severity of the impact can be ranked without regard to the value of the asset is:

i. No change
ii. Negligible change
iii. Minor change
iv. Moderate change
v. Major change

The significance of the effect of change – i. e. the overall impact - on an attribute is a function of the importance of the attribute and the scale of change. This can be summarized for each attribute described using the following descriptors. As change or impacts may be adverse or beneficial, there is a nine-point scale with "neutral" as its centre point:

i. Major beneficial
ii. Moderate beneficial
iii. Minor beneficial
iv. Negligible beneficial
v. Neutral
vi. Negligible adverse
vii. Minor adverse
viii. Moderate adverse
ix. Major adverse

The table shows the Value of Heritage Asset

VALUE OF HERITAGE ASSET	SCALE & SEVERITY OF CHANGE/IMPACT				
	No Change	Negligible change	Minor change	Moderate change	Major change
	SIGNIFICANCE OF EFFECT OR OVERALL IMPACT (EITHER ADVERSE OR BENEFICIAL)				
Very High	Neutral	Slight	Moderate/ Large	Large/very Large	Very Large
High	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
Medium	Neutral	Neutral/Slight	Moderate/Slight	Moderate	Moderate/Large
Low	Neutral	Neutral/Slight	Neutral Slight	Slight	Slight/Moderate
Negligible	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

All proposals should be tested against existing policy frameworks and the management plan for the property and surrounding area. The compatibility of the scale, pattern, use, etc. should be tested according to the attributes of the property.

5.2. Impact Evaluation

The process focuses on evaluation and impact assessment as discussed in the methodology on protecting and enhancing cultural and natural resources. It also focuses on enhancing a social value creation which benefits the local communities who are the major stakeholders of heritage.

Baseline Feature No.	**Name**	**Protection Status**	**Value Assessment**					**Contributions to values**	**Scale of Change**				
			Historical	Symbolic	Social	Spiritual/Religious	Aesthetic		No change	Negligible	Minor Change	Moderate Change	Major Change

5.3. Impact Evaluation

The process focuses on evaluation and impact assessment as discussed in the methodology on protecting and enhancing cultural and natural resources. It also focuses on enhancing a social value creation which benefits the local communities who are the major stakeholders of heritage. Impact evaluation is a result of data collection and evaluation which is def into the design process for the development, or proposals for change or for archaeological investigation. Every reasonable effort should be made to avoid, eliminate or minimise adverse impacts on the features that contribute to the overall value of the town.

Baseline Feature No.	**Name**	**Protection Status**	**Value Assessment**					**Contributions to values**	**Scale of Change**				
			Historical	Symbolic	Social	Spiritual/Religious	Aesthetic		No change	Negligible	Minor Change	Moderate Change	Major Change

1.	Sewaram Saraf *Haveli*							Medium					
2.	Ram Pratap Nemani *Haveli*							Medium					
3.	Hanuman Prasad Goenka *Haveli*							Medium					
4.	Goenka Double *Haveli*							Medium					
5.	Murmuria *Haveli*							Medium					
6.	Jhunjhunwala *Haveli*							Medium					
7.	Mohan Lal Saraf *Haveli*							Medium					
8.	Gulab Rai Ladia *Haveli*							Medium					
9.	Aakharamka *Haveli*							Medium					

10.	The Bansidhar Newatia *Haveli*							Medium					
11.	Lakshmina rayan Ladia *Haveli*							Medium					
12.	Chokhani Double *Haveli*							Medium					
13.	Mandawa Fort							High					
14.	Harlaka Well							Very High					
15.	Raghunath Temple							Very High					

5.4. Potential Impacts

The infrastructure work may impact heritage structures or underground archaeological pieces of evidence via noise, vibration and leakages. Some of the key issues are:

1. Emissions of noise from the Project adversely affecting the amenity of residences or sensitive areas.
2. Generation of airborne or ground-borne vibrations, which could adversely affect the PCRs.
3. The issues associated after the installation of pipes are leakage, cracks, corrosion, poor quality, poor installation and many others.
4. Access to the PCRs during the construction process
5. Visual integrity

The water supply and drainage system may have a direct impact on the historic structures close to the existing road network. The areas where the distribution network does not follow an existing road may also have a bearing on historic landscape fabric and integrity.

The pipelines which may not be following the existing roads may transverse the historic landscape and archaeological sites. While water distribution networks are linear interventions undertaken primarily along roads we need to keep in mind that they do not disrupt the historic landscape as a whole and identified and unidentified physical cultural resources.

Baseline Feature No.	**Name**	**Type of Impact**	**Nature of Impact**
1.		No impact / Direct/ Indirect/ Cumulative/ Residual	Accepted /Beneficial/ Acceptable with mitigation measures/ unacceptable

6.0. Mitigation Strategy

The mitigation strategy will help in the layout of sustainable water supply and drainage systems that are in keeping with the heritage character of the town. The aim is that during conception, design and execution of the projects, the Physical Cultural Resources are protected for their socio-cultural significance. Therefore, any new development in a historic context needs to be carefully evaluated for potential adverse effects. Policy, Legislation and Administration framework guides the kind of work that can or cannot be undertaken in the vicinity of PCRs. However, this document attempts to address specifically the impact of infrastructure work related to water supply and sewerage networks and the measures to minimize and mitigate this impact.

6.1. During Conception

Identifying value and character-defining elements in a historic town is the first and essential step in any project*. (Refer section on Recommendation for Documentation)* On-site consultation, as well as archival research, should be carried out as a basis of for a detailed assessment of current conditions and previous maintenance and repair works. Any additions or changes to the historic fabric has to be documented in chronology. It is very important to carry out photographic documentation to record the current conditions.

The development being undertaken should ensure that there is

i. No disruption to traditional water harvesting systems and natural drainage systems of the town and its natural context
ii. Alignment of modern drainage systems with the natural gradient and existing water systems on site
iii. No negative impact on rock formations, vegetation patterns in the regional context.

6.2. During Planning and Designing

If any intervention will impact the cultural resources, every effort has to be made in the planning phase to avoid or mitigate these impacts. Any addition has to be compatible with the heritage value to ensure it will last and not bring harm to the resource in the future. It is necessary to define priorities and organise work in the logical phases. Considerations such as health and safety, accessibility, change in use, loss of integrity and authenticity have to assessed to improve the performance of the project.

Developing mitigation strategy is central to the process of preserving, reuse and new construction. To ensure that any work is based on a thorough understanding of cultural resources and its character-defining elements, it is recommended documenting and assessing the form, materials and condition before any project.

The planning phase should also identify **the need for heritage expertise and experience**. During the planning and designing phase, heritage conservation/management experts should form part of the PMU Project Management and capacity building consultants. These heritage specialists must ensure that all Physical Cultural Resources are:

i. Identified and demarcated adequately before the commencement of construction activities.
ii. An inventory of the PCRs to be affected by the route which should include information about each feature including:

Distance from the pipeline Nature of
predicted impact
Predicted impact before mitigation Mitigation measures
Extent of impact

iii. Design permanent and temporary works to avoid or minimise impacts on PCRs. The detailed design of these should be discussed and approved before the execution of the project.

iv. A vibration and noise impact assessment is essential to understand the impact of heavy machinery and digging of pipelines. It gives a clear understanding of the initial and residual risk. The purpose is to design in a manner that the impact is minimal and risks do not significantly alter the character of the PCRs.

v. The measures devised have to ensure that the impact due to construction and operation works can be managed and mitigated. For operational noise, vibration control systems have to be adopted to control vibration and ground-borne noise emissions from construction work.

vi. The key issues identified with a water supply and sewerage network have to be addressed during the planning phase as this may result in moisture-related damage to the PCRs which may be of various degrees. This is the most commonly occurring damage in historic structures.

vii. The construction of the water storage facility and new office block needs to minimize any negative impact on the nearby PCRs from the visual perspective as well.

Mapping of festival routes and rituals - Construction activity must not create conflict or onsite disturbance during the festival calendars.

Providing a water supply system should reduce the bore well dependency and allow the groundwater recharge and aid long term aquifer conservation. While the benefits of provision of a sewage system for a town is understood to have long term direct benefits to the people, we also need to highlight the benefits of this to rejuvenating the local water harvesting systems.
Therefore, the priority should be given to laying out the sewage system for areas that are responsible for polluting the surface water and groundwater resources.

Chance finds protocols process: Planning for Archaeological sites

The objective of the Chance finds Protocol is to:

i. Define the processes which must be followed to ensure the management of Physical Cultural Resources and preservation and appropriate treatment of chance finds while also minimizing disruption to the construction schedule.

ii. Enable compliance with all relevant national laws and regulations and other requirements.

Project Management Unit shall consult all relevant parties including local stakeholders to agree to Chance Finds Protocol. The arrangements have to be made for a suitable laboratory and other necessary facilities for testing. PMU shall develop and issue to Contractor a PCR Training and

Awareness manual. The PCR Training and Awareness manual will include basic training in the identification of archaeological materials relevant to the area, including human skeletal remains. Contractor shall deliver the Cultural Heritage Training and Awareness manual to all relevant Contractor personnel before they commence work.

6.3. During Construction

The implementation is the most critical phase. It is equally important to have well-supervised people with the appropriate skills to undertake the work as it is to determine the right work to undertake. Every effort has to be made to familiarize those working on the project with the approach and to ensure that they understand the scope of the project. The construction of infrastructure and facilities have the potential of disturbing or altering the known and unknown, recorded or unrecorded Physical Cultural Resources.

i. Ensure that areas with tourist populations have a short construction span.
ii. The PCRs and their importance are brought to the attention of relevant project staff, including construction workers through on-site training workshops.
iii. The inspection should be continued monthly even during the process of construction to avoid/minimise any residual effect.

6.4. Post Implementation

Since it is an ongoing process, a management plan is an important part of protecting and extending the life of cultural resources.

The conservation and heritage management plan should incorporate a section on the repair and corrective action to the resources that have been impacted due to moisture post-implementation. Some of the key recommendations are as follows:

i. Urgent repair of water supply and drainage pipelines and faucets that have been leaking or damaged.
ii. Control excessive ground moisture with the use of damp proof treatments.
iii. It is critical to monitor areas vulnerable to moisture damage.
iv. Moisture management built into an O&M schedule
v. Training local community members to identify and take immediate steps to minimise leakage as soon as it becomes evident

7.0. Technical Guidelines for Physical Cultural Resources

The guidelines pertain to PCRs of all typology, sizes, materials, occupancy, and construction types; and apply to interior and exterior work as well to new additions.

7.1. Guidelines for Cultural Landscapes

From dense residential areas to wide-open areas surrounding the historic towns, the cultural landscape exhibits countless contrasts and subtleties. These guidelines provide general recommendations for the conservation of features and resources of a cultural landscape.

i. Understanding the environmental, economic and social contexts that support the cultural landscape. This also includes climate and other ecological processes.
ii. Documenting the overall pattern: the orientation, the size, configuration and relationships with ecological and social context.
iii. Repairing an extensively deteriorated or missing feature that supports a past or continuing use by using non-destructive methods and materials. E. g. reintroducing grazing lands or working on natural drainage.

7.2. Guidelines for Archaeological Sites

Archaeological sites are places or areas where tangible evidence of past human activity is located in situ on, below or above ground, or on lands underwater. Any intervention or maintenance activity in historic town should endeavour to safeguard archaeological sites. Any intervention planned on an archaeological site or area containing an archaeological site should involve an archaeologist and, where appropriate, other field scientists, conservators, architects, engineers, Elders and other knowledge keepers.

Before an intervention, mitigation measures have to be carefully designed.

The ideal mitigation for all archaeological sites is preservation in situ. This is not always a practical solution when they are not exposed and a new project has to be carried out. Therefore, a series of recommendations are suggested.

Avoidance – The first step is to mark the area which is suspected to have archaeological remains and avoid any kind of construction in that area.

Archaeological Test trenching – This would determine the presence or absence of archaeological features, structures, deposits, artefacts within the specified area defined under the project. The trenching is performed as per the international standards. In the event of the presence of any indicator. the following actions should be taken immediately:

i. All construction within a radius of at least 20 m should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery could cause further disturbance to the suspected physical heritage resource.
ii. This area must be marked using visible means, such as barrier tape, and all personnel should be informed that it is a no-go area.
iii. A guard should be appointed to enforce this no-go area. The access should be negotiated in the immediate area.
iv. All concerned stakeholders should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains.

Note: Please refer to Chance find protocol (attached) for further details on handling sensitive cultural sites.

Scientific Excavations – This would determine the entire extent and significance of the remains, features, structures, deposits, artefacts to avoid any impact on the resources.

Re-planning

Temporary relocation – Traditional burial places have to be relocated if needed with the permission of the concerned authority.

7.3. Guidelines for New Construction Works

These guidelines guide the construction of the new building within the historic landscape. It also applies to all exterior modifications to PCRs that are located within the historic town. It not only applies to new residential or commercial buildings but new construction such as water tanks, sheds and other building typologies. Construction work goes through several stages. In most of the historic towns, the major challenge is space modification with new additions and functions. Careful planning is required to introduce and update building systems appropriately.

Building Line, Setback and Orientation – Any new structure shall conform to the given historic town and shall adhere to the existing building line of the street/area. The alignments of the primary façade of the new structure will be guided by the existing buildings. This should be maintained to provide continuity to the streetscape. The orientation has to be consistent with the predominant orientation of historic buildings. For. Eg. In the case of Mandawa, the predominant orientation of the residential units is E-W, thus it is important to maintain that orientation.

Size, Design and Scale – New construction that is designed with a scale, mass and form that is drastically different when compared to other Physical cultural resources can appear out of place and detract from the historic town's character. The size of a new building and its mass concerning open spaces should be compatible, but not contrasting greatly, with surrounding historic buildings. New buildings should attempt to conform to the volumetric proportions of their neighbouring historic structures.

Height – The height of new construction and individual elements such as foundation, wall, plinth, parapet and main roof(s) should be compatible, by not contrasting greatly, with those of surrounding historic buildings of residential nature. The permissible height of any new structure shall be such that it does not obstruct the view of any surrounding cultural resources.

Openings size and styles – Openings of any new structure or addition within the cultural resources should respect the traditional styles and designs of the period of construction. It should replicate the size, shape and uniformity in opening spaces.

Roofs – Incorporate roof forms, overhangs and orientation that are consistent with predominantly found in the town. Roof form changes drastically within Rajasthan thus, the character of each town has to be followed.
Material – Materials must complement the type, colour and texture of historic materials. E. g. metal railing would not be appropriate for a new structure where brick parapet walls are used.
Utilities – All the connections such as MCB, electric meters, phone cable, and all conditioning units should be located to minimize their visibility from the street and shall not be located on the primary façade facing the street.

Plumbing

i. Retain and preserve the historic layout
ii. When installing new pipes don't damage the finish materials. They should be located inconspicuously and complement the adjacent finishes.
iii. Avoid primary facades and rooms if pipes must be affixed to the interior or exterior of a building.
iv. Don't cut through the features which define the cultural resource.
v. Ensure that the addition of plumbing systems and other repairs will not corrupt the building's structural integrity.

7.4. Guidelines for Materials

General Recommendations

i. Identify all the traditional materials used and their respective source. Traditional techniques and materials should be preferred for work.
ii. Use of modern materials and techniques should always be the second option.
iii. The extent of replacement of material must be minimised because the original materials themselves contribute to the authenticity of the cultural resource. Even when the replacement material exactly matches that of the original, the integrity of a heritage building is to some extent compromised when extensive amounts are removed.
iv. Covering original building material with new material is inappropriate and should not be approved by Heritage professional. Modern consolidation such as Epoxies and resins should not be used for any type of consolidation.
v. Use the gentlest means possible to clean the surface of the primary material. Perform a test patch to determine that the cleaning method will cause no damage to the surface. Many procedures can have an unanticipated negative effect on building materials and result in accelerated deterioration or a loss of character. Harsh cleaning methods, such as sandblasting, damage the weather-protective glaze on brick and change its historic appearance. Such procedures should be avoided. When cleaning is an appropriate treatment, a low-pressure water wash is preferred.

Guidelines for Lime work

Lime work in Rajasthan varies in composition which is a direct reflection of Rajasthan's geological diversity. Calcium carbonate (CaCo3) is an important constituent of sedimentary rocks, next to quartz and clay minerals. In the form of limestone, it is extensively used in the manufacture of lime. Limestone occurs in almost all the districts of the State, but important deposits are located in Ajmer, Bundi, Chittaurgarh, Jodhpur, Nagaur, Pali, Sirohi, and Jaisalmer districts.

Lime and lime products have been used for long in the building construction. Traditional buildings in the state have used lime in various forms such as mortar, concreting, plaster and ornamental works.

1. **Lime Mortar –** Mortars are a mixture of an aggregate, a binder, and water. In a lime-based mortar, the binder is lime. A good aggregate for a lime mortar should be with angular grains and free of contaminants such as salt and organic matter. The aggregates should be well graded with grain sizes between 4mm and 0. 125 mm. The ratio of the usual lime mortar used in Rajasthan is 1:2 with 1 slaked lime and 2 marble dust.

Process of Lime Mortar

Step 1: To make mortars, plaster and limewash, quicklime is converted into hydrated lime by adding water and this process is called slaking. If done reverse, it created an explosive reaction and is not recommended. This process gives lime putty which is also used in the construction works.

Step 2: To make mortar, marble dust or sand is added to the slaked lime. In some cases, surkhi is also added to provide its desired colour and strength.

2. **Stucco Work** – It is a lime and sand mix applied in three coats either directly to the surface or wooden base. The first for binding, second for strength and third for texture. Animal hair and straw are used as the binder. The most common damage to stucco work is cracking or falling away at the edges. While repairing the stucco work, traditional ingredients and techniques, particularly the use of lime and sand mix have to be used. The only trained craftsman should be doing repairs of stucco work.

Guidelines for Masonry work

Masonry consists majorly of stone, brick or concrete blocks bonded with mortar or interlocked. In the case of lime mortar joints, repointing is required not before 50 years. Brick is the most common masonry wall, usually with limestone or granite for foundation but in Rajasthan, there is a tradition of stone masonry. The masonry work can only deteriorate of the following reasons:

i. **Excessive moisture**
ii. **Water in the walls rusting out masonry bonds**
iii. **Vibrations (Natural and Man-made both)**

The principles for conservation of masonry work should be based on following specific criteria's:

iv. **Preservation and minimum intervention**
v. **Documentation** - Identifying, retaining, and preserving masonry features that are important in defining the overall historic character of the building (such as walls, brackets,

railings, cornices, window and door surrounds, steps, and columns) and decorative ornament and other details, such as tooling and bonding patterns, coatings, and colour.

vi. **Protection and maintenance** – Stabilizing deteriorated or damaged masonry as a preliminary measure, when necessary, before undertaking preservation work.

During the construction works, the following techniques help restore the structural stability of the masonry work:

i. **Repointing** – Restores the aesthetic appearance of masonry and improves weather resistance and structural performance. The process includes removing deteriorated mortar from the joints and replacing with new mortar. The joint has to be racked to a depth of two times the joint height. The new mortar should match, as closely as possible, the existing mortar in colour, texture and properties.

ii. **Grouting** - Involves filling the cracks and voids to restore the original strength of the masonry. Grout can be injected into walls to anchor other components or to strengthen and stiffen a wall by solidly filling hollow units or open cavities. It is important to ensure complete filling and avoid later shrink-back as water is absorbed from the grout whether using a non-shrinkage grout, epoxy or polymer-modified grout. A grout is site-specific and has to be designed in consultation with a structural engineer.

7.5. Guidelines for Dismantling and Demolishing Works

The guidelines include demolition and dismantling of the selected portion of the cultural resource for construction works.

i. Proceed with selective demolition systematically, from higher to lower level. The selective demolition should be completed above each floor before disturbing supporting members on the next lower level.

ii. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

iii. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

iv. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

v. Remove structural framing members and lower to ground by a method suitable to avoid free fall and to prevent ground impact or dust generation.

vi. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

vii. Dispose of demolished items and materials promptly.

7.6. Guidelines for Documentation

The concepts that need to be understood to determine a Physical Cultural Resources are listed below:

Historic Significance Historic

Integrity Historic Context

Key definition

Historic Significance[30] is the importance of a property to the history, architecture, archaeology, engineering, or culture of a community, region or nation.

Historic Integrity[31] is the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic period.

Historic Context[32] is information about historic trends and properties grouped by an important theme in the history of a community, region or nation during a particular time. Knowledge of historic context enables listers to understand a historic property as a product of time.

Guidelines for Listing

Listing is carried out in two phases

Background research – All the basic information is gathered from various sources including gazetteers, travel books, history books and other secondary sources. This phase has to ensure that no important structure or representative style of the cultural resource is left out. It helps in identifying the historic area, historic developments in the area, the significance of events that have taken place at different times, important persons who have shaped development. Distinctive characteristics of design, construction, material and form of the building can also be identified in this stage.

Fieldwork – It includes recording information for each PCR in a pre-approved format. It comprises of physically inspecting the property as well as meeting local people such as owners of the property, talking to other residents, local ward members. By physically inspecting the PCR one can gather facts such as physical characteristics of the property, the date of construction, style of construction and design characteristics. By conducting a dialogue with the residents, one can determine the changes over time, ownership details, historic function and activities, association with events and persons, and its role in local, regional or national history.

Photography is an important component of the listing. A photograph freezes the building and its setting to the time when it is taken.

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[30] Handbook of Conservation of Heritage Buildings, Published by Directorate General, Central Public Works Department, July 2013

[31] IBID

[32] IBID

Guidelines for Mapping

Systematic documentation and mapping of Physical Cultural Resources within the area of laying out the infrastructural works as part of preconstruction surveys. It involves collecting and collating data required for a comprehensive understanding of the current or baseline situation; the typology, number and distribution of Physical Cultural Resources. The list mentioned in the earlier sections is only an indicative legend. During surveys and stakeholder meetings many more structures and intangible systems may become evident. A clear understanding of terrain and PCR should be built into the work schedule to prevent delays when the actual work is undertaken. For this, a Heritage Impact Assessment advisor is to be engaged before the commencement of infrastructure design works. The mapping should include information in this particular form.

i. HEADING - This section is very important; it contains the all-important ID number and the name of the fieldworker who collected the data
ii. LOCATION - Critical data goes here concerning the exact and relative location of the resource
iii. SITE DESCRIPTION - This provides general information about the type of resource
iv. LANDSCAPE - General data concerning the setting of the resource
v. PCR – description of the features
vi. LOCAL HAZARD-This is section highlights any major risks facing the cultural resource
vii. LANGUAGE / ETHNICITY The language(s) spoken and ethnic groups of the community are recorded here, if applicable
viii. CUSTOMS AND TRADITIONS associated

Guidelines for Stakeholder Consultation

The consultation will involve local communities regarding the protection of Physical Cultural Resources. The process will consider the opinions and recommendations to involve communities in cultural awareness activities. It is important to reach on consensus on what values to protect for transmission to future generations. Therefore, a series of stakeholder workshops are advised to be undertaken both at the city level and also at the neighbourhood levels. The consultant should engage with relevant academicians, experts and practitioners. [33]

Interviewing well and structured meaningful discussions is not always as easy as it seems. The expert must consider issues like gender and other inbuilt societal biases. Many people, especially elders, may have a wealth of historic facts and traditional knowledge that is yet unrecorded. Oral

[33] ICOMOS. (1987, October). Charter for the Conservation of Historic Towns and Urban Areas. *Adopted by ICOMOS General Assembly*. Washington DC, USA: ICOMOS.

history is recording and sharing interviews with such people about their memories. It allows people who cannot write to become a part of history.

Chance finds protocols process: Implementation and Management (Refer to the section on guidelines for Archaeological sites)

Chance Finds Report Form[34]

Chance Finds Report Form		
Initial Detail		
Location of Find:	Date of Find:	The person who identified find:
Description of Initial Find:		
Was work stopped near the find?		Yes No
Was an archaeologist contacted?		Yes No
Archaeological Detail:		
Date of inspection:		Reporting Archaeologist:
GPS coordinates:		Photo Record: Yes No
Description of Find (fill in applicable information) (use additional pages if required):		
Artefact type:		
Max artefact length(inmm):	Max artefact width (inmm):	
Max artefact thickness(in mm):	Max artefact platform width (inmm):	
Approximate number of artefacts at site: 1 2 to 10 > 10 >50 Other:		Approximate size of site: Sitearea: _____m2 Sitelength:_____m Site height (max) (for rock shelters/caves):_____m

[34] PAPUA NEW GUINEA Cultural Heritage Chance Finds Protocol LNG Project

Brief description of site and vegetation (e. g. , surface sediment type, ground surface visibility, distance to the nearest fresh water source, attach site sketch if necessary):
Statement of Significance (scientific, spiritual, historic, aesthetic and emotive and any evidence of stratification):

A-02: IMAGES AND ILLUSTRATIONS OF PHYSICAL CULTURAL RESOURCES

(To be updated after field visit)



Figure 1 Entrance to a haveli/fort in Mandawa (Source: Richard De Guzman)



Figure 2 Inner court of a haveli/fort in Mandawa (Source: Richard De Guzman)



Figure 3 Entrance to Mandawa fort (Source: Richard De Guzman)



Figure 4 Exterior walls of a haveli in Mandawa (Source: Richard DeGuzman)



Figure 5 Exterior walls of a haveli in Mandawa (Source: Richard DeGuzman)

A-03: MAPS

A-04: LIST OF PEOPLE MET & STAKEHOLDER CONSULTATION

1. 0. Consultation with Government Bodies

2. 0. Consultation with Local community

3.0. Key Observations

3.1. Cultural Landscape

3.2. Built Heritage

3.3. Natural Heritage

3.4. Intangible Heritage

3.5. Water Supply and Water management

A-05: LIST OF SITES VISITED *(To be updated after field visit)*

A-06: BRIEF WRITE UP ON SHEKHAWATI ART AND ARCHITECTURE

'…in the same desert is a wonderful city where all the fortunes (fortunes so vast that the owners cannot trust even the strong hand of the government to protect them, but take refuge in the waterless sands) and drive sumptuous C-Spring barouches and buy beautiful girls and decorate their palaces with gold and ivory and Minton tiles and mother-of-pearl. '

- Rudyard Kipling

Kipling's description of Shekhawati paints a picture of excessive indulgence and opulence; for art and architecture, back in those days, it was a means to display wealth and cement social status. The region stands as a most untouched resource for the region in terms of watershed management, art and architecture, traditional indigenous knowledge system and biodiversity.

Shekhawati is located in the semi-desert area of Rajasthan and falls in the hot and arid climatic zone of India. The region was home to rich merchants knowns as Marwari. The region covers two major districts of Rajasthan i. e. Jhunjhunu and Sikar comprising of historic towns like Ramgarh, Fatehpur, Lachhmangarh, Danta, Khetri, Nawalgarh, Dhundhlod, Mukundgarh, Mandawa, Mahandar, Pilani, CHirawa, Bagar, Alsisar, and Bissau. In Churu district, Ratangarh and Sujangarh have architectural similarities with Jhunjhunu and Sikar. The monumental richness includes forts, palaces, *Haveli*s and temples. The *Haveli*s are built by the Marwari merchants, who made fortune due to the presence of Caravan trade in the region and served as a medium to attract the traders. However, today most of the *Haveli*s have been deserted and the owners have moved to bigger cities to expand their businesses. The concept of *Haveli*s in Shekhawati originated from the Rajput rulers in the 16th Century. The idea was to create grandeur for their courtiers and nobles and to differentiate their dwellings from that of the common man. Each *haveli* of the entire Rajasthan has a unique identity which tells the story of his owner, his family, his culture, customs and beliefs.

The art and architecture of the Shekhawati region can be broadly divided into these sub- categories:

1. Religious buildings
2. Residential dwellings (*Haveli*s)
3. Royal palaces
4. Water structures including stepwells, well and ponds
5. Commemorative structures including chhatris (cenotaphs)
6. Mixed-use buildings known as Gaddis which run parallel along the roads consisting of shops at the lower ground level and residential blocks are designed at upper levels.

The rich culture and tradition can be found in community buildings. Each Shekhawati merchant, as a token of his success, aimed to construct five buildings in his name; a temple to the family deity, *Haveli*s, a memorial chhatri to his father, a caravanserai and a well.

The Mughal and Rajputs influenced the architecture of the region in the 18th century. The front façade was decorated with the Jharokha supported with carved stone brackets. The main attraction to the *Haveli*s was the fresco work, the artwork is done on the stucco with natural colours. The frescoes covering the walls of the *Haveli* present a unique particular style with Hindu and Mughal iconography. It includes figures of the Gods and Goddesses and other geometric and floral patterns.

In the 19th Century, the traditional elements were influenced by colonial architecture. The merchants began to blend the European elements with their traditional elements. In the historic town of Fatehpur, the *Haveli*s constructed after 19th Century is the amalgamation of Rajput architecture with colonial, neo-baroque and Art deco.

SPATIAL PLANNING AND BUILDING FEATURES

The typical spatial pattern of residential buildings is Indo-Islamic in style with central courtyards and rooms around it. These courtyards in hot summers help ventilate the fresh air inside the rooms and the *Haveli*s. It serves as a micro-climate modifier. Carved columns support the trefoil arches of classical Islamic architecture. The other building features and their unique characteristics can be discussed as follows:

Shading Devices

Jharokhas, projection run along with the parameter of the building, and the Jaalis serve as the shading devices which obstruct the direct solar heat gain. They also serve as a barrier to sandstorms.

Opening sizes

The sizes of the openings are usually small and the larger openings are covered with stone Jaalis. These openings are opened during the night to allow convective cooling. In the daytime, the thick wooden shutters of low thermal mass are closed.

Ceiling heights

The ceiling height is larger than 3. 5 meters while the other spaces like the Jharokha which were to be used temporarily and occasionally were only 2. 5 – 1. 8 m high. This meant a larger air mass resulting in lower temperatures.

Roofs with insulation layer

The roofs are constructed with flat stone slabs with lime mortar. Above this, a layer of inverted earthen pots is laid to create air insulation. On top of it, a layer of lime mortar finishes with reflective smooth material like broken pieces of ceramic pots to reflect most of the sunlight is used.

Building materials

Stone is used along with lime mortar in the slab and façade elements. Lime mortar keeps the temperature low inside the *Haveli*. The stone helps to create time lag due to high thermal capacities. All the materials were locally available including the wood for doors and windows.

Light colour exterior

The exterior of the *Haveli* is light coloured to reduce the heat gain inside the building. Walls are painted with murals to provide the aesthetics for the *Haveli*.

HISTORIC TOWNS

The towns in Shekhawati are developments of trading communities under the patronage or protection of trading communities, under the patronage or protection of local rulers, which is why the existence of forts in some towns, or the spontaneous indigenous development of some and the planning of others on the style of Jaipur, are understandable. Not all cities and towns went through such morphological formations; some had an urban structure that simply emerged from the daily routines of life and has streets, chowks, houses and institutional spaces. A characteristic common to all was their strong visual character.

Shekhawati towns work as much with a picture urbanity as with a morphological structure, where the geography of painted images constructs visual landscapes and references that connect to sites and towns that figure in the largest map of the mercantile community.

HISTORIC TOWNS AT THREAT

The unique character of Shekhawati town is at risk of loss and disappearance. The legendary frescoes and the marginalized community of artisans which were once the living tradition of Shekhawati are also getting lost with time.

Another aspect of the vulnerability of Physical Cultural resources is the change in the lifestyle and lack of value towards heritage. For example, ad hoc addition of toilets to the buildings result in an ugly mess of waste pipes and jutting out facades as most drains lead directly to one stormwater drains lining the street. Open drains and sewers entail a public health nightmare with flooded streets, overflowing drains and waterlogged neighbourhoods. Waterlogging due to poor civic drainage results in constant rising damp in historic buildings with groundwater percolation leading to loss of exterior plasters.

CHANCE FIND PROTOCOL

1.1 Introduction

Project town being a heritage town, there are possibility of any chance finds (artefacts) recovery during excavations. Contractors working at heritage towns must take additional care not to destroy or damage historic features during excavations. There may be many buried historic features in heritage towns such as –idols, toys, wells, ancient drains, remains of buildings, other walls, grain pits, etc. Every care must be made not to destroy these during excavations.

Excavator drivers need to be instructed to be aware of hitting buried features and that they must be investigated before continuing work. When features are encountered during mechanical excavation, work should stop and the PIU/Consultants engineers must be informed immediately so that they can be inspected at the first opportunity.

When historic features such as walls, brick constructions and other features are encountered during excavation the excavation must be stopped immediately and the PIU/Consultants must be informed immediately.

1.2 Contractors' instruction: As soon as contractor recovers any chance find during any excavation works for pipe laying, they should immediately inform PIU/Consultant present in town about the chance find recovery. Immediately stop the excavation activity near point of recovery. After PIU/consultants engineers come at site, contractor should follow cleaning and photography in supervision of PIU/Consultant engineers.

1.3 Cleaning

When a feature/chance find is discovered it must be defined by careful cleaning. Roots must be removed and dirt must be carefully cleaned away. The section or trench base should also be cleaned back for a little distance around the feature.

1.4 Record photography

When the feature is clean good photography should be taken – vertical and face-on shots and a few general shots of the feature, also showing its position in relation to surrounding features, buildings, etc. The photographed should be catalogued (date, location, direction of shot)

1.5 Drawn record

When features/chance finds are revealed a drawn record should also be made.

a. General location record – measuring its position and orientation within the protected site / in relation to surrounding structures

b. Record drawings – detail drawings made in plan and section/profile. The extent (edges) of the feature should be drawn and the level of the existing ground surface and the top and base of the feature should be recorded. These levels should be marked on the drawings. The drawings should include detail of the construction of the

feature. Perspective sketches could also be made if necessary. Explanatory notes can also be put on the drawings.

1.6 Reporting finds

When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

1.7 Discovery of historic objects

When clearance and excavation takes place artifacts and historic objects are sometimes found. These should be recovered and kept in a safe place. The place of discovery should be recorded and each find given a number and tag tied to the find with the same number on it. A list of the finds should be kept (with the find No. And place of discovery and date of discovery recorded).

1.8 PIU/Consultants responsibility- PIU/Consultants should inform in written to the State Archaeological Department at the earliest with photographs and request to Archaeology Department to visit the site and hand over the chance finds to them.

Appendix 12: Water Analysis Report - Mandawa

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT LABORATORY, JHUNJHUNU

REPORT OF THE CHEMICAL EXAMINATION OF WATER

No: Lab/Jr. Chem./JJN/2019-20/ 131 Date 4-6-19

To,
Assistant Engineer
PHED Sub Division
Distt Sub Div II Jhunjhunu

Tehsil Jhunjhunu

Reference JEN Mandawa/spl-1/31-5-19

Particulars	Source		Tap	Tap		
	Location		Suresh Kumar W.No.16	Karni Singh Rajput Mohalla		
Block			Jhunjhunu	Jhunjhunu		
Village/Town			Mandawa	Mandawa		
Date of Collection			31-5-19	31-5-19		
Date of receipt			4/6/2019	4/6/2019		
Date of Examination			4/6/2019	4/6/2019		
Lab Sample No.			260	261		
	Permission value as per I.S.:10500/2012					
	Requirement (Acceptable Limit)	Permissible Limit in the absence of Alternate Source				
1. pH	6.5-8.5	6.5-8.5	8.6	8.4		
2. Turbidity (NTU)	1	5	Nil	Nil		
3. Colour (Hazen Units)	5	15	None	None		
4. Odour	UnObjectionable		U.O	U.O		
5. Total Alkalinity (as CaCo3) mg/l	200	600	690	560		
6. Total Hardness (as CaCo3) mg/l	200	600	180	230		
7. Calcium Hardness			80	100		
8. Calcium (as Ca) mg/l	75	200	32	40		
9. Magnesium Hardness			100	130		
10. Magnesium (as Mg) mg/l	30	100	24	31		
11. Chloride (as Cl-) mg/l	250	1000	450	330		
12. Nitrate (as No3-) mg/l	45	45	58	43		
13. Fluoride mg/l	1.0	1.5	1.30	0.90		
14. Total Dissolve Solids mg/l	500	2000	1560	1170		

Junior Chemist
P.H.E.D. Laboratory, Jhunjhunu

Date

No: Lab/Jr. Chem /JJN/2019-20/
Copy to:-
1.SE PHED Circle Jhunjhunu
2. Ex.En.PHED Distt Div Jhunjhunu

Junior Chemist
P.H.E.D. Laboratory, Jhunjhunu

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OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT LABORATORY, JHUNJHUNU

REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab/Jr. Chem./JJN/2019-20/ 429 Date 4-10-19

To,
Assistant Engineer
PHED Sub Division
Distt Sub Div II Jhunjhunu

Tehsil Jhunjhunu

Reference Samples collected on 3-10-19

Particulars	Source		CWR			
	Location		JEN Office			
Block			Jhunjhunu			
Village/Town			Mandawa			
Date of Collection			3/10/2019			
Date of receipt			3/10/2019			
Date of Examination			4/10/2019			
Lab Sample No.			631			
	Permission value as per I.S. 10500/2012					
	Requirement (Acceptable Limit)	Permissible Limit in the absence of Alternate Source				
1. pH	6.5-8.5	6.5-8.5	8			
2. Turbidity (NTU)	1	5	Nil			
3. Colour (Hazen Units)	5	15	None			
4. Odour	UnObjectionable		U.O.			
5. Total Alkalinity (as CaCo3) mg/l	200	600	600			
6. Total Hardness (as CaCo3) mg/l	200	600	260			
7. Calcium Hardness			120			
8. Calcium (as Ca) mg/l	75	200	48			
9. Magnesium Hardness			140			
10. Magnesium (as Mg) mg/l	30	100	34			
11. Chloride (as Cl-) mg/l	250	1000	460			
12. Nitrate (as No3-) mg/l	45	45	55			
13. Fluoride mg/l	1.0	1.5	1.20			
14. Total Dissolve Solids mg/l	500	2000	1530			

Junior Chemist
P.H.E.D. Laboratory, Jhunjhunu

Date

No. Lab/Jr. Chem./Jn/2019-20/
Copy to -
1. SE PHED Circle Jhunjhunu
2. Ex.En.PHED Distt Div. Jhunjhunu

Junior Chemist
P.H.E.D. Laboratory, Jhunjhunu

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Feasibility Report of Tube wells, Mandawa

Government of Rajasthan
Office of the Incharge Hydrogeologist (Survey & Research)
Ground Water Department ,Behind Collectorate office ,JHUNJHUNU

Phone No. 01592232309
Email. jggwdjjn@gmail.com

NO.F-(1)FR/TA/IHG/GWD/JJN/ 586

Date 21/1/19

To,

Executive Engineer
District Division, Jhunjhunu

Subject :- FEASIBILITY REPORT FOR SOURCE : Three Phase T/W

Reference :- Your letter no.3090 dated 18-01-19

Sr.No.	Name of Gram Panchayat	Tehsil /Block	Location of Source	Expected Water level in Meters	Depth Recommended in mts with Size in (mm)	Casing Recommended in mts.with size in (mm)	Expected discharge in LPH	Hydrogeological Formation	Type of Rig Recommended	Chemical Parameters of Nearby Source				Remark
										TDS	CL	NO,	F	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Mandawa	Jhunjhunu	In Ward No18	45 - 50	140 - 150 (444)	90 - 100 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
2	Ajari Khurd	Jhunjhunu	Near Temple	55 - 60	160 - 180 (444)	80 - 90 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
3	Toliyasar	Jhunjhunu	New Meghwal Basti	45 - 50	140 - 150 (444)	90 - 100 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
4	Khatehpura	Jhunjhunu	On Bus Stand near GLR	55 - 60	160 - 180 (444)	80 - 90 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
5	Seegri	Jhunjhunu	Gopal Ram ki Dhani	40 -50	120 - 125 (444)	60 - 80 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
6	Dheerawali Dhani	Jhunjhunu	In Dheerawali Dhani	55 - 60	160 - 180 (444)	80 - 90 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
7	Kuharu	Jhunjhunu	Bhariyon ka Bas	55 - 60	160 - 180 (444)	80 - 90 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W
8	Budaniya	Jhunjhunu	Harijan Basti	55 - 60	160 - 180 (444)	80 - 90 (200)	10000 - 12000	Alluvium/ Qtz.Sc.	Combination	—	Potable	–	—	Three Phase T/W

उक्त कार्यों के संबंध में निम्न शर्तों की पालना करना आवश्यक होगाः–

1. कार्य सहायक अभियंता भू–जल विभाग से पंजीकृत रिग मशीन से कराना आवश्यक होगा।
2. क्षेत्रीय भू–जल वैज्ञानिक से स्थल चयन के पश्चात ही नलकूप/हैण्डपम्प/भूजल दोहन यूनिट स्थापित कराया जावेगा।
3. नलकूप आदि का डिजाईन (पाईप एसेम्बली) क्षेत्रीय भूजल वैज्ञानिक से प्राप्त कर लोरिंग कराना होगा।
4. कार्य स्थल के पास वर्षा जल संरक्षण/रिचार्ज स्ट्रेचर का निर्माण कराना आवश्यक होगा
5. कार्यकारी एजेन्सी को कार्य सम्पादन के 15 दिवस में भूजल विभाग को बैसिक डाटा रिपोर्ट (लीथोलाग, पाईप एसेम्बली, गहराई,डीस्चार्ज, वाटर लेवल, व्यास इत्यादि) प्रस्तुत करनी होगी

21/1/19

(Rajesh Pareek)
INCHARGE HYDROGEOLOGIST
GWD (S&R) JHUNJHUNU

Appendix 13: Biodiversity Assessment Report for Mandawa

Biodiversity Assessment –Mandawa Town Water Supply and Sewerage Subproject

A. Introduction

This detailed biodiversity assessment is carried out for the proposed Mandawa Town Water Supply and Sewerage Subproject located in Mandawa Town, Jhunjhunu district of Rajasthan State in India. This subproject is included in the Rajasthan Secondary Towns Development Sector Project (RSTDSP) to be financed by ADB. The assessment has been carried out to identify critical habitats and anticipated impacts from the subproject implementation. The assessment is based on the desk review and analysis of the secondary information collected through various sources and supported by the results of the proximity report generated by the Integrated Biodiversity Assessment Tool (IBAT). The findings and assessment will be further strengthened following field assessments and consultations with key stakeholders involving forest and wildlife officials from the state before project implementation.

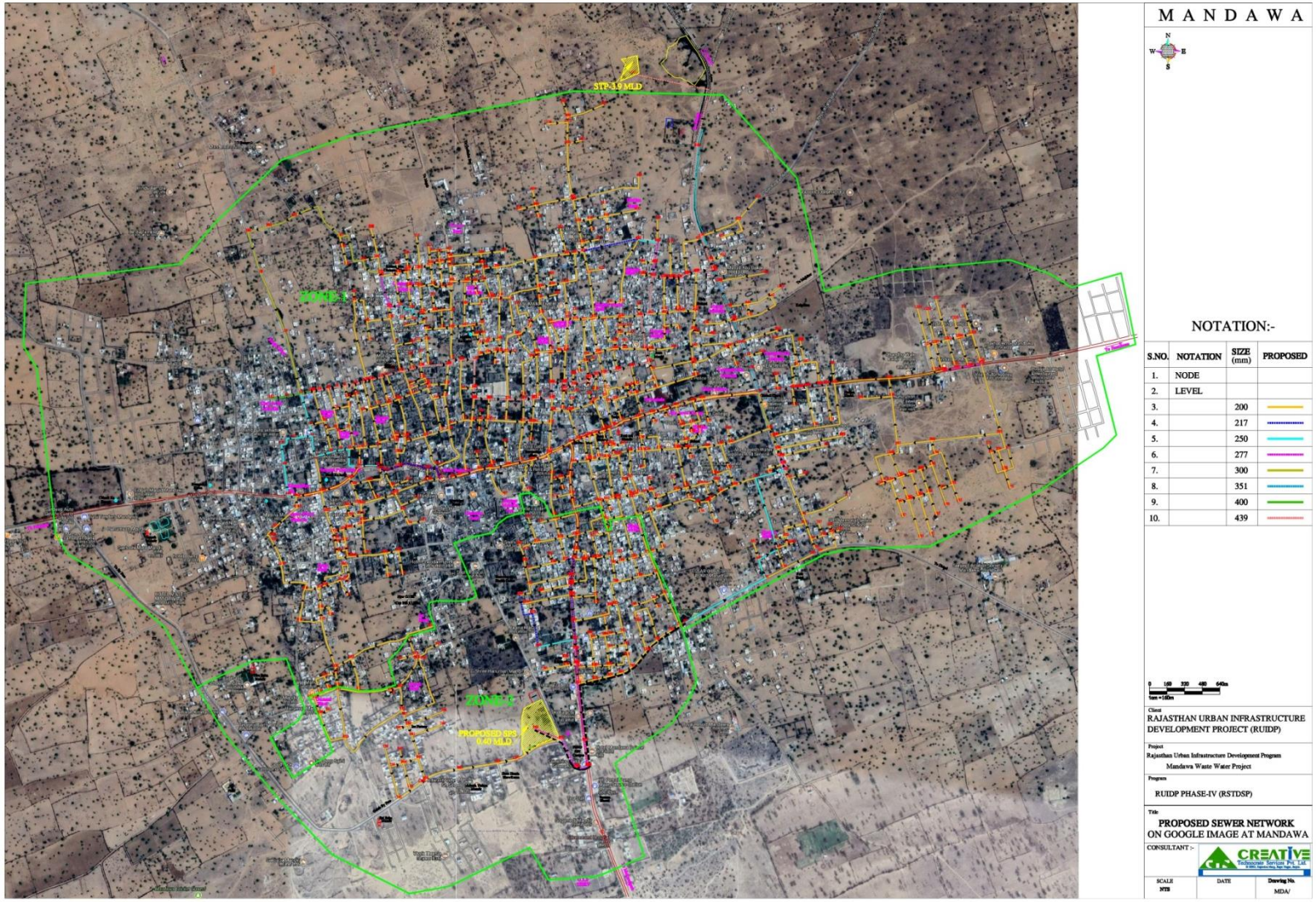
B. Project Description

The subproject is located in Mandawa Town, Jhunjhunu district of Rajasthan State. All the project components are planned and will be located inside the municipality limits. The components under this subproject include for Water Supply system (i) Construction of 1no. of new Clear Water Reservoir (CWR) of 1200 KL with 1 no. of chlorination of 1 kg per hour capacity for CWR at PHED, JEN, Campus. (ii) New 108. 40 km of water distribution network of dia. 75mm to 250mm of HDPE materials (iii) Rehabilitation and Refurbishment 11 Nos. of Tube wells, submersible motor pumps at Ganesh Mandir, BPS School, Shankar Baba, Sai Baba, Ice Factory, Electricity Board GSS, Ruth Hotel, Gulab bypass near Saimandir, Tiba ka Mandir, Near Shamshan bhumi and PHED J. En. Campus locations. (iv) Rehabilitation and Refurbishment of one 360KL capacity Overhead Storage reservoir at existing PHED J. En. campus, (v) New water transmission mains of 0. 98 kms of dia. 150 mm of DI material from CWR to OHSR/ESR, (vi) Consumer relations and SCADA system control for entire water supply system along with • one Consumer Relation Management Centers (CRMC), one Central Control Center (CCC) and one Master Control Center. The sewerage collection and treatment system with (i) Collect wastewater from houses by construction of 53. 40 km of sewer line having 5. 0 km trenchless, (ii) New transmission main 0. 91 km of 100 mm dia of DI material from SPS at govt. secondary school to existing MH, (iii) New Sewage Pumping Station (SPS) of 0. 4 MLD capacity Near existing PHED J. En. campus on Fatehpur Road, (iv) New Sewage Treatment Plant (STP) of 3. 9 MLD capacity based on SBR (sequential batch reactor) with all associated facilities near Bissau Road. (v) for treated wastewater storage 1 nos. of Treated Effluent Storage Reservoir (TESR) of 200 kL and one Treated Effluent Elevated Reservoir (TEER). of 400 kL capacity.

The pipelines for water supply will be laid underground along the public roads/streets covering entire area of the town. The network of new pipes will be laid without distributing the existing pipes, which will be left as it is in the ground untouched. Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the center of the road. The existing/ proposed water pipes are/will be located on one or either side of the roads, and therefore sewers will be laid in the center without distributing the water pipes.

The Sewerage Treatment Plant of 3. 9 MLD capacity will be constructed on land in possession of Nagar Palika. The location of subproject components in Mandawa Town on google map is given in Figure-1.

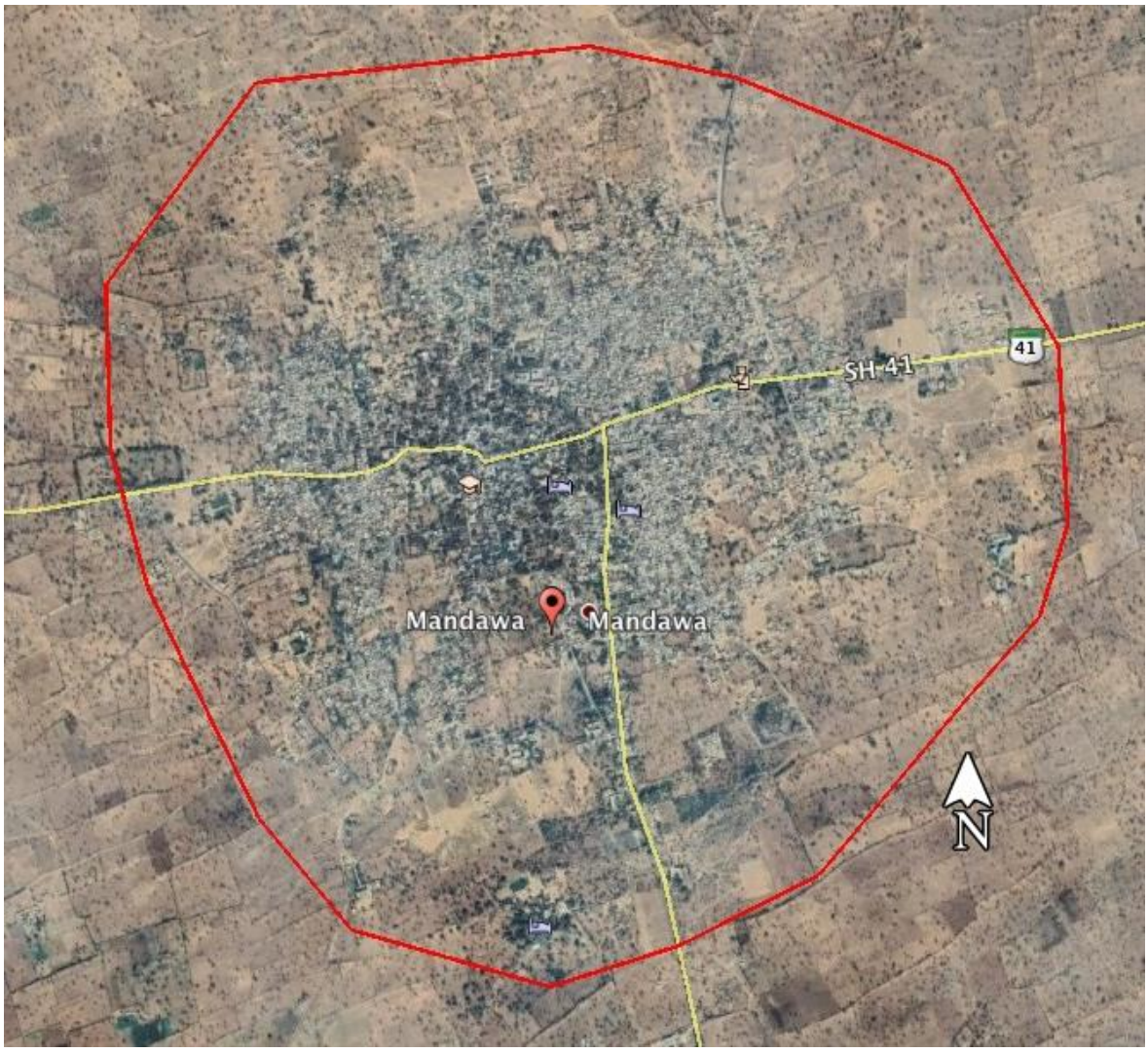
Figure 1: Subproject component and town area on Google Map



C. Establishing project area of influence (PAI)

The project area of influence (PAI) is established on basis of location on project components of proposed project. The scope of work covering all components and associated facilities under the subproject in Mandawa Town are considered as a project area of influence (PAI). The critical habitat assessment has been conducted within the boundaries of PAI which has been established using ecological units and/or physical features within the landscape such as state highway, rural roads and village settlement. The established PAI for water supply and sewerage treatment system and facilities in Mandawa Town is given in Figure -2.

Figure 2: Map showing boundary of PAI Mandawa Town subproject



The boundaries of PAI for subproject has been based on physical/topographical features surrounding Mandawa Town. There is as such no major physical features surrounding the town of Mandawa. Mainly rural settlements are located in the vicinity of the town area. The town of Mandawa is connected through State Highway -41 to Jhunjhunu city. In the east of the town Tetara and Dani of Joshiyan are twin habitation area on both side of SH-41. The agriculture fields of these villages are considered as study area limits. While on north direction of town the location for proposed STP at Bissau road after the crossing point of Bissau road and road for Pipal ka Bas is marked for boundary of study area. On the west side of the city a village road for Khalasi is the limit for study and south direction is closed by a link road connecting from SH-41 to Mukhandgarh road are established boundary for the PAI for subproject

area.

D. Biodiversity Assessment

Biodiversity assessment in the project influence area has been conducted as per the International Finance Corporation's (IFC) Performance Standard No 6 of 2012, within updated version in June 2019 on the Guidance Note for the Performance Standard. The process of biodiversity assessment based on presence of protected or designated areas and the potential presence of Critical Habitat in the study area. The Critical Habitat assessment is based on presence of Threatened species (Critically Endangered (CR), Endangered (EN) species, and to a lesser extent Vulnerable (VU) species as defined by the IUCN.

D.1 Key Biodiversity Area

The project areas have been screened to determine presence of Key Biodiversity Areas (KBAs) using the Integrated Biodiversity Assessment Tool (IBAT)[49]. As per the Proximity report generated by IBAT, there are neither protected area nor any key biodiversity areas within the buffer of 10km radius of the subproject components. The nearest protected area is Tal Chappar Wildlife Sanctuary; which is approx. 75 km away (nearest aerial distance) from the Mandawa town area. However, there are 32 International Union for the Conservation of Nature (IUCN) Red List threatened species. The key findings of the IBAT report are presented in the subsequent sections.

D.2 Protected Area- Tal Chappar Wildlife Sanctuary

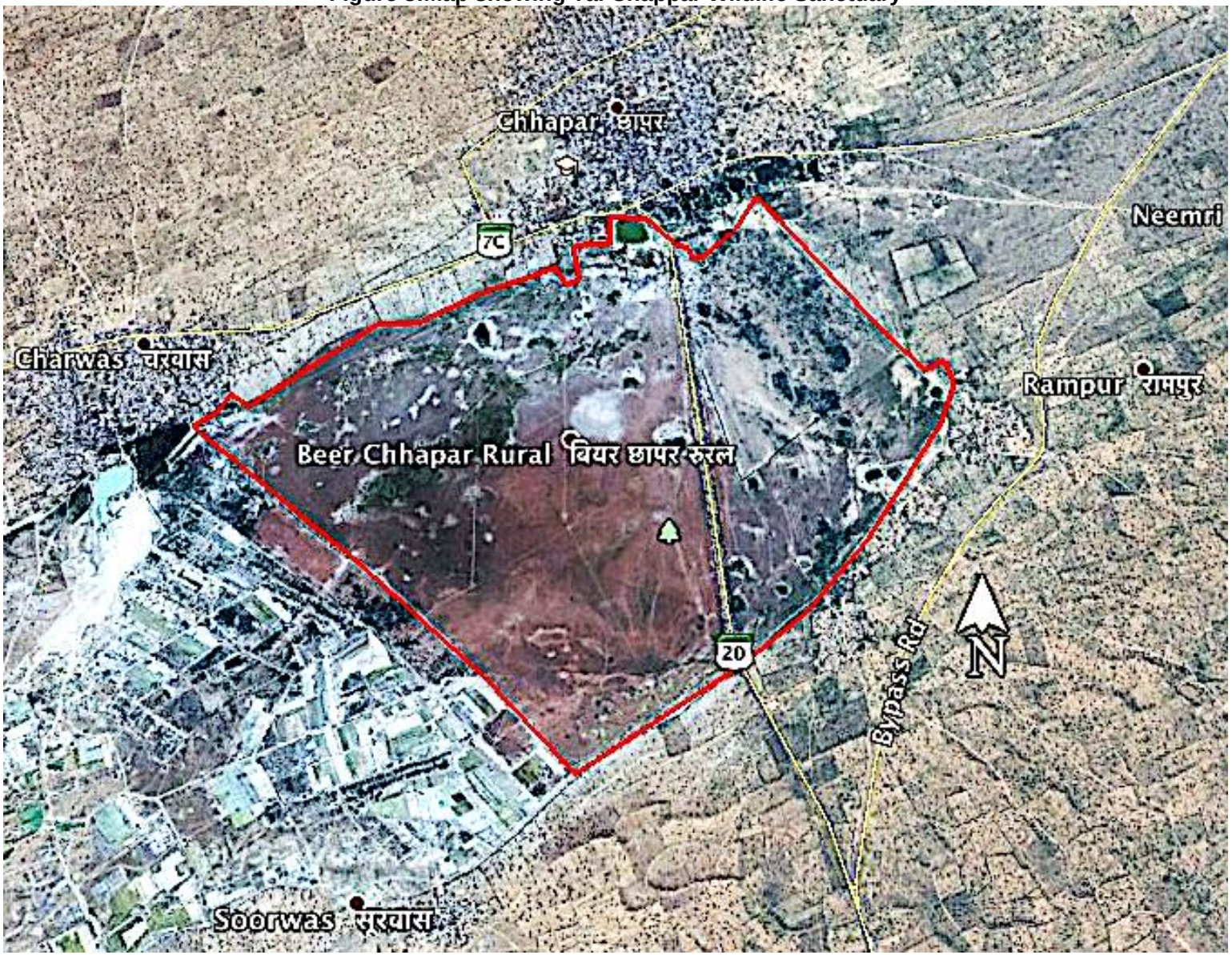
The area is nationally notified protected area under Wildlife Protection Act 1972, located on South west direction of the project town at an approx. 75 km nearest aerial distance. Figure-3 shows map of the Tal Chappar Wildlife Sanctuary area.

Tal Chapper sanctuary is located on Nokha- Sujangarh state Highway in the Sujangarh Tehsil of Churu District of Rajasthan State. The area of 7. 19 sq. km within the Lat. 27°79'77. 77'' and Long. 74°43'71. 30'' was notified on 19th September 1962 as Wildlife Sanctuary for Black Buck (Antilope cervicapra). Tal Chapper sanctuary with almost flat tract and interspersed shallow low lying areas has open grassland with scattered Acacia and prosopis trees which give it an appearance of a typical Savanna. Some small hillocks and exposed rocks of slate and quartzite are found in the western side of the sanctuary. Area between hillocks and the sanctuary constitutes the watershed area of the sanctuary.

The salt pans located on the South-western boundary of the protected area. The migratory birds visit this area during winter starting from month of September. Birds commonly seen in the sanctuary are harriers, Eastern Imperial Eagle, Tawny Eagle, Short-toed Eagle, sparrow, and Little Green Bee-eaters, Black Ibis and Demoiselle Cranes, which have habitat in protected area by month of end March. The other bird species like skylark, crested lark, Ring Dove, brown dove and blue jay are seen throughout the year in the protected area. Desert fox and desert cat can also be spotted along with typical avifauna such as partridge and sand grouse.

[49]IBAT is a multi-institutional programme of work involving BirdLife International, Conservation International, IUCN and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognised biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

Figure 3:Map showing Tal Chappar Wildlife Sanctuary



D.3 Critically Endangered / Endangered Species:

A total of 32 IUCN red list (CR, EN & VU) species reported within 50km radius. Out of these 32 IUCN red list species, 14 species are classified as Critically Endangered (CR) and Endangered (EN). Birds are common species which includes 23 species (CR-5, EN-8& VU-10), 5 mammals (EN-1, VU-4), 1 reptile (VU-1), 1 Fish (VU-1) and 2 plants (VU-2). Table-1 lists the species designated by the International Union for the Conservation of Nature (IUCN) as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) having recorded ranges that include the study area.

Table 1: List of species designated by IUCN threatened species as CR, EN & VU

S. No.	Scientific Name	Common Name	IUCN Red List category
	Birds		
1	*Ardeotis nigriceps*	Great Indian Bustard	CR
2	*Vanellus gregarius*	Sociable Lapwing	CR
3	*Gyps bengalensis*	White-rumped Vulture	CR
4	*Sarcogyps calvus*	Red-headed Vulture	CR
5	*Gyps indicus*	Indian Vulture	CR
6	*Oxyura leucocephala*	White-headed Duck	EN
7	*Neophron percnopterus*	Egyptian Vulture	EN
8	*Aquila nipalensis*	Steppe Eagle	EN
9	*Falco cherrug*	Saker Falcon	EN
10	*Leptoptilos dubius*	Greater Adjutant	EN
11	*Sterna acuticauda*	Black-bellied tern	EN
12	*Sypheotides indicus*	Lesser Florican	EN
13	*Haliaeetus leucoryphus*	Pallas's Fish-eagle	EN
14	*Antigone antigone*	Sarus crane	VU
15	*Aquila heliaca*	Eastern imperial eagle	VU
16	*Aquila rapax*	Tawny eagle	VU
17	*Aythya ferina*	Common pochard	VU
18	*Chlamydotis macqueenii*	Asian houbara	VU
19	*Ciconia episcopus*	Asian woollyneck	VU
20	*Clanga clanga*	Greater spotted eagle	VU
21	*Columba eversmanni*	Yellow-eyed pigeon	VU
22	*Rynchops albicollis*	Indian skimmer	VU
23	*Saxicola macrorhynchus*	White-browed bushchat	VU
	Mammals		
24	*Manis crassicaudata*	Indian Pangolin	EN
25	*Lutrogale perspicillata*	Smooth-coated otter	VU
26	*Panthera pardus*	Leopard	VU
27	*Tetracerus quadricornis*	Four-horned antelope	VU
28	*Rusa unicolor*	Sambar	VU
	Fish		
29	*Wallago attu*		VU
	Reptile		
30	*Crocodylus palustris*	Mugger	VU
	Plant		
31	*Anacyclus pyrethrum*	Atlas daisy	VU

32	*Oryza malampuzhaensis*	Asian Rice	VU

E. Critical Habitat Assessment Process:

Habitats that are critical to the survival of International Union for the Conservation of Nature (IUCN) designated Critically Endangered or Endangered species, migratory species, congregatory species and endemic or restricted range species are classified as critical habitats.

The screening of Critical Habitat in the area has been conducted based on species which enlisted in red list of IUCN. The presence of habitat of these species in the area will designate Critical Habitat. There are five criterion set out in updated Performance Standard No 6 Guidance note (IFC 2019) to consider the area as Critical Habitat. The five criterion for Critical Habitat determination is:

Criterion 1: Critically Endangered and Endangered Species
Criterion 2: Endemic and Restricted range Species
Criterion 3: Migratory and Congregatory Species
Criterion 4: Highly Threatened or Unique Ecosystems
Criterion 5: Key Evolutionary Processes

Out of these five criteria, first three criteria are related to species and threshold of species enlisted in the IUCN Red list representing the risk of extinction of species at global level. While the criterion 4 & 5 are related to ecosystems and evolutionary processes. The brief description of criteria is mentioned in below sections.

E.1 Criterion 1: Critically Endangered and Endangered Species

Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. Critically Endangered species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

As described in footnote 11 of Performance Standard 6, the inclusion in Criterion 1 of species that are listed nationally/regionally as CR or EN in countries that adhere to IUCN guidance shall be determined on a project-by-project basis in consultation with competent professionals.

Thresholds for Criterion 1 are the following:

a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0. 5% of the global population AND ≥ 5 reproductive units of a CR or EN species).

b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds.

c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

E.2 Criterion 2: Endemic and Restricted range Species

For purposes of this Guidance Note, the term endemic is defined as restricted range. Restricted range refers to a limited extent of occurrence (EOO).

- For terrestrial vertebrates and plants, restricted range species are defined as those species that have an EOO less than 50, 000 km^2.
- For marine systems, restricted range species are provisionally being considered those with an EOO of less than 100, 000 km^2.
- For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i. e. , the distance between occupied locations furthest apart).

The threshold for Criterion 2 is the following:

a) Areas that regularly hold ≥10% of the global population size and ≥10 reproductive units of a species.

E.3 Criterion 3: Migratory and Congregatory Species

Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis. Examples include the following:

- Species that form colonies.
- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (for example, foraging and roosting).
- Species that utilise a bottleneck site where significant numbers of individuals of a species occur in a concentrated period of time (for example, for migration).
- Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (for example, wildebeest distributions).
- Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).

Thresholds for Criterion 3 are the following:

a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.

b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

E.4 Criterion 4: Highly Threatened or Unique Ecosystems

The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed, the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized Non-Government Organizations (NGOs)).

The thresholds for Criterion 4 are the following:

a) Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.

b) Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

E.5 Criterion 5: Key Evolutionary Processes

The structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation, and combinations of these variables, can influence the evolutionary processes that give rise to regional configurations of species and ecological properties. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have been described as surrogates or spatial catalysts for evolutionary and ecological processes, and such features are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, particularly the conservation of genetic diversity. By conserving species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, ensures the evolutionary flexibility in a system, which is especially important in a rapidly changing climate.

For illustrative purposes, some potential examples of spatial features associated with evolutionary processes are as follows:

- Landscapes with high spatial heterogeneity are a driving force in speciation, as species are naturally selected based on their ability to adapt and diversify.
- Environmental gradients, also known as ecotones, produce transitional habitat, which has been associated with the process of speciation and high species and genetic diversity.
- Edaphic interfaces are specific juxtapositions of soil types (for example, serpentine outcrops, limestone, and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism.
- Connectivity between habitats (for example, biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from “crest to coast. ”
- Sites of demonstrated importance to climate change adaptation for either species or ecosystems are also included within this criterion.

F. Critical Habitat Assessment in PAI

A critical habitat assessment has been carried out using the above mentioned five criterion of Performance Standard No 6 Guidance note (IFC 2019).

F.1 IBAT study output for habitat analysis (Criteria 1-3)

A habitat analysis carried out for the Critically Endangered (CR) and Endangered species (EN) reported in the project area of influence (50km) shows that it is likely that the 32 species identified in IBAT are mostly located inside the ecological areas and not within the project area of influence (PAI). Details of the habitat analysis in the PAI is presented in Table-2.

Table 2: Habitat Analysis in PAI – Mandawa Subproject

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
Birds				
1	Great Indian Bustard *(Ardeotis nigriceps)*	CR	Grassland - Subtropical/Tropical Dry	None: Possible range extend in State of Rajasthan. The species occurs in the Indian Subcontinent, with strongholds in the Thar desert in the north-west and the Deccan tableland of the Peninsula. Mainly found in Western Rajasthan with small population in in Gujarat, Maharashtra, Andhra Pradesh and Karnataka. https://www. iucnredlist. org/species/22691932/134188105#geographic-range
2	Sociable Lapwing (*Vanellus gregarious)*	CR	Desert, Wetlands (inland), Grassland, Artificial/Terrestrial	None; The species occurs in the north-west part of India, as non-breeding habitat, mainly in Great Rann of Kutch. https://www. iucnredlist. org/species/22694053/130586388#habitat-ecology
3	White-rumped vulture *(Gyps bengalensis)*	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes, the species habitat in South Asia and South-east Asia. Habitat reported in North India including Rajasthan state. https://www. iucnredlist. org/species/22695194/118307773
4	Red-headed Vulture (*Sarcogyps calvus)*	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; distributed in parts of Rajasthan State, habitat extend mainly in North India. https://www. iucnredlist. org/species/22695254/118371885
5	Indian Vulture (*Gyps indicus)*	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; possibility of habitat in Rajasthan, species breeds in south-east Pakistan and peninsular India south of the Gangetic plain, north to Delhi, east through Madhya Pradesh, south to the Nilgiris, and occasionally further south. https://www. iucnredlist. org/species/22729731/117875047
6	White-headed Duck (*Oxyura leucocephala)*	EN	Wetlands (inland), Artificial/Aquatic & Marine, Marine Coastal/Supratidal	None: Habitat range in South Asia is limited to Pakistan and rarely reported in India.

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
				https://www. iucnredlist. org/species/22679814/119403602
7	Egyptian Vulture (*Neophron percnopterus)*	EN	Rocky areas (eg. inland cliffs, mountain peaks), Wetlands (inland), Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; extend of migratory bird species breeding habitat during winter in India including Rajasthan state. https://www. iucnredlist. org/species/22695180/154895845
8	Steppe Eagle (*Aquila nipalensis)*	EN	Rocky areas (eg. inland cliffs, mountain peaks), Grassland, Savanna	Yes; extend of migratory bird species non-breeding habitat during winter in India including Rajasthan state. https://www. iucnredlist. org/species/22696038/155419092
9	Saker Falcon (*Falco cherrug)*	EN	Marine Intertidal, Wetlands (inland), Grassland, Shrubland, Artificial/Terrestrial	Yes; extend of migratory bird species non-breeding habitat during winter in India including Rajasthan state. https://www. iucnredlist. org/species/22696495/110525916
10	Greater Adjutant (*Leptoptilos dubius)*	EN	Forest, Wetlands (inland), Artificial/Terrestrial, Grassland	None; in India species breeding habitat extend is limited in Assam and Bihar state only. https://www. iucnredlist. org/species/22697721/93633471
11	Black-bellied Tern (*Sterna acuticauda)*	EN	Wetlands (inland)	None: breeding range extend into parts of India excluding Rajasthan State. https://www. iucnredlist. org/species/22694711/110488626
12	Lesser Florican (*Sypheotides indicus)*	EN	Grassland, Artificial/Terrestrial	Yes; possibility of habitat in Rajasthan state as species breeds in Gujarat, Rajasthan, Maharashtra, Madhya Pradesh & Andhra Pradesh. https://www. iucnredlist. org/species/22692024/110438391
13	Haliaeetus leucoryphus (Pallas's Fish-eagle)	EN	Wetlands (inland)	None; the species may instead breed only in northern India (apparent strongholds in Assam and Uttarakhand), Bangladesh and Myanmar, with very small numbers in Bhutan. The habitat extend as per IUCN distribution map is extinct from Rajasthan state and adjoining areas.

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
				https://www. iucnredlist. org/species/22695130/131934599#geographic-range
14	Sarus crane (Antigone antigone)	VU	Grassland, Artificial/Terrestrial, Wetlands (inland), Artificial/Aquatic & Marine	None; habitat extend of the bird species resident is mainly in Uttar Pradesh State and nearby areas of surrounding states, breeding habitat during winter extended in adjoining areas of Rajasthan state. https://www. iucnredlist. org/species/22692064/93335364
15	Eastern imperial eagle *(Aquila heliacal)*	VU	Forest, Wetlands (inland), Grassland, Shrubland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in Northern parts only. https://www. iucnredlist. org/species/22696048/155464885
16	Tawny eagle *(Aquila rapax)*	VU	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; habitat extend of the bird species resident is mainly in central India including Rajasthan state https://www. iucnredlist. org/species/22696033/131671001
17	Common pochard *(Aythya ferina)*	VU	Marine Neritic, Wetlands (inland), Marine Coastal/Supratidal, Artificial/Aquatic & Marine	None; the migratory bird specie's non-breeding habitat extend during winter season is limited in eastern and northern parts of India https://www. iucnredlist. org/species/22680358/155473754
18	Asian houbara *(Chlamydotis macqueenii)*	VU	Desert, Grassland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in western parts of Punjab and Rajasthan State. https://www. iucnredlist. org/species/22733562/155425140
19	Asian woollyneck *(Ciconia episcopus)*	VU	Marine Intertidal, Forest, Artificial/Terrestrial, Artificial/Aquatic & Marine, Grassland, Wetlands (inland), Marine Neritic	Yes; the species is found patchily across South Asia and South East Asia, range extends throughout India https://www. iucnredlist. org/species/22727255/110064997

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
20	Greater spotted eagle *(Clanga clanga)*	VU	Forest, Wetlands (inland), Shrubland, Artificial/Aquatic & Marine, Grassland	Yes; the species non-breeding habitat is found across South Asia and South East Asia, range extends throughout northeast and Northern India https://www. iucnredlist. org/species/22696027/110443604
21	Yellow-eyed pigeon *(Columba eversmanni)*	VU	Desert, Caves and Subterranean Habitats (non-aquatic), Wetlands (inland), Shrubland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in north-west parts including parts of Rajasthan State. https://www. iucnredlist. org/species/22690097/110099638
22	Indian skimmer *(Rynchops albicollis)*	VU	Wetlands (inland)	Yes; the species is found patchily across India; range extends throughout Rajasthan State. https://www. iucnredlist. org/species/22694268/110600990
23	White-browed bushchat *(Saxicola macrorhynchus)*	VU	Desert, Grassland, Shrubland	None; The species is endemic to the north-west Indian subcontinent, distribution recorded in Punjab, Haryana, Uttar Pradesh, Rajasthan and Gujarat. The recent regular records of this species from Tal Chhapar in Churu district of Rajasthan State. https://www. iucnredlist. org/species/22710160/110578039
Mammals				
24	Indian Pangolin (*Manis crassicaudata)*	CR	Forest, Savanna, Shrubland, Artificial/Terrestrial, Grassland	Yes; species is distributed in South Asia through much of India including Rajasthan https://www. iucnredlist. org/species/12761/123583998
25	Smooth-coated otter (*Lutrogale perspicillata)*	VU	Artificial/Aquatic & Marine, Wetlands (inland), Forest, Grassland, Marine Coastal/Supratidal, Marine	Yes; species is distributed in South Asia through much of India including Rajasthan https://www. iucnredlist. org/species/12427/21934884

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
			Neritic, Marine Intertidal, Shrubland	
26	Leopard (*Panthera pardus)*	VU	Forest, Desert, Rocky areas (eg. inland cliffs, mountain peaks), Grassland, Savanna, Shrubland	None; Leopard range widespread in inside and outside Protected Areas of India. https://www. iucnredlist. org/species/15954/160698029
27	Four-horned antelope (*Tetracerus quadricornis)*	VU	Forest, Shrubland	None; species habitat is extended most parts of India including Rajasthan https://www. iucnredlist. org/species/21661/50195368
28	Sambar (*Rusa unicolor)*	VU	Forest, Artificial/Terrestrial, Savanna, Shrubland, Grassland, Wetlands (inland)	None; the habitat extend is throughout India except North India and western parts of Rajasthan and Gujarat state. https://www. iucnredlist. org/species/41790/85628124
Fish				
29	Wallago attu	VU	Wetlands (inland), Artificial/Aquatic & Marine	None; the species habitat extends in India to waterbodies including lakes, water reservoirs and rivers, in Rajasthan State. https://www. iucnredlist. org/species/166468/60586371
Reptile				
30	Mugger (*Crocodylus palustris)*	VU	Wetlands (inland), Marine Neritic, Artificial/Aquatic & Marine	None; the species habitat extends in India to waterbodies including rivers, in Rajasthan State mainly in River Chambal. https://www. iucnredlist. org/species/5667/3046723
Plant				

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
31	Atlas daisy *(Anacyclus pyrethrum)*	VU	Rocky areas (eg. inland cliffs, mountain peaks), Forest, Grassland, Shrubland	Yes; the plant species is native to India and extend of occurrence in Rajasthan State. https://www. iucnredlist. org/species/202924/121743450
32	Asian Rice *(Oryza malampuzhaensis)*	VU	Particularly found in forest reserves either in marshy fields or along the margins of streams or rivulets in the forest interiors	None; the species is endemic to the Kerala region in India. https://www. iucnredlist. org/species/112680709/113899465

F.2 Assessment output based on Criteria 4 & 5:

The ecosystem within the project area of influence has not been assessed to date under IUCN assessment for the extinction threat to species. The ecosystem within the PAI is not considered to be highly threatened, as main landuse is of residential, commercial & industrial in urban or agricultural in the surrounding locality. Further, there is no key evolutionary processes[50] within the PAI, as the key indicator for evolutionary process areas is presence of a high number of endemic or range restricted species. Therefore, the project area of influence does not meet the thresholds set out in Criterion 4 & 5.

F.3 Protected Areas:

As per ADB's SPS 2009; the designated[51] or proposed protected areas at national and international level should be considered as Critical Habitat. In the PAI for subproject in Mandawa Town there is no national protected area and no international designated site or proposed and notified protected area. The nearest national protected area is Tal Chappar Wildlife Sanctuary, which is approx. 75 km away from the PAI boundary established for critical habitat assessment study.

G. Impacts & Mitigation Measures

The project components are proposed to be implemented within the developed areas of Mandawa Town and on land under municipal limits. The project area is approx. 75 km (nearest aerial distance) away from the boundary of Tal Chappar Wildlife Sanctuary. The protected area of Tal Chappar has also been established an IBA site due to migratory birds visit the area during winter season.

The species of vulture and eagle reported from Tal Chappar wildlife sanctuary or passing by may visit the project area mainly in water reservoir/waste water pond or nearby areas; due extend range of habitat or in search of food during migration period. The availability of these species in the PAI need to be confirm with local community and district forest and wildlife department.

Implementation of subproject for water supply and sewage treatment plant for the town will result in reduce in waste water in reservoir. It is generally known that birds generally migrate in winter season. The treated water from proposed sewerage treatment plant will be used for irrigation purposes in agriculture fields and horticulture plantation in area. This will increase in food sources and with horticulture plantation will be improve settler and nesting ground for birds.

Construction workers may hunt, birds or carry out other activities that will negatively impact wildlife. No construction or labour camps, batching plants, and quarrying activities will be allowed within or near the forest area. The contractor will clearly brief the construction workers on strict forestry rules on illegal harvesting of forest products and poaching of wildlife. Contractor will ensure supply of all necessary food items; cooking fuel and proper housing is provided to prevent illegal hunting and tree felling.

The operation of various construction equipment is likely to generate significant noise. Noise disturbance may cause migration of the birds to other areas which may increase the probability of habitat loss. Setting of construction camp near forests or protected area may generally disturb surrounding fauna.

[50] The evolutionary processes often occur in an isolated habitat and ecosystem due to physical or biological barriers, for example habitat on islands or valley.

[51] As per ADB's SPS the sites which are of international designation, such as Ramsar and UNESCO sites should be considered as Critical Habitat.

The such impacts on avifauna can be mitigated by following measures:

- Project improvement proposals are restricted to available land with minimal tree cutting.
- Adequate measure is included in the design for development of green belt development and horticulture plantation scheme at proposed STP area.
- Noise generating equipment like DG set, compressors will have acoustic enclosures. Noise generating activities should not be permitted during night.
- Workers should be warned about wild life protected areas and possible movement.
- project staff and work crews should not be allowed to have fire-arms and animal traps etc. ;
- construction facilities such as workers camp, construction camp, batching plant should be located at least 1 km away from any the forest stretches.
- employment agreements should specify heavy penalties for illegal hunting, trapping and wildlife trading – all other ancillary works should also agree not to participate in such activities.
- Strict anti-poaching surveillance measures need to be implemented, especially during project construction phase.

The anticipated impacts on ecological system due to project and proposed mitigation measures for EMP are provided in Table -3.

Table 3: Impact-mitigation measures for EMP

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Design					
Site selection for project component implementation	Disruption of biodiversity & damage to habitat due to project infrastructure at specified location	(i) Avoid or no land acquisition in forest area or in notified wildlife area	PIU/PMU	PMU	No cost required Mitigation measures are part of project design
Water in wastewater drain and tree cutting	Sources of food and water for birds in the area	(i) Green belt and landscaping development plan at location of proposed STP	PIU/PMU	PMU	No cost required mitigation measures are part of project design
Permission	Failure to obtain necessary permits for tree cutting can result to design revisions and/or stoppage of works	(i) Ensure all permission before start of construction in place (ii) Removal of trees after verification and approval from concerned agency (iii) Plantation of three trees against every single tree removed	PIU/PMU	PMU	No cost required mitigation measures are part of project design
Construction					
Construction camp location	Impacts on forest resources for establishing construction camp and plants.	(i) Prior approvals for establishing construction facilities from PMU with submission of location details (ii) Construction facilities such as workers camp, construction camp, batching plant should be located at least 1 km away from any forest stretches	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor
Construction work camps, hot mix plants, stockpile areas, storage areas, and	(i) Impact due to noise generated from project activities (ii) Contamination of water and soil due to construction	(i) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers to reduce impact to surrounding sensitive receptor; and	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
disposal areas.	waste disposal in forest area	(ii) Prepare and implement construction waste management plan (iii) Disposal of waste at designated sites and approval from local authorities (iv) Conduct surface quality monitoring according to the EMP.			
Construction Workers	Involvement in illegal hunting, trapping and wildlife trading	(i) Awareness training to workers on wildlife presence in the project area and protection of wildlife. (ii) Reporting to PMU on slighting of wild animals in the project area. (iii) Employment agreements should specify heavy penalties for illegal hunting, trapping and wildlife trading – all other ancillary works should also agree not to participate in such activities. (iv) Strict anti-poaching surveillance measures need to be implemented, especially during project construction phase	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor
Operational Stage					
Project area development	Failure of STP for wastewater treatment, plantation of non-fruit bearing trees, contamination of water source or agriculture fields due to	(i) Regular monitoring of treated effluent quality before discharge or reuse for plantation and irrigation purposes (ii) Tree plantation and landscaping in the project	O&M Contractor	Mandawa Nagar Palika	Contractor' s O&M cost

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	inadequately treated wastewater	area as per approved plan with preference to local species			

H. Conclusion

ADB SPS's requires that project will not be developed in critical habitat area or will not adversely affect the identified critical habitat. The below mentioned criteria should be considered for assessment of impacts on biodiversity, if project development in an identified critical habitat:

- There should be no measurable adverse impacts, or likelihood of such impacts on the critical habitat which could deteriorate its high biodiversity value or the ability to function of ecology of the area.
- The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative of host ecosystem be compromised.
- Any lesser impacts are mitigated.

This assessment study for Critical Habitat indicates that within the PAI there are no known species which would qualify the area as Critical Habitat for Criterion 1 - 3. Further, within the PAI there are no chance that migratory bird species may visit in the area of wetlands. The presence of birds in area need to be confirmed with local community and divisional forest & wildlife department. However, the PAI does not qualify as Critical Habitat under Criteria 4 and 5.

The implementation of project component is not anticipated to trigger in a population reduction of any recognized endangered or critically endangered species or a loss in area of the habitat for wildlife. The construction activities of the project may lead to some impacts on biodiversity and ecosystem in the area, these impacts can be mitigated with application of measures in design and construction phase.

I. Recommendation

Following are the recommendations to support and reconfirm the identified potential adverse impacts and suggested mitigation measures for biodiversity due to project implementation:

i. PIU should conduct consultation before start of work with local community in subproject area and district forest and wildlife department to know presence of IUCN red list species as mentioned (refer Table -1) in this assessment report.
ii. Contract a local biodiversity expert to further verify the presence of IUCN red list species in the subproject area.
iii. On confirmation of enlisted species in the subproject area, same will be reported to PIU and do not start of works on site until clearance from PIU.
iv. Update Environmental management plan based on findings/verification of IUCN species in the subproject area, and
v. The finding/presence of IUCN red list species in the subproject area are confirmed in course of construction work, PIU shall stop the work and coordinate with forest department for the translocation of species.

Appendix 14: Excerpts from Rajasthan State Sewerage and Wastewater Policy for reuse of treated effluent and sludge

viii. Design and performance specifications of wastewater treatment plants shall be as per guidelines given in the manual on sewerage treatment systems published by CPHEEO. Sufficient room in tendering for the construction of new plants shall be provided for competition to take place in both technologies and costs.

5.4. On Reuse of Treated Effluent and Sludge

1. Treated wastewater effluent is considered a water resource and is added to the water stock for reuse.
2. Priority shall be given to agricultural reuse of treated effluent for unrestricted irrigation. Blending of treated wastewater with fresh water shall be made to improve quality where possible. Crops to be irrigated by the treated effluent or blend thereof with freshwater resources shall be selected to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations.
3. Crop nutrient requirements shall be determined taking into consideration the prevailing effluent quality. Overuse of nutrients shall be avoided.
4. Accumulation of heavy metals and salinity shall be monitored, managed and mitigated. Leaching of soils shall be advocated by the irrigation authorities.
5. Farmers shall be encouraged to determine the rate of water application needed for different crops, taking into consideration the value of nutrients in the treated water and other parameters.
6. Farmers shall be encouraged to use modern and efficient irrigation technologies. Protection of on-farm workers and of crops against pollution with wastewater shall be ensured.
7. Treated effluent quality should be monitored and users alerted to any emergency causing deterioration of the quality so that they will not use such water unless corrective measures are taken.
8. Studies should be conducted and projects designed and implemented to store the excess treated wastewater in surface reservoirs but artificial recharge is not permitted . Due attention shall be given to the quality of treated and groundwater and the characteristics of the strata.
9. Plans and studies for power generation from sludge, if proven technically, economically and financially feasible, shall be made with due attention to environment impacts.
10. Sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner. Care shall be taken to conform to the regulations of public health and environment protection norms.

11. **Industry:** Industrial reuse of reclaimed wastewater represents major reuse next only to irrigation in both developed and developing countries. Reclaimed wastewater is ideal for many industrial purposes,. Where effluent is to be used in the industrial processes, it should be the responsibility of the industry to treat it to the quality standards required. Pilot scale feasibility studies carried out in Australia have concluded that it is possible to economically treat the domestic wastewater to achieve adequate quality for reuse as cooling water. Based on the conclusions of the feasibility study, a full-scale treatment plant employing cross-flow membrane microfiltration system may be installed. The membrane filtration system can remove all suspended solids, fecal coliforms, and giardia cysts. It could also significantly reduce human enteric viruses such as *reovirus*and *enterovirus*. The water reclamation plant at Eraring Power Station demonstrates the potential for reuse of wastewater in power generation and other industrial manufacturing facilities.

Industrial uses for reclaimed water include:

(i) Evaporative cooling water:-

  (a) Once-through cooling system.

  (b) Re-circulating cooling system.

  (c) Cooling water quality requirements.

(ii) Boiler –Feed water- The use of reclaimed water differs little from use of conventional public supplies for boiler-feed water,as both require extensive additional treatment quality requirement for boiler feed make up water are dependent upon pressure at which boiler is operated.

(iii) Industrial process water-

Suitability of reclaimed water for use in industrial process depends upon particular use like-

(a) Pulp and paper.

(b) Chemical industry.

(c) Textile industry.

(d) Petroleum and coal.

12. Whenever possible, other end uses of treated effluents; such as recycling, cooling, power generation, etc. shall be considered.

13. Re-use Options: The following options for re–use of effluent have been identified: In general, public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated. Potential reuse of wastewater depends on the hydraulic and biochemical characteristics of wastewater, which determine the methods and degree of treatment required. While agricultural irrigation reuses, in general, require lower quality levels of treatment, domestic reuse options (direct or indirect potable and non-potable) reuses need the highest treatment level. Level of treatment for other

reuse options lie between these two extremes. The reuse options may be (artificial recharge of aquifers is not permitted):

i. Irrigation

(a) Agriculture and forestry

(b) Landscaping

ii. Fish – farming

iii. Industry

iv. Non-potable Domestic Reuse.

The detailed project report should clearly define the best reuse option particular to town and strategy to obtain it. Action plan with clarity should be the part of Detailed Project Report (DPR), while preparing sewerage projects. Before deciding the reuse of treated waste water, authorities must full fill the water quality norms and its legal implications.

14. Governing local body can sell the treated waste water and digested sludge to generate the revenue.

5.5. On Pricing, Financing and Investment

1. In view of increasing marginal cost of wastewater collection and treatment, wastewater charges, connection fees, sewerage taxes and treatment fees shall be set to cover at least the operation and maintenance costs. It is also highly desirable that part of the capital cost of the services shall be recovered. The ultimate aim is for a full cost recovery.

2. Appropriate criteria in order to apply the "polluter pays" principle shall be established.

3. Different charges for different areas may be applied. This shall be assessed for each geographical area as a function of end users and effluent quality and will be subject to economic and social considerations.

4. Because of the limited financial resources available to Government of Rajasthan, setting investment priorities in wastewater will be compatible with government investment plans.

5. Criteria for prioritizing investments in the wastewater sector shall take into account the current and future needs of the state, needs to expand wastewater systems in urban areas and to provide wastewater systems to smaller towns and villages.

6. Priorities of wastewater projects shall not be disconnected from water supply projects and urbanization in general. Decisions will be made concerning them to attain optimum solutions to the need for services, availability of finance and availability of trained manpower.

7. Treated effluent shall be priced and sold to end users at a price covering at least the operation and maintenance costs of delivery.

8. It is the intention of the Government, through private sector participation, to transfer management of infrastructure and services from the public to the private sector, in order to improve performance and upgrade the level of service.

9. The role of the private sector will expand with management contracts, concessions and other forms of private sector participation in wastewater management.

10. The concepts of BOO/BOT shall be entertained, and the impact of such concepts on the consumers shall be continually addressed and negative impacts mitigated.

11. The private sector role in reuse of treated effluent shall be encouraged and expanded.

12. As per urban reforms (under various schemes by MOUD) 100% cost of O&M of sewerage system shall be recovered from consumer. The costs will depend on the system/technology adopted for collection of sewerage and treatment and the administration costs. It is important that the full cost of the service is assessed for each urban area instead of adopting a typical cost assessment. The full cost shall cover the following:

(i) Institutional aspect of the sanitation service e.g. the management information systems, accountancy and finance management, billing and collection, customer services, etc. and oversight activities.

(ii) Operating, maintaining (on a planned maintenance basis), repairing replacing and extending sanitation service physical infrastructure.

(iii) Keeping updated infrastructure and customer data on a GIS base.

(iv) Managers, staff, vehicles, equipment and consumables associated with the above.

(v) Consumable like chemicals etc.

(vi) Power charges.

(vii) Spare Parts.

(viii) Any other O&M contract amount

5.6. Source of Funds for Sewerage Project

(A) In general, implementation of reuse facility requires substantial capital expenses. In addition to capital cost associated with reclaimed water facility, there are also additional operation, maintenance, and replacement and administrative costs. Hence responsible agencies may consider following sources of 'Funds for Construction of Sewerage Project':

Guidelines for Reuse of Treated Effluent and Sludge from STP for Beneficial Purposes (Source: Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Govt. of India)

Health Hazards during Sewage Operations

Labourers working on the sewage treatment and operations may suffer from a number of aliments directly attributed to handling of sewage. In view of this it is desirable to disinfect sewage and where feasible mechanize sewage operations.

The staff of sewage operations must be well educated in the sanitary rules on the utilization of sewage for irrigation as well as with personal hygiene. All persons working in sewage farms must undergo preventive vaccination against enteric infections and annual medical examination for helminthiases and be provided treatment if necessary.

Sewage treatment plants should be provided with adequate space for canteens with proper sanitation, wash-stands and lockers for irrigation implements and protective clothing. Safe drinking water must be provided for the workers and for population residing within the effective range of the sewage treatment plants.

All workers should be provided with gum boots and rubber gloves, which must compulsorily be worn while at work. They should be forced to observe personal hygiene such as washing after work as well as washing before taking food. The use of antiseptics in the water used for washing should be emphasized. The farm worker should be examined medically at regular intervals and necessary curative measures enforced.

Mitigation measures to avoid Health Hazards

Personal Hygiene against Pathogen

The worker should take precautions because a large number of coliform groups, various kinds of micro-organisms, and egg parasites exist in sewage. The workers should strive to maintain good health by taking care of the following points:

- Wear clean uniform, work boots, etc.
- After work and before having a meal, always wash hands and disinfect them.
- After work, take a shower if possible.
- Do not enter the offices and lounges wearing dirty clothes.
- If necessary, take vaccinations against tetanus, leptospirosis fever and so on

Maintaining Cleanliness The worker should maintain each facility in a clean and neat condition.

- The flors of workrooms, stairs and corridors should be cleaned at the appropriate frequency to maintain them in a clean condition
- Disinfection of relevant locations is to be carried out periodically.

Health Check Workers should receive health check once a year to maintain their health, and prevent illnesses or detect them at an early stage. The results of the health check should be maintained as records. Recommended items to be inspected during the health check are as given below.

- Examine medical history.
- Examine subjective symptoms and other objective symptoms.
- Check height, weight, vision and hearing ability.

• Chest X-ray examination.
• Blood pressure measurement.
• Check for anaemia.
• Check for liver functions.
• Check for lipids in blood.
• Check blood sugar level
• Urine analysis.
• Electrocardiogram analysis

Welfare Measures The Sanitation Workers (Regulation of Employment and Conditions of Service) Act 2012 proposes constitution of a Sanitation Workers State Welfare Board to exercise powers conferred on it and to perform welfare functions such as the following for sanitation workers:
• Provide immediate assistance to a beneficiary in case of an accident
• Sanction of loan and advances
• Medical expenses for treatment of major ailments
• Financial assistance for education of children
• Payment of maternity benefits
• Make provision and improvement of welfare measures and facilities as may be prescribed

Corrective Measures When a worker has symptoms of an illness listed above, the plant engineer should ensure that the worker is checked-up by a specialist doctor and receives proper treatment and care and should take the following actions considering the content of work done by the worker:
• Change the workplace if necessary
• Change the content of the work
• Shorten the working hours
• Perform relevant measurements of the working environment
• Maintain the facility or equipment

Risks in use of treated effluent and sludge in agriculture practices

Cultivation of crops that are eaten raw should be banned. Cultivation of paddy in bunded fields is likely to give rise to sanitation problems and hence is undesirable. Growing of non-edible commercial crops like cotton, jute, fodder, milling varieties of sugarcane and tobacco would be suitable. Cultivation of grasses and fodder legumes, medicinal and essential oil yielding plants like menthol and citronella may be allowed. Cultivation of cereals, pulses, potatoes and other crops that are cooked before consumption may be permitted, if sewage is treated and care is taken in handling the harvests to ensure that they are not contaminated. Cultivation of crop exclusively under seed multiplication programmes would be advantageous as these are not consumed. As an additional safeguard, sewage irrigation should be discontinued at least two months in advance of harvesting of fruits and berries, one month for all kinds of vegetables and a fortnight for all other crops. Direct grazing on sewage irrigated farms should be prohibited.

Risks of Nutrient Loading in Agriculture

Crops receiving excessive dosage of nitrogen show superflous vegetative growth and decrease in grain or fruit yield. The phosphate deficit of sewage, therefore, should be made good by supplementing with phosphate fertilizers, the extent of phosphate fortification depending upon the nature of crop and its phosphate requirements. As the availability of phosphate is low in the irrigation water it would be desirable to apply the required quantity of phosphatic fertilizer at the

time or even (about a fortnight) before the sowing or planting of the crop. Even when sewage nutrients are balanced by fortification, irrigation with such sewage may supply excessive amount of nutrients resulting in waste or unbalanced growth of plants with adverse effects on yields. It may therefore be necessary to dilute the sewage. Dilution also helps in reducing the concentration of dissolved salts and decomposable organic matter in the sewage thus, decreasing hazards to the fertility of the soil. It is desirable to limit the BOD and total suspended solids of sewage to be disposed on land for irrigation, as per relevant standards. There is a need to take caution on describing nutrient supply capacity of sewage particularly in the case of availability of phosphorus because there is a possible conversion of available phosphorus in unavailable mode in the presence of heavy metals present in the sewerage. This happens commonly in high as well as low pH soils.

Alternative Arrangement during Non-irrigating Periods

During rainy and non-irrigating seasons, agricultural practices may not need any water for irrigation. Even during irrigating season, the water requirement fluctuates significantly. Hence, satisfactory alternative arrangements have to be made for the disposal of sewage on such occasions either by storing the excess sewage or discharging it elsewhere without creating environmental hazards. The following alternatives are generally considered: a) Provision of holding lagoons for off-season storage. They enable irrigation of a fied area of land to varying rates of crop demand. They may also serve as treatment units such as aerated or stabilization lagoons, provided the minimum volume required for treatment is provided beyond the flow-balancing requirement. b) Provision of additional land where treated sewage is not required on the main plot of land c) Discharge of surplus treated sewage to river or into sea with or without additional treatment. Combining surface discharge facilities with irrigation system is quite common and often quite compatible. d) Resorting to artificial recharge in combination with an irrigation system where feasible.

Treated Sewage into Perennial Rivers

When sewage is treated and discharged into perennial flowing rivers and the blended river water is drawn downstream of the point of such blending as raw water for treatment in public water supply schemes. This is indirect potable use after blending. This is historical and ongoing all around. However, of late, the organic load due to the discharged treated, partially treated and non-point sewage becomes in excess of the self-purifying capacity of the river. Thus, the river water is not actually fresh water. The water quality of Yamuna river for Agra water supply scheme requires to be fist treated in MBBR to purify the river water to a level as raw water for the downstream WTP. When it passes through flowing surface water it has the potential disadvantages of contamination by human and animal activities adding organic matter and waterborne pathogens unless the river stretch is protected from such activities. The guiding principle in such cases for the ULBs will be to at least intercept the sewage outfalls and provide adequate STPs and follow the recommended quality criteria for the treated sewage.

Treated Sewage into Non-Perennial / Dry River Courses

There are locations where the rivers are not perennial or almost dry throughout the year except some monsoon runoff. In this case the discharged treated sewage sinks into the aquifer zone and is extracted by infiltration wells or galleries. The advantage of direct dilution from surface water is lost, but the additional purification in the soil and dilution from the aquifer water are happening. An example is the case of the Palar river course in Tamilnadu. The surface water flow in this occurs only for about a week if the monsoon is normal and if the water spills beyond the upstream

impoundments. The aquifer however supports the public water supply of over 30 habitations along its dry tract of nearly 80 km before the sea. The partly treated sewage of the en-route habitations does reach this river course as intervals. So far, no epidemics have been met with. This may be due to the above said additional purification in the soil and dilution by aquifer water. However, if these are exceeded by the contamination load, there can be immediate health problems. The guiding principle in such cases for the ULBs will be (a) to keep a check on the raw water quality from the infiltration wells to detect sudden increase in contaminants and (b) at least intercept the sewage outfalls and provide adequate STPs.

Appendix 15: Preliminary Audit Note for Existing Facilities

I. Introduction

1. Under the ADB funded Rajasthan Secondary Town Development Sector Project (RSTDSP), it is proposed to develop water supply system (water supply distribution and transmission network, Construction of Clear Water Reservoir and rehabilitation of existing infrastructure of water supply system) in Mandawa, District-Jhunjhunu, Rajasthan. Potable water for the Mandawa town is available from two main sources i. e. Ground water (tube wells) and Surface water of Integrated Taranagar Jhunjhunu Sikar Khetri Drinking Water Supply Project Package-II.

Groundwater source: Presently, source of Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water from 7nos tube wells are collected at Clear Water Reservoir at JE office and further it transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1. 76 MLD (11 TW). The tube wells are fitted with submersible pumps. All the pumps have served their useful lives, they work at very low efficiency. Refurbishing them under the present condition will be uneconomical. Further duty of these pumps will not suit the revised demand of the Mandawa. Hence these pumps are recommended to be phased out.

Surface water source: A package “Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II” is sanctioned by PHED and under execution. Mandawa will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal”. The work of pipeline system from canal off take point to JE office has been completed. 300 mm DI pipe has been laid from canal off take to JE office. Water treatment plant (WTP) of this scheme is at Malsisar Town around 50 Km from Mandawa.

Presently in Mandawa town one clear water reservoir is available of 450 KL capacity at JE office. Water is stored in the CWR and transferred (by pumping) to two ESR’s located at JEN office and Ward No 4. Condition of CWR at JE office is very poor. It was constructed in 1960. It is required to be re-constructed. Water Collected at CWR at JE office from 7 no. of tube well is transferred through 150 AC transmission line to ESR at JE office and 250 AC transmission line to ESR at Ward no 4 ESR. The existing distribution system with AC and PVC pipes are very old with heavy leakages due to breakages and joints leakages due to ageing and hence need to be phased out.

Entire town has been divided into 2 water supply distribution zones with gravity fed from zone OHSRs. The existing distribution system with asbestos cement (AC) and polyvinyl chloride (PVC) pipes are very old with heavy leakages due to breakages and joints leakages due to ageing and hence need to be phased out.

At present, an intermittent water supply system is running in the town with actual service level 100 LPCD at consumers end, which will improved to 135 LPCD after full commissioning of “Integrated Taranagar, Jhujhunu, Sikar, Khetri Drinking Water Supply Project, Package II” of PHED. At present it is partially commissioned and water is received at PHED J. En. Campus H/w. After commissioning of this project water will be provided 12m head with continuous supply.

II. Description of the existing Water Supply Components at Mandawa

Location	**PHED J. En. Campus, Mandawa** Latitude: 28° 02' 50. 87" N Longitude: 75° 09' 0. 34 " E
Start of operation (year)	1957
Owned by	Public Health Engineering Department
Contact person and designation	Mr. Jaichand (Executive Engineer, PHED) 9680613618
Capacity	Details is given in point no. III.

Flow Diagram of Existing Water Supply System in Mandawa is as follows:

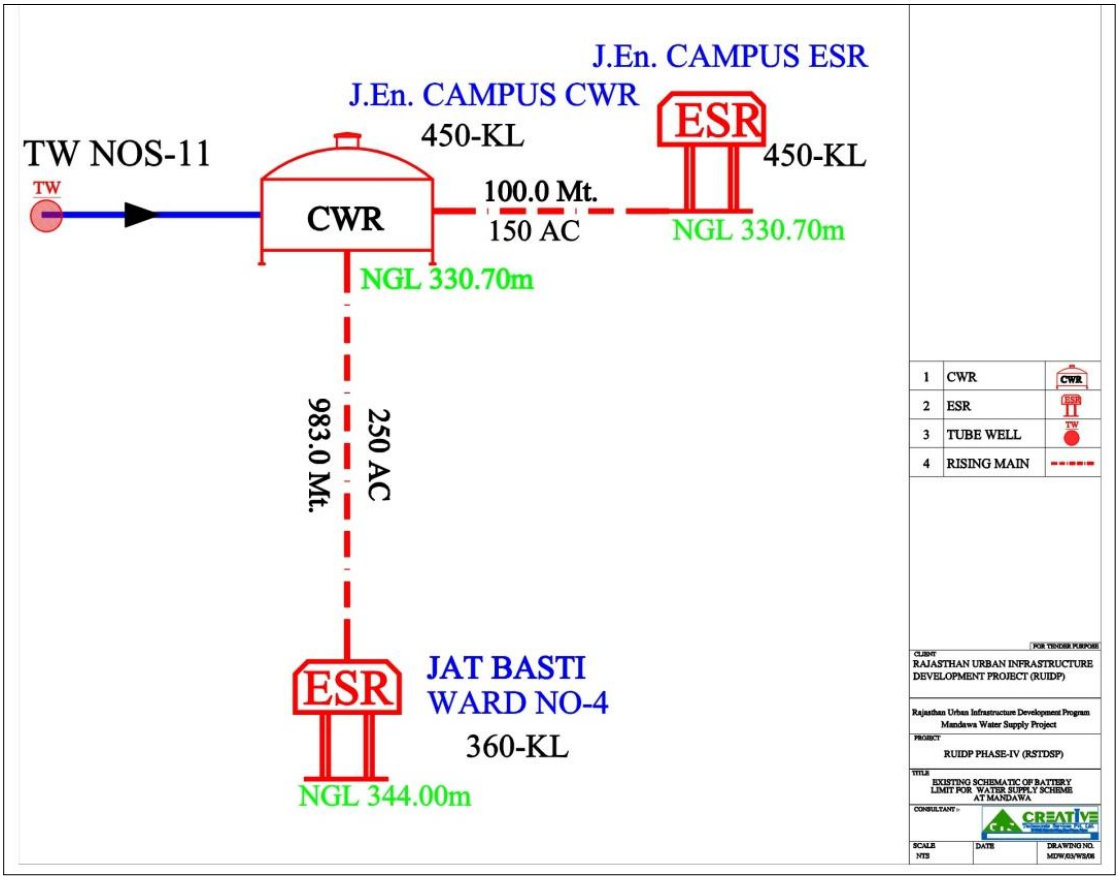


Figure 1: Flow Diagram of Existing Water Supply System in Mandawa

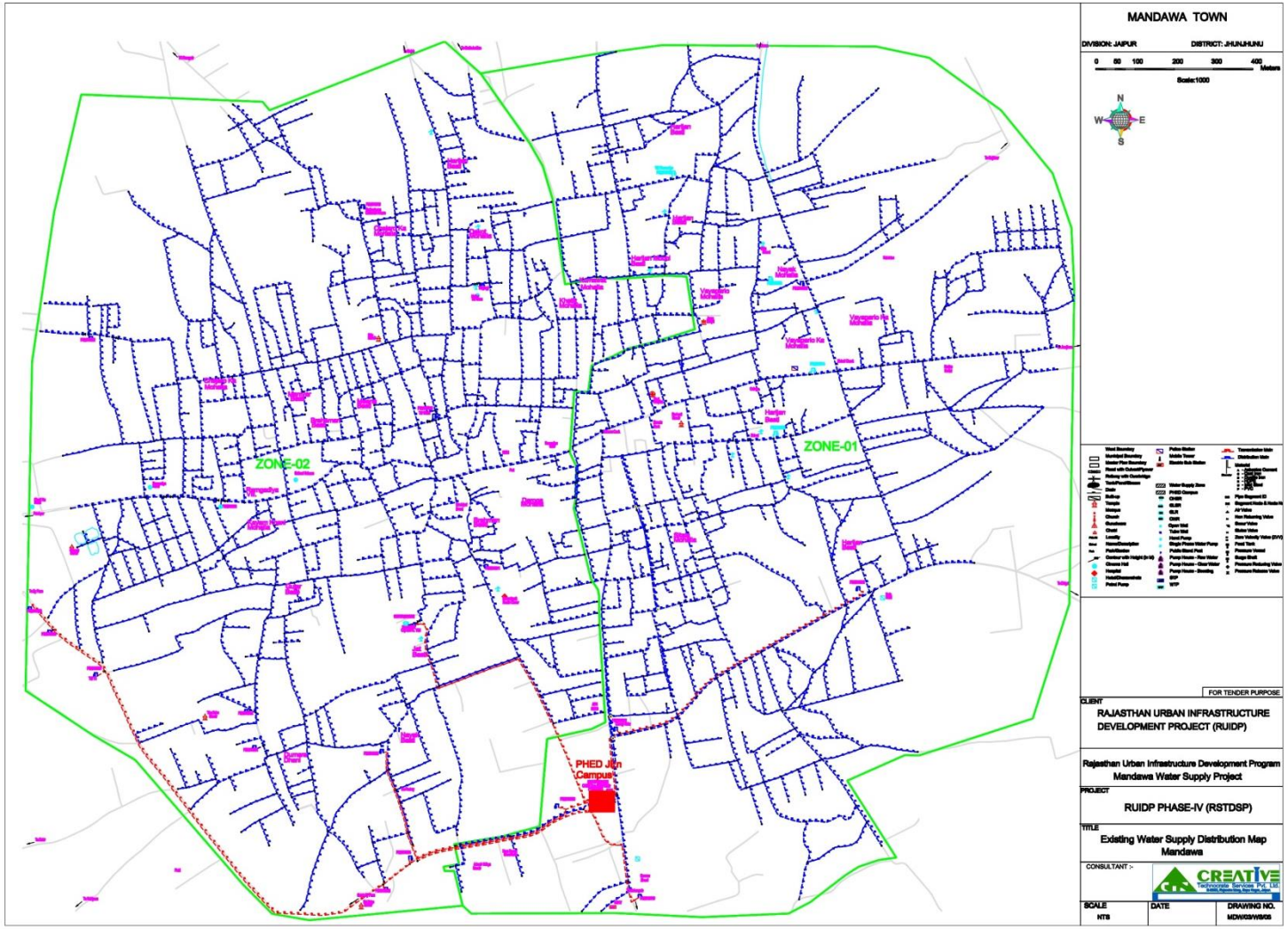


Figure 2: Existing Water Supply distribution and component Map (Composite Map) of Mandawa



Figure 3: Layout of existing water Transmission System in Mandawa

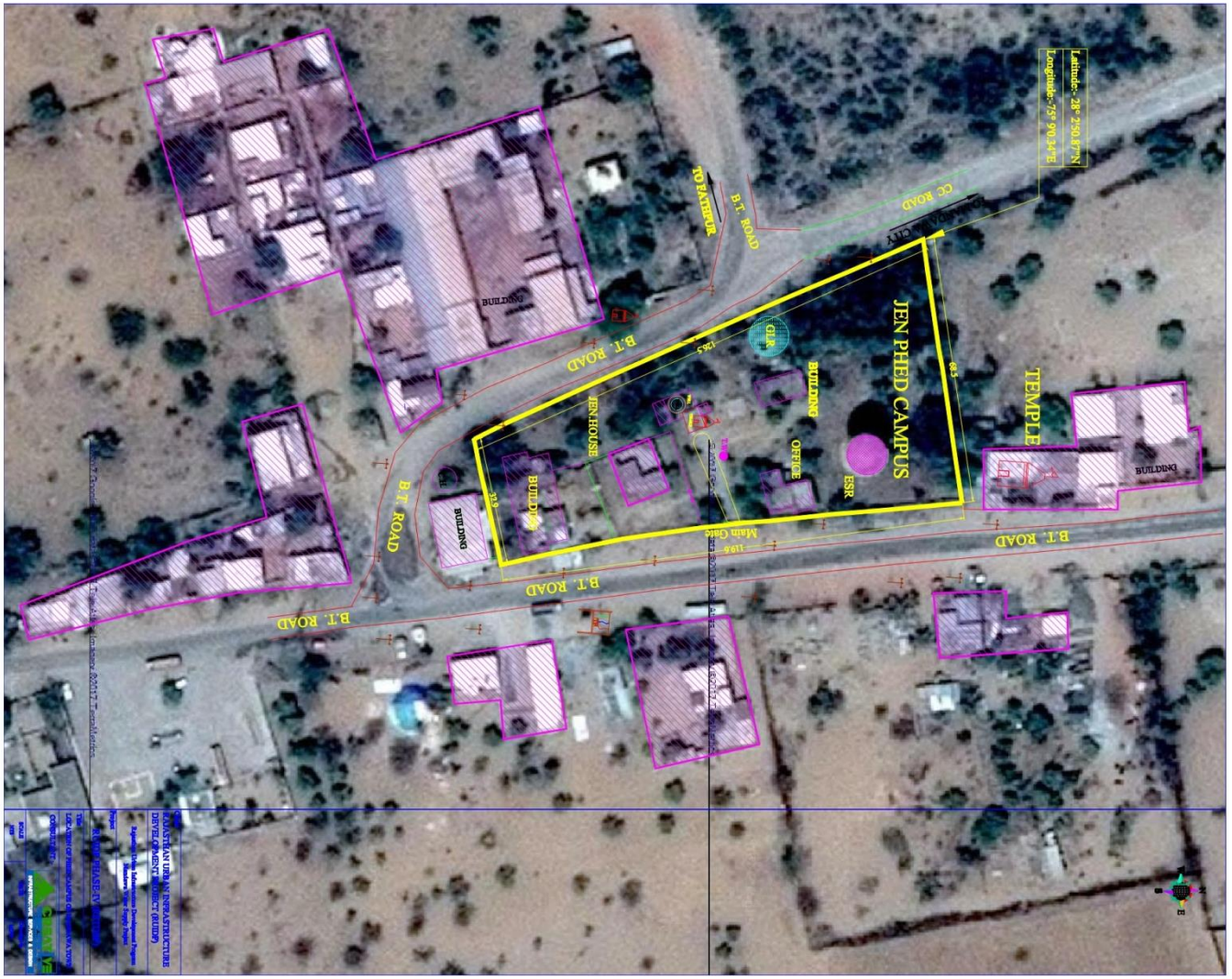


Figure 4: Showing existing component of water supply at PHED J. En. Campus, Mandawa

III. Description of Existing Water Supply system:

1. Clear Water Reservoir (CWRs):

Presently in Mandawa town one clear water reservoir is available of 450 KL capacity at JE office. Water is stored in the CWR and transferred (by pumping) to Two ESR's located at JEN office and Ward No 4. Details of CWR are mentioned below:

Table 1: Details of the clear water reservoir

Sr. No.	Location	Capacity (In KL)	Remarks
1	RCC CWR at JE office Head Works	450	7 TWs

Condition of CWR at JE office is very poor. It was constructed in 1960. It is required to be re-constructed.

2. Pumping Machinery

For transferring water from CWR to OHSR pumping machinery area is used. Due to uneven topographical condition gravity based system is not feasible for transmission mains.

(i) Present condition of the Pump

As all these pumps have served their useful lives, they work at very low efficiency. Refurbishing them under the present condition will be uneconomical. Further duty of these pumps will not suit the revised demand of the Mandawa. Hence, these pumps are recommended to be phased out.

(ii) Service Reservoirs

There are 2 No's of OHSR located in Mandawa town. The capacity of the OHSRs is 360 KL to 450 KL. Location of Existing OHSR and its capacity, staging height are furnished below.
Location of Existing OHSR and its capacity, staging height are furnished below.

Table 2: Details of existing OHTs

S. No.	Location	Capacity of OHRs in KL	Staging in mtr.	Condition (Based on Preliminary Inspection)	Year of construction
1	JE office	450	18	Very Bad	1960
2	Ward No 4	360	18	Moderate	2013

3. Tube wells details:

Presently source of Mandawa town is ground water. The town is benefited from 26 no. of tube wells at various locations in the city. Out of this, 19 TWs directly connected to distribution system. The potential of 15 TWs out of 19 TWs are comparatively low. Therefore, only remaining 11 TWs considered as GW source. Water from 7 nos tube wells are collected at Clear Water Reservoir at JE office and further it transferred to ESR available at JEN office and Ward No 4 ESR. Total water abstracted from Tube Wells is 1. 76 MLD (11 TW).

Table 3: Water Source details of Mandawa

S. No.	Type of Source	Production in KLH	Pumping Hours	Total Production in KLD
1	Ganesh Mandir TW	10	16	160
2	BPS School TW	10	16	160
3	Shankar baba TW	10	16	160
4	Sai baba TW	10	16	160
5	Ice factory TW-7	10	16	160
6	Electricity board GSS TW	10	16	160
7	Ruth hotel TW-9	10	16	160
8	Gulab by pass near sai mandir	10	16	160
9	TibaBnkamandir	10	16	160
10	Near Shamshan bhumi	10	16	160
11	PHED JEn campus	10	16	160
Total				**1760**

4. Distribution System:

Entire town has been divided into 2 water supply distribution zones with gravity fed from zone OHSRs. The existing distribution system (67. 266 km) with AC, PVC and CI pipes are very old with heavy leakages due to breakages and joints leakages due to ageing and hence need to be phased out.

Table 4: Existing Distribution Network of WS in Mandawa

S. No.	Dia	Material	Type	Length
1	80	AC	Distribution	51223
2		CI	Distribution	224
3	90	PVC	Distribution	1179
4	100	AC	Distribution	5963
5		CI	Distribution	373
6	125	AC	Distribution	628
7	150	AC	Distribution	2327
8		CI	Distribution	665
9	200	AC	Distribution	2030
10		CI	Distribution	343
11	250	AC	Distribution	1046

12		CI	Distribution	683
13	300	AC	Distribution	357
14		CI	Distribution	225
	Total Existing Distribution			**67266**

5. Present LPCD supplied

Water is supplied for one and half hour daily @ 80 to 85 lpcd. Water supply is currently intermittent and suffers with distribution losses and quality issues. Water supply is from ground water and partially from surface water. Currently PHED is supplying around 0. 3 MLD water from Integrated Taranagar-Jhunjhunu water supply project and ultimate reservation is 5. 3 MLD and as soon as water supply system improved under RSTDSP and ready to receive allocated water, per capita water supply will be improved to 135 lpcd.

6. Area covered/ uncovered

Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED. Remain area which is newly developed and newly added to the municipality area is remain unconnected with piped scheme.

7. Metering

Presently due to faulty/damaged water meter 100% metering is not achieved.

8. Service Connection

Details of service connection are as below:

Sr. No.	Domestic	Non Domestic	Industrial	Central Govt.	State Gov.	PSP
1	5290	220	14	2	22	4

III. Compliance with Applicable National and State Laws, Rules, and Regulations

Law, Rules, and Regulations	Description and Requirement	Water Supply System
		Y = compliant (if applicable, specify expiration date of permit/clearance) *N = non-compliant*[52] *N/A = not applicable (state justification)*
EIA Notification	The EIA Notification of 2006 states that environmental clearance is required for certain defined activities/projects.	N/A

[52]Compliant = There is sufficient and appropriate evidence to demonstrate that the particular regulatory requirement has been complied with; non-compliant = clear evidence has been collected to demonstrate the particular regulatory requirement has not been complied with.

Law, Rules, and Regulations	Description and Requirement	Water Supply System
		Y = compliant (if applicable, specify expiration date of permit/clearance) *N = non-compliant*[52] *N/A = not applicable (state justification)*
Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	Storage of chlorine	N/A Chlorine is being used as disinfectant in water supply before distribution. No chlorine is being stored at the site.
Drinking Water Specification IS: 10500, 2012	Drinking water (TWs and CWRs) comply with the requirements of IS	Complied Residual chlorine testing is being done regularly at Pumping Station, Wahidpura about 3-4 km distance from PHED J. En. Campus and detail analysis of water is done once in a month at district headquarter Jhunjhunu as per norms of IS.
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Consent to operate from RSPCB	N/A
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	Consent to operate from RSPCB	N/A
Environment (Protection) Act, 1986 and CPCB Environmental Standards	Emissions and discharges from the facilities to be created, refurbished, or augmented shall comply with the notified standards.	N/A
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010	Applicable ambient noise standards with respect to noise for different areas/zones	No source of noise
National Institute of Occupational Safety and Health (NIOSH) Publication No. 2002-149	Compliance with NIOSH Guidance for Controlling Potential Risks to Workers	N/A
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the central government.	N/A
Ancient Monuments and Archaeological Sites and Remains Rules of 1959	No development activity is permitted in the “protected area, ” and all development activities likely to damage the protected property are	N/A

Law, Rules, and Regulations	Description and Requirement	Water Supply System
		Y = compliant (if applicable, specify expiration date of permit/clearance) *N = non-compliant*[52] *N/A = not applicable (state justification)*
	not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.	
The Child Labor (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule are present.	No children are engaged.

IV. Institutional Arrangement

Parameter	Water Supply System
Operations	Continuous operation; involves mechanical and electrical operation;
Public health engineer on-site	J. En. and Ex. En.
Estimated number of technical employees on-site per shift	Pump Operator- 18 Nos. Fitter- 04 Nos. Assistant- 08 Nos. Junior Engineer- 01 Nos. (Ms. Savita Choudhary-8279101854)
Frequency of water quality monitoring	Monthly
In-house laboratory for water quality analyses (Yes/None). If none, provide name of third-party laboratory.	In-house laboratory is available at the District headquarter at Jhunjhunu, Rajasthan; Testing is being done as per IS.

Appendix 16: Sample Asbestos containing material (ACM) Management Plan

BACKGROUND OF ASBESTOS

1. The purpose of this Asbestos Management Plan (AMP) is to identify, use appropriate methodology and scientifically handling /disposal of the Asbestos Containing Materials (ACM) in order to comply with the applicable National legislation and International standards in sync with norms of ADB's SPS 2009. ADB has mandated as per Appendix 5 - prohibit the investment activities list - production of, trade in, or use of un-bonded asbestos fibers is deliberated. As per SPS 2009 Safeguard Requirement 1, it is emphasized "that the borrower/client will provide workers with a safe and healthy working environment" in the work areas with accounted risks inherent to the work zone and defined safety instructions and standard operating procedures identifying roles and responsibilities.

2. Asbestos is a collective name given to a group of minerals that occur naturally as fiber bundles and possess high tensile strength, flexibility, heat resistance, non-biodegradability with chemical and physical durability. Asbestos is hydrated silicates with complex crystal structures. It is found in two configurations: chrysotile (derived from serpentine minerals) and amphibole is a naturally occurring mineral with long thin fibers. The most abundant asbestos used in the world is chrysotile. The use of ACM propagated due to its economic viability.

3. The purpose of this AMP is to identify, use appropriate methodology and scientifically handling /disposal of the Asbestos Containing Materials (ACM) in order to comply with the applicable National legislation and International standards in sync with norms of ADB's SPS 2009. . As per SPS 2009 Safeguard Requirement 1, it is emphasized "that the borrower/client will provide workers with a safe and healthy working environment" in the work areas with accounted risks inherent to the sector and defined safety instructions and standard operating procedures identifying roles and responsibilities.

REGULATORY FRAMEWORK, STANDARDS AND PROTOCOL
Table. 1

Government of India Laws, Regulations and standards on Asbestos Applicable to the projects	**Requirements for the project**
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste material	The standard emphasis that every employer who undertakes work which is liable to generates asbestos containing waste, shall undertake adequate steps to prevent and /orreduce the generation of airborne dust during handling, storing, transportation and final disposal of final disposal of asbestos and asbestos containing products. • The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation. • Waste Collection: In the project circumstance, the waste is referred to the damaged powered asbestos which will be collected in the Permissible plastic bags to be disposed off to the

	nearest TSDF facilities.
IS 12081: Pictorial Warning to be implemented on equipment containing Asbestos Contaminated Products.	The objective of the caution is to make the person handling to take all pre-cautionary measures and make them aware of all the possible risk.  
IS 11451: Safety and Health Requirements related to Occupational Exposure to Asbestos contaminated Products.	In the project the norms pertaining to limiting number of hours working with ACM will be 8. 0 hrs/48 hrs a week and the medical examination has to be periodic, the environmental monitoring has to be done as per the protocol. The safety at work place shall be enforced.
IS 11768: Waste Disposal Procedure for Asbestos Containing Products.	The protocol pertaining to disposal of the waste is emphasized, the collection of ACM powered will be in permissible plastic bags, which will be twisted tight at the neck so that the wear and tear due to abrasion will be minimum and the transportation of the asbestos waste has to be done by the authorized vendor to the approved landfill site that in the project case id TSDF.
Sampling of asbestos fiber (as per BIS-11450) has to be done regularly using personal sampler and determined using phase contrast microscope.	The Sampling and analysis protocol is emphasized. Details are given as above.

Further, there are several legislations that regulate the use and handling of asbestos as applicable, namely:

a. The Supreme Court of India – Banned ACM use in January 21 2011.
b. National Green Tribunal - In pursuant to the above order, in 2015, NGT issued an order- “that there is no asbestos mining presently operational anywhere in the country and the operations of the mines of associated minerals with asbestos has also been halted. ”

c. Environmental (Protection) Act (1986)-Environmental monitoring.

RISK ASSESSMENT:

4. The process of evaluation of risk at all the working sites was evaluated with the inventorization of the unscientific storage pipes-in case of worst scenario. The site identified and evaluated was Sardarshahar. Site visit was conducted to evaluate the risk associated with the ACM handling and re- handling. Working with or handling AC pipes in manner that produces dust, fibers, air borne particles etc. , is very harmful and hazardous to the workers and general public in and around the work sites. The condition of existing underground AC pipes are not known, however, as these are old certain pipes will be in deteriorated conditions. So the Conditions were presumed if it is in friable form or in a condition in which it can release fibers before it is subjected any disturbance or removal, all safeguard measures needs to be adopted. There were certain areas where the AC pipes were subjected to shear and are powered, and AC Pipe ends were damaged these were the high risk zones in the campus. The probability of the air borne asbestos fibers in the areas cannot be over ruled.

5. Thus it is necessitated to draft standard operating procedure for disposal of ACM. The purpose of this standard operating procedure (SOP) is to ensure the safe handling of AMC including protection from hazards associated with uncontrolled distribution, encounter and removal of Asbestos Cement (AC) Pipes and pipe fittings. The scope of this SOP encompasses all aspects of safe AC pipe handling including identification of site, re-handling and encountering of ACM, site selection and proper identification for storage, inventorization, monitoring, final disposal, training and maintenance of records.

6. The fatal health hazard with inhalation of air borne asbestos fibers and its adverse health impact are known and needs a proper attention and planning with defined roles and responsibilities to ensure the work zone is at minimal risk and safe for the workers. It is also necessary to mandate the standard operating procedures with implementation of all requisite safety gears.

7. The assessment of the ACM disposal will be vested with the DOB Operator. The undamaged pipe-where the pipe ends are intact that there is no damaged on the entire length of pipe-to be stored in isolated storage with secured pipe ends either by wrapping the ends with permissible plastic bags. The damaged/broken pipes/powered pipes will be disposed off, by bagging the same in permissible plastic bags. All the records pertaining to the inventorizationhas to be kept by the DBO Contractor. The same shall be cross verified by RUIDP.

EMERGENCY RESPONSE PLAN & CHANCE FIND PROTOCOL

8. The emergency procedures should include managing an uncontrolled release of asbestos materials into the workplace. The onus of the same shall be ensured with immediate action of the field staff-DOB Operator/ HSE Staff. Steps should be taken to:

- Warn anybody who may be affected.
- Exclude from the area anyone not needed to deal with the release.
- Identify the cause of the uncontrolled release.
- Regain adequate control as soon as possible.
- Make sure anyone in the work area affected, who is not wearing personal protective

equipments (PPEs), including respiratory protective equipment (RPE), leaves the affected area immediately.

- Minimize the spread of asbestos by ensuring they are suitably decontaminated.
- Clean up dust and debris.
- Decontaminate anyone who is contaminated with dust and debris.
- Ensure rags, clothing or PPE is decontaminated or disposed of as contaminated waste.
- Consider alone and/or remote workers to ensure they can alert someone if necessary.

Check what you're working on before you start:

- Avoid using a sweeping brush as this can spread asbestos.
- Make sure no unauthorised personnel enter the area.
- The clean-up of any accidental release of higher risk materials, eg asbestos cuttings, powered asbestos that may release the asbestos fibers, to be done by authorized person

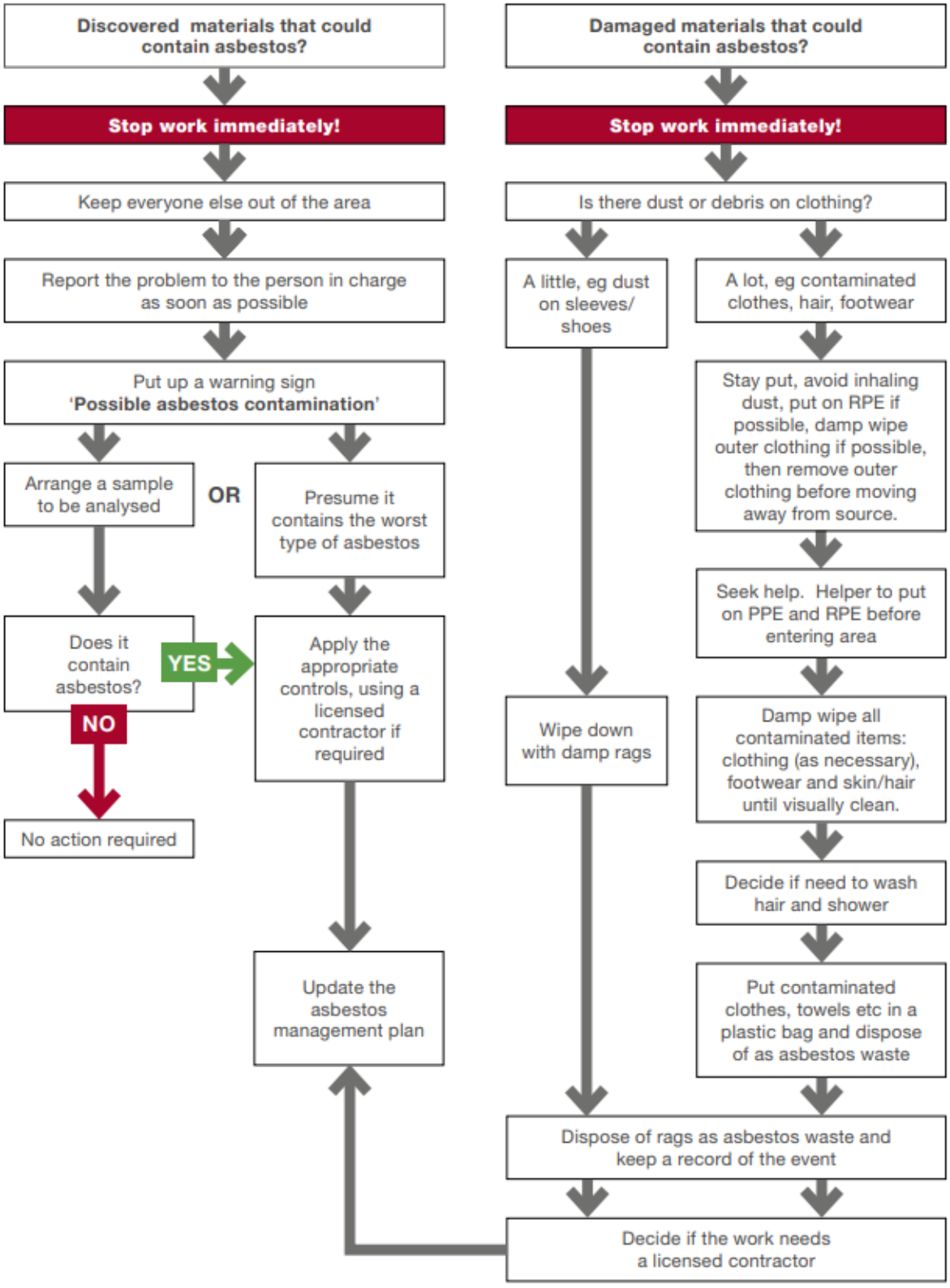


Fig. No. 1-Showing Flow chart of ERP

Table. no. 2-Roles and Responsibilities

PRE-CONSTRUCTION				
Activities	**Responsibilities**	**Associated Documents**	**Estimated Cost**	**Remark**
Design to encounter minimal ACM, and then Identification &Inventorization ACM - AC pipes & fittings	**RUIDP &DBO CONTRACTOR**	Form-I	Rs. 100/km	The onus of the minimal encounter of ACM is vested upon the RUIDP and inventory will be with the DOB Operator and has to be annually verified by RUIDP.
Define & confine ACM storage area-in-situ			Rs. 65/Sq. m	The storage area made available will be confined and fenced.
Warning signage near the ACM work site, storage and on AC pipes in local language****			Rs. 500/label	The signage labels can be printed, sticker pamphlets or painted.
Training of personals handling the AC pipes and fittings	**DBO CONTRACTOR**	Form-II	Rs. 1000/Person	All requisite safety gears should be made available at all sites.
Use of safety Gears			Rs. 6000/Person	All the safety gears should be silicon based and suitable for Asbestos protection.
Briefing of Emergency Response Plan			Rs. 500/Person	All the risk zones with respect to white card has to be briefed.
Confined storage with access control plan			Rs. 5000/site	Inward and outward movement of authorized person must be allowed and has to be guarded or should be under key control.
Pre-history medical records of the ACM handling team			Rs. 3000/Person	All requisite medical test, Respiratory test, lungs /Chest X-ray/CT Scan, Blood Test, Lower Abdomen examination etc
CONSTRUCTION PHASE				
Monthly Inspection & Annual Environmental Monitoring.	**DBO CONTRACTOR**	Form-III	Rs. 40, 000/sample	The sampling zone should be 500 m from the storage site and personal sampling has to be as per SOP-2
Reporting in SEMR	**RUIDP/DBO CONTRACTOR**	None	Nil	As per ADB Format
Collection of Health records in compliance to the local laws	**DBO CONTRACTOR/RUIDP/PHED/LSG**	Form-IV	Nil	For regular evaluation & identification of any aboronmality.
Ensure adoption of all standard operating procedure		SOP-1&2	Nil	As revision desired on basis of Site specific information may be upgraded in the SOP

				1&2 if required
Collection, Segregation, Reception and Disposal as per National norms of ACM		Form-V	Nil	Standard Regulatory format has to be filled and disposed off within 90 days.
Use of safety gears prior to handling of ACM based on White Card.		White Card-Page-11	Nil	Periodic training can be site specific
Disposal of ACM to the indentifiedTSDF Facility to be done as per procedure within or prior to 90 days		SOP-2	1500/ton of waste plus freight as per actual.	Within 90 days from the generation of waste, in case of existing waste it has to be disposed off within 90 days from the Project Start.
To inform and fill the returns in the prescribed manifest as per HWMR.		Form-V(Form-10 of the Rule HWMR	Nil	90 days from the start of work
To facilitated a restricted confined storage space with access control with proper inventorization.		Form-II	Nil	Site Specific
In-situ storage of ACM.	**DBO CONTRACTOR**	Form-VI		The storage of existing and encountered ACM pipes (more than 4. 0 ft) will be stacked end to end at 90 deg. With vertical stacks, 8 inches above the ground, covered with permissible plastic sheet. The campus custodian-viz PHEDetc should also be informed about the In-situ storage of ACM and its impact.
ACM removal	**DBO CONTRACTOR**	--	--	Follow ACM Removal
Record maintenance of ACM in-situ and disposed off to TSDF	**DBO CONTRACTOR**	Form-I & Form-IV	Nil	The copies of inventory generated and collected will have to be shared with Land Custodian (LC), RUIDP and DOB Operator. To distinguish the forms they can be numbered.

				FORM-I(LC), Form-IV(LC)
Transits ACM storage of waste to be disposed off to TSDF	**DBO Contractor**	Form-IV	50, 000/room	An isolated storage room should be constructed with 10x10 with height of 3. 5 ft roofed properly for transit disposal of ACM to TSDF. **DISPOSABLE ASBESTOS WASTE STORAGE ROOM HAZARDOUR WASTE CATEGORY-15. 2** (as per Hazardous waste management &Handling Rules 2015).
POST CONSTRUCTION PHASE				
Compliance of AAQM, Asbestos Fiber monitoring and Soil Quality monitoring and Periodic Work zone monitoring(Asbestos fiber count) records to be maintained	DBO Contractor	SOP-2	Rs. 40, 000/sample	The Asbestos Fiber count monitoring has to be conducted prior to ACM handling operation and after ACM Handling operation by an Accredited Laboratory. List of accredited laboratory will be available at Rajasthan State Pollution Control Board website-rspcb. nic. in
Health records &Periodic Medical Checkup of the personals handling ACM to be maintained.	PHED/LSG/DBO CONTRACTOR	Form-II	Rs. 3000/Person	All the concerned employees deputed to handle or deal with ACM has to have Pre medical history and periodic medical examination done

Permissible Levels

9. Permissible Exposure Limit (PEL) for asbestos is 0. 1 fibers per cubic centimeter of air as an eight hour time weighted average (TWA), with an excursion limit (EL)of 1. 0 asbestos fiber per cubic centimeter over a 30 minutes period.

ACM REMOVAL

ACM Removal has to be checked in sync with the design and emphasis has to be laid to avoid the removal of ACM, in case it is unavoidable, then all the requisite safety gears are to be adopted:

- Inform the Asbestos Expert/HSE Expert prior to removal.
- Isolate the area with access to only trained staff/employees under supervision of Asbestos /HSE Expert.
- Exhibit all warnings

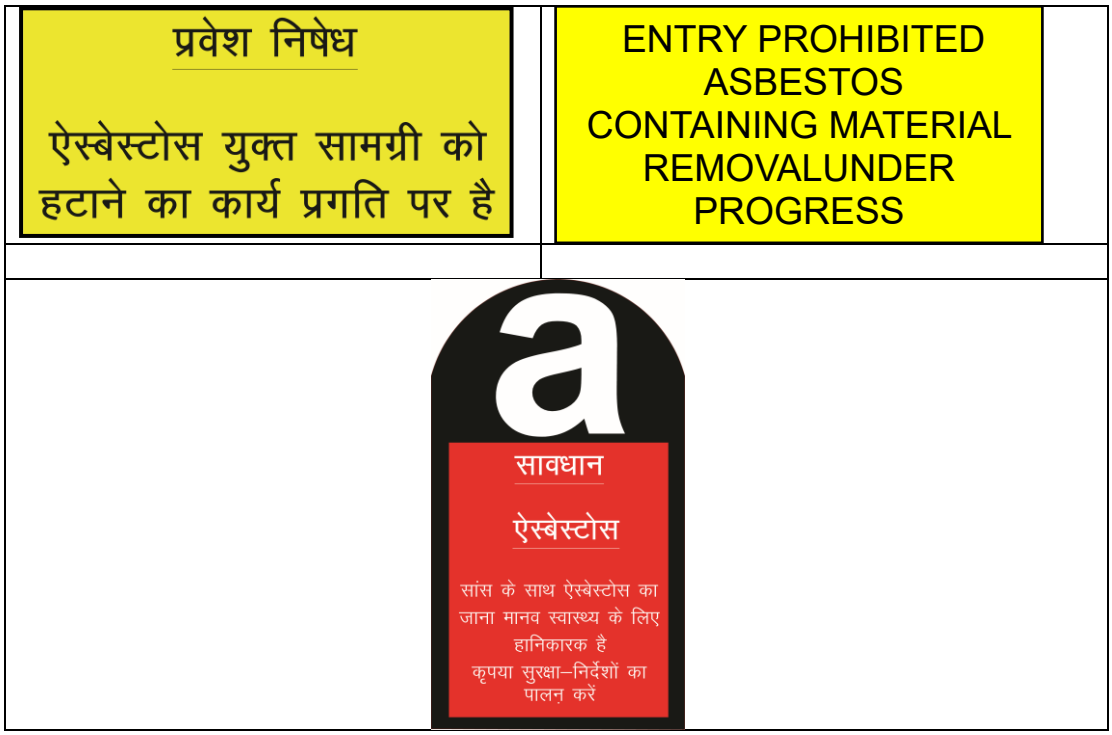


Fig. No. 2 Asbestos warning signage

- Undertaken Asbestos fiber Monitoring
- The trained Employees have to be deputed for removal of ACM.
- The removal ACM material has to be check with the status and extent of damage.
- Efforts should be made to remove the ACM as minimal as possible.
- The ACM removal has to be manual; it should neither be cut nor drilled.
- All removal operation should be undertaken with ACM in wet condition.
- The removed ACM will then be labeled and placed on permissible plastic sheet. It should not be put on ground directly.
- The dimension of plastic sheet should be larger than the ACM placed.
- If the ACM pipe is not damaged as about 4. 0 ft and above, the ACM will be subjected for in-situ disposal.
- If the ACM is damaged and broken then it has to be packed in permissible plastic bags and disposed off to TSDF.
- Prior to disposal it can be stored in isolated room-showing board of –Hazardous waste storage room.
- The hazardous waste to be disposed off to TSDF should not be stored over 90 days after the removal date of ACM at site.
- All the safety procedures and safety gears should be worn by all the employees engaged in the ACM Removal operation.
- The Asbestos fiber monitoring, soil monitoring has to be undertaken during the operation as well.
- The process of removal of ACM will be completed after the removed ACM and its suitably disposed off either in -situ or to the isolated room prior to disposal at TSDF.
- Post ACM Removal asbestos fiber monitoring has to be undertaken to ensure the work zone is safe to resume further operations.

Safe Practices in Handling ACM

10. Proper handling and PPE:

a. Cover up and wear PPE (Personal Protection Equipment). including respirator or dust mask
b. Make sure the mask has two straps to hold it firmly in place. Don’t use masks that only have one
c. Also wear a Hard hat, gloves, disposable coveralls with a hood, and safety glasses or goggles to protect eyes
d. Do not eat, drink or smoke in the work area as you may inhale or eat dust. Wash your hands and face with soap and water before meal breaks and when finished work for the day.
e. Do not use power tools Asbestos fibers can be released if power tools are used for anything other than the removal of screws.
f. Do not water blast or scrub with a stiff broom or brush. It is illegal to water blast asbestos cement sheets. If the material has been accidentally water blasted or has suddenly deteriorated in some way, you should call a licensed asbestos removal DOB Operator
g. Wet gently with water when removing asbestos cement pipes, use a pump spray to lightly dampen the pipes and keep the dust down. Remember: Not to waterblast asbestos cement materials.
h. Avoid drilling and cutting into asbestos products.
i. Do not drill holes through and never cut Instead remove the entire product and replace it with a non-asbestos product
j. Don’t drop fiber pipes remove them carefully, Lower them to the ground, don’t drop them, to minimize breakage.
k. Lay plastic sheeting under the work area to prevent any dust contaminating the ground. Use 200 micron thick plastic sheeting or bags or as permissble these must not be made from recycled materials or re-used for any other purpose.
l. The work area has to be barricaded and there should be no un-authorised person allowed. Only Trained ACM expert should be allowed to handle the ACM along with EHS Expert.
m. Close windows and doors and seal vents to stop dust getting into the house; ask neighbors' to do the same.
n. Seal off other places where dust can get in.
o. Remove soft furnishings like rugs, clothes, jute bags from the work area, and seal anything with plastics if it cannot be moved.
p. All the AC broken pipes have to collected and stacked properly with 200micron plastic wrapping with winning signage.

q. Do not leave plastic sheet lying about where they may be further broken or crushed by people or traffic.

r. Remove all ACM by the trained handler.

s. Since we are amidst of dry climatic conditions due care must be taken to see that no waste broken pipes or fittings are left loose and outside the confined area and may be dampened as required.

t. Mark and add signage.

11. Due care has to be taken to collect the dampened waste in a permissible standard bags with proper warning signage's.

12. The wastages packed have to be disposed off to Treatment, Storage or Disposal Facility(TSDF). The plastic bags must have legible note:

d. Waste Type:

e. Date of packing:

f. Qty/Numbers:

g. Packed by:

h. Warning Signage:

i. Disposal



Fig. No. 3- ACM: In-situ storage warning

13. The AMP procedures-**Standard Operating Procedure-01-** are as follows and are summarized as above

j. Objectives – to keep the work zone safe and secured.

k. Requirements – identify all the requirements needed for handling AC in the specific site and project

l. Conduct and ensure awareness and vocational training to ACM handlers

m. Conduct a comprehensive identification and risk assessment of ACMs

n. Apply restriction / re-handling of ACM on ground-use of PPE. Ensure that workers handling ACM have the right PPEs as follows:

i. Hard helmet
ii. Overall suit
iii. Gloves
iv. Mask to be strapped tight
v. Safety goggles
vi. Safety shoes
vii. Ear plugs

o. Avoid underground encountering of ACM
    i. Ensure that an authorized person (HSE) are supervising the work
    ii. Barricade the area with signage
    iii. Damp ACM
    iv. Use safety gears
    v. Dismantle ACM to be labeled, kept on plastic grounding and packed in permissible bags
    vi. Label the bags properly
    vii. Ensure shipping to proper disposal sites
p. Site selection – the disposal site should be ready to handle ACM and protect the nearby people as well The site selection criteria are as follows:
    i. Away from habitation
    ii. Avoid low lying areas
    iii. Away from water storage
    iv. To be enveloped with minimum of 8-feet height enclosure
    v. Avoid high vertical stacks
    vi. Access controlled
    vii. Proper signage enclosure
q. Proper re-handling of AMC, labeling and packing
r. Control access and ensure proper monitoring of records, specifically:
    i. Environment
    ii. Health
    iii. Reporting to regulators

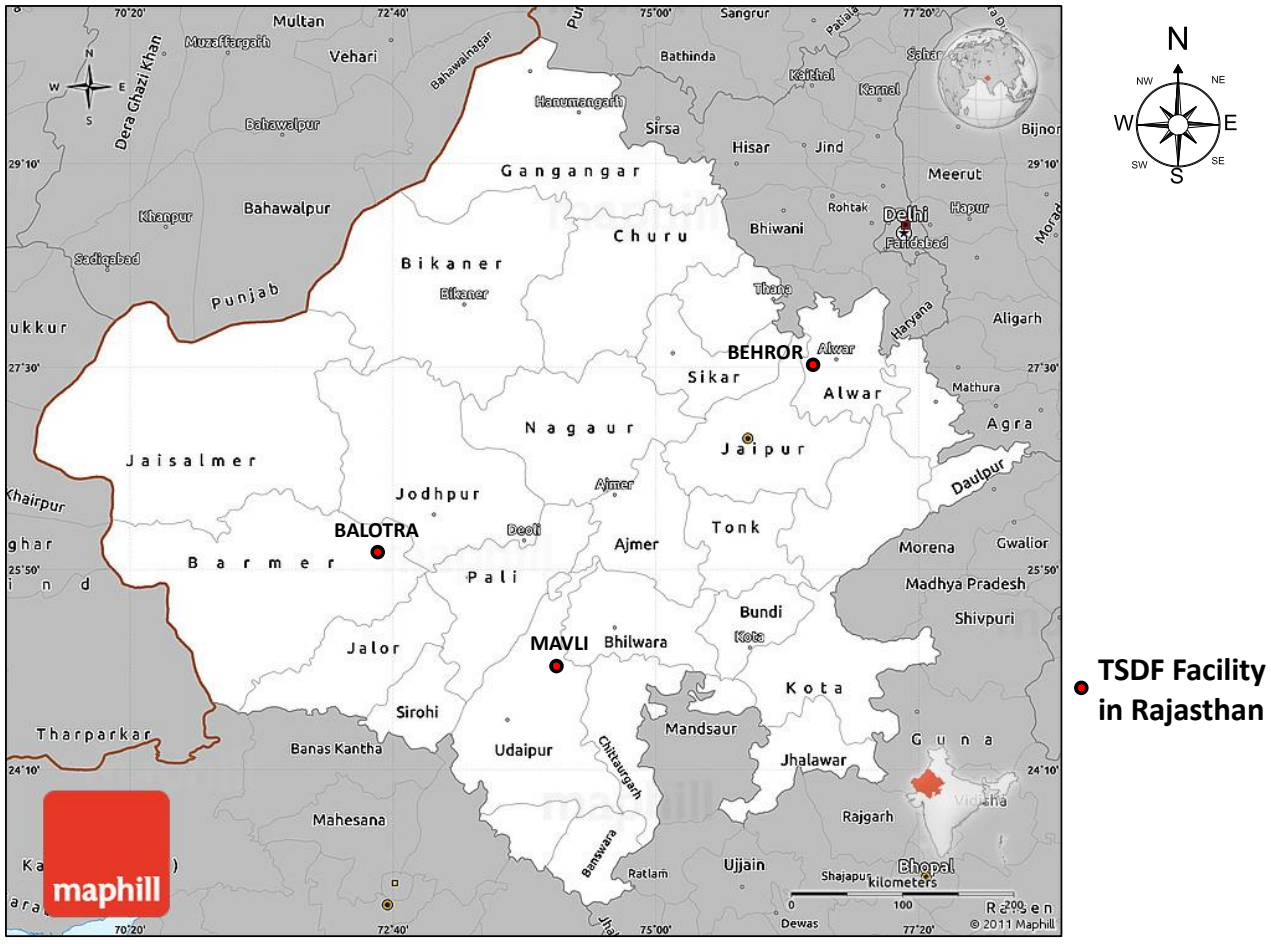
Dispose the ACM through qualified DOB Operators up to the Total Sanitary Disposal Facility (TSDF)

LIST OF APPROVED TSDF OPERATORS IN RAJASTHAN

S. No	Operator	Address	Remark
1.	Rajasthan Waste Management Project (M/s Ramky Enviro Engineers Ltd)	Survey 1018/13, Vill-Gudli, Tehsil-Mavli, Zinc Choraha to Debari Railway Station Road, Dist Udaipur (Rajasthan).	This TSDF is for all kind of hazardous waste as listed in the hazardous waste (Management & Handling) Rules.
2.	Ramky Enviro Engineers Ltd, Balotra	RamkyBWMP Rd, Rajasthan 344032.	This TSDF is for all kind of hazardous waste as listed in the hazardous waste (Management &Handling)

			Rules
3.	Continental Petroleum Ltd	Bheror, Distt- Alwar	Only for Incineration

Label/display for TSDF disposal bags has to have clear display of the content in both English and local language as displayed under:



The above map clearly depicts the location of approved TSDF in Rajasthan.

IN-SITU STORAGE ACM PIPES AREA

The removed undamaged ACM pipes have to be stacked properly as shown below to avoid any rolling of the pipes and eventual damage. The existing ACM Pipe stacking has to be re-handled to stack the ACM pipes properly. If the removed ACM Pipes is less than the full length of the ACM pipes, then separate stack of the same should be done with proper pre-caution and safety measures and gears.

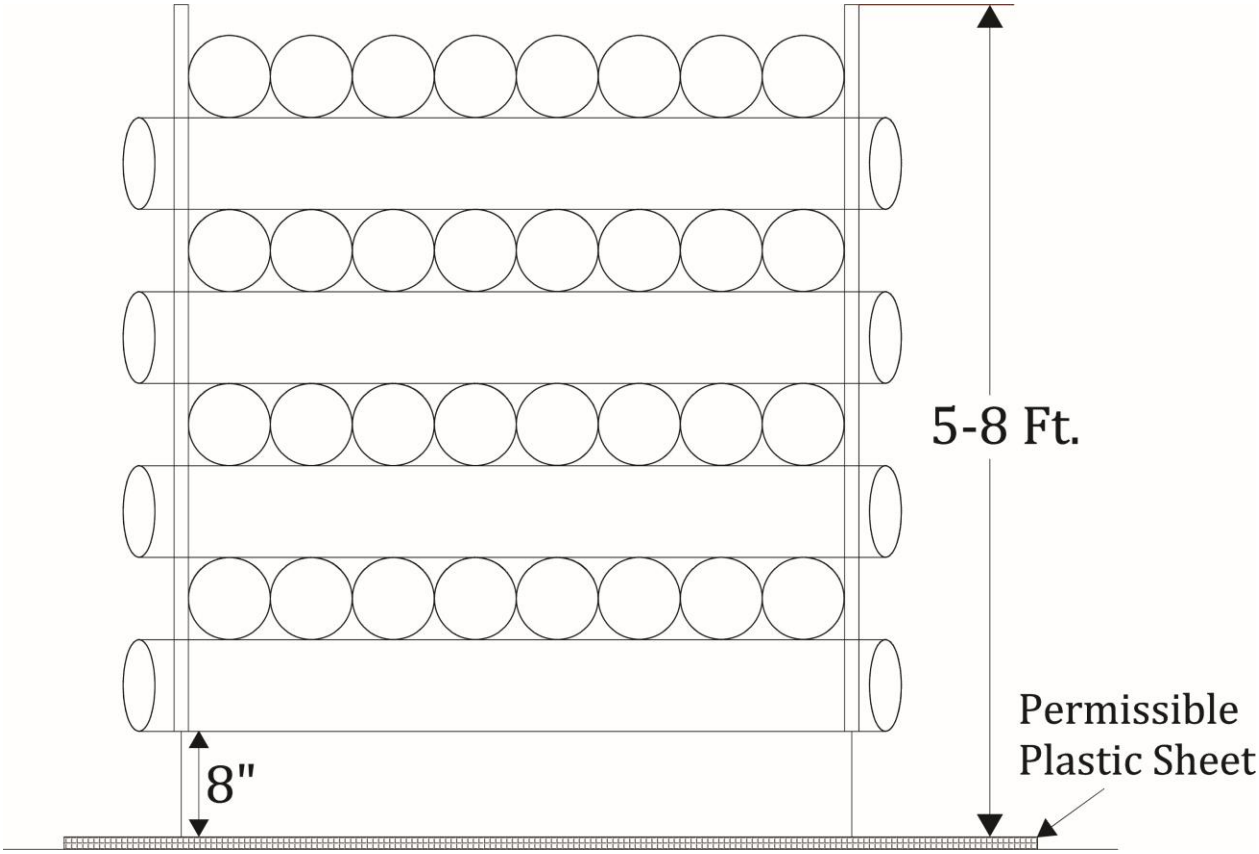


Fig. No. 5: Schematic diagram showing ACM Pipes stacking

The ACM stack has to be enveloped with proper fencing showing internal movement of person with 4. 0ft corridor all around the stack. The Storage area will have display of all requisite warning and access control of the authorized person's entry and exit.

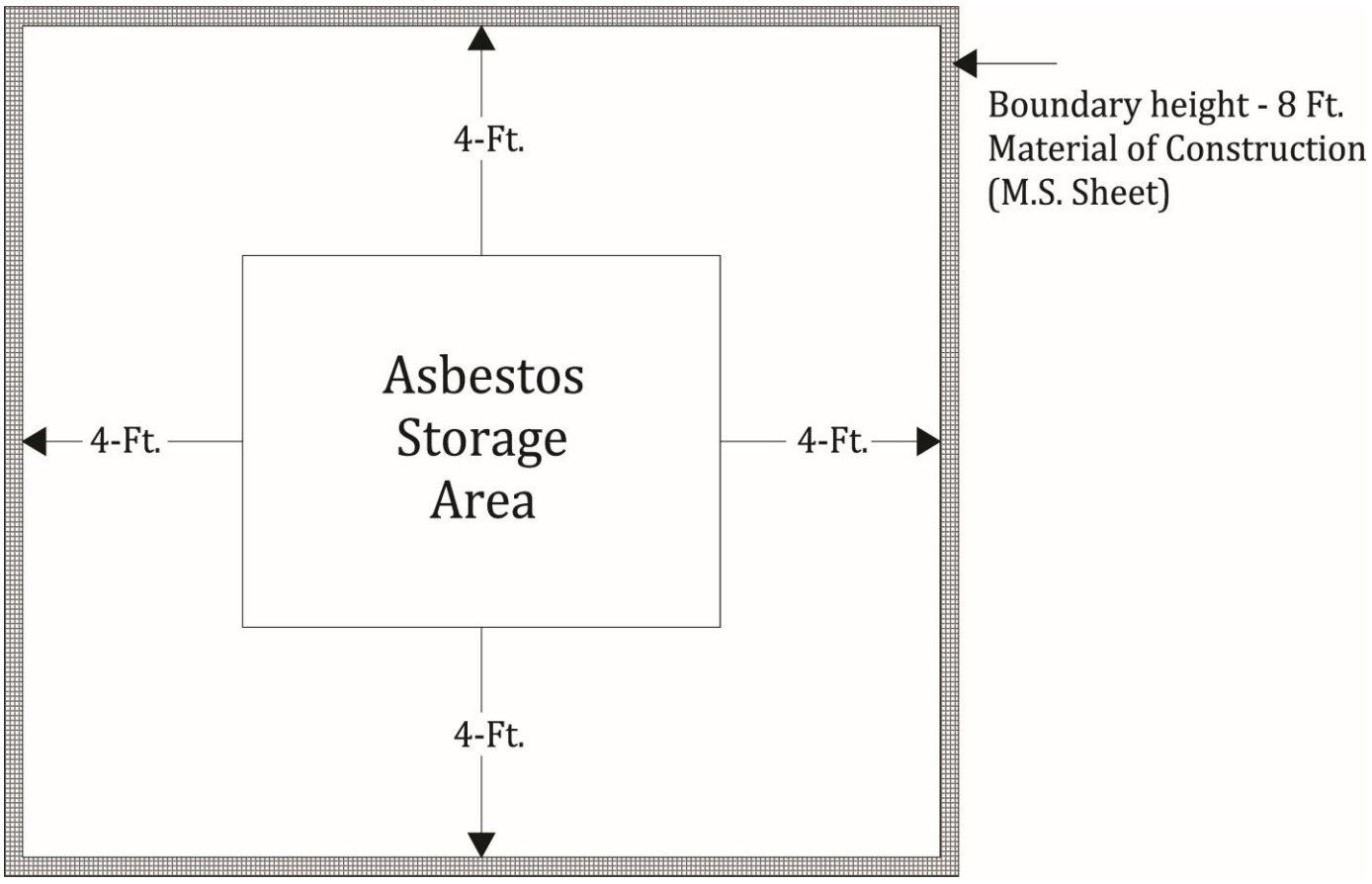


Fig. No. 6: Schematic diagram showing ACM Pipes storage area

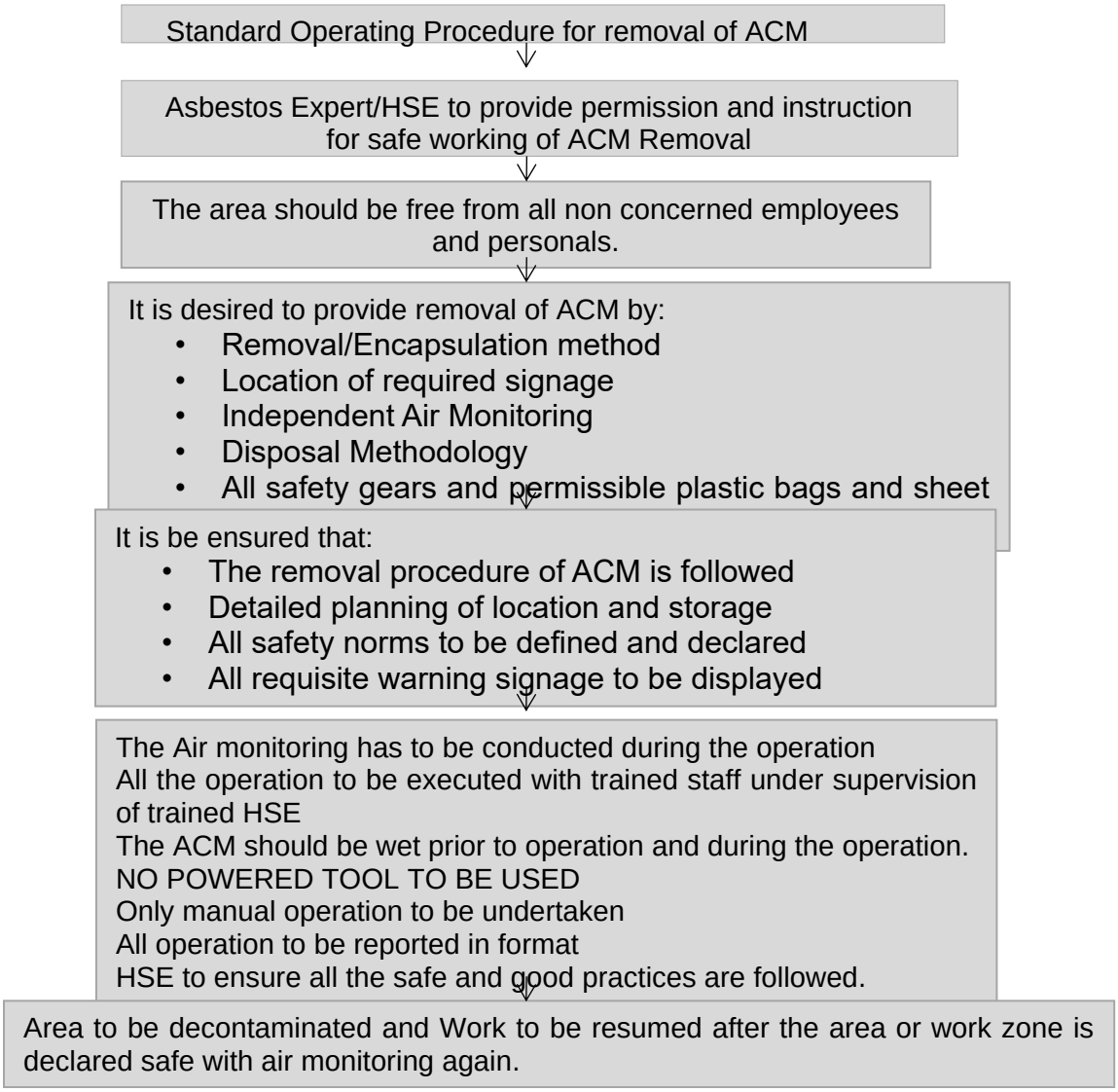


Fig. no. 2-Standard Operating Procedure Flow Sheet

14. All the records in the pre-determined format are to be maintained and the disposal as stated in the applicable National legislation is to be followed. Any innovative use of the discarded ACM with the permissible law frame must be approved by respective Regulators prior to practice.

15. The format of Inventorization& records at all locations must be maintained irrespective of generation of ACM waste. The format of documentation must be uniform in order to track and trace the details as desired.

16. Based on the outcome of the workshop it was essential to enumerate the standard operating procedure & define the roles and responsibilities (already discussed as above) and the re-handling cost of the ACM as stated below:

Table. 03- Suggestive Protective measures & Estimation of the cost of Re-Handling of ACM

1	Re-Handling			
	Re-handling of AC Pipes scattered/used in the premises.	• Re-Handling of the old AC Pipes in the premises needs to be quantified and a proper inventorizationhas to be prepared. • The isolated enveloped storage sites should be away from the habituation, the pipes used for fencing, tree guard needs to be re-handled & stored in the nearest isolated storage site and the damaged pipes/broken pipes have to be disposed off to the TSDF with all pre-cautionary measures. **NOTE:** Only powered/ grounded ACM will have to be disposed off to TSDF.	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	The re-handling cost will be part of the laying program. The disposal cost is Rs. 1500/MT plus freight as per actual
	Removal of encountered AC Pipes	• The damaged / broken AC Pipes have to be cautiously handled with prior moistening and packed in plastic bags (permissible plastic bags) and sent for re-use in road making or to TSDF with all signage and precautionary measures as suggested above.	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	As stated above
	Storage	• The existing storage stacks have to be shielded with 8. 0 ft height and above ground (min1. 0 ft) The Pipes shall be stored in stacks with stoppers provided at the bottom layer to keep the pipe stack stable. The stack, particularly of smaller diameter pipes, shall be in pyramid shape. Pipes shall not be stacked more than 1. 5 m high. Each stack shall have pipes of the same type and size only. Removal of pipes shall start from the top layer and by pulling from one end, if required, with all safety precautions. A pipe shall not be stored inside another pipe. The	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	As on daily wages

		pipes may also be placed alternately length and crosswise. They shall be stored on horizontal racks supported throughout their lengths on a reasonably flat surface free from stones and sharp projections. They should not be stacked in large piles, especially under warm conditions. Open ends of pipes to be sealed with permissible polythene.		
	Transportation	• Full length pipes • Damaged/Broken Pipes	Authorised agency	As per actual.
	Disposal			
	Isolated storage	The storage area should be twice the area required for storage of ACM	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert. Authorised vendor. Boundary, signage, safety aspects etc	As stated in Table1. 1.
	Sent to TSDF	The damaged/broken pipes will be packed in permissible Poly bags and has to be stored in defined location within the isolated storage. The records pertaining to the disposal (within 90 days of generation) have to be made systematic. Possibilities of using the broken pipes in wet conditions in road making in order to bind the asbestos fibers can be explored.	Authorised agency	Freight as per actual.
Estimation of suggestive protective and preventive measures				
	Air Quality sampling & Analysis- Asbestos fiber count	Personal sampler, phase contrast microscope, In case of asbestos dust, the same shall not exceed 2 mg/Nm3. Per the OSHA standards for asbestos, exposure monitoring and medical surveillance of workers is required when the Workers are or will be exposed to airborne concentrations of fibers of asbestos at or above OSHA's	Approved/accredited laboratory	As stated above.

		exposure limits for a combined total of 30 or more days per year; Workers perform work that disturbs asbestos-containing material (ACM) or presumed asbestos-containing material (PACM) for a combined total of 30 or more days per year. Minimum 3 locations (@120deg from each location) at min 500 m from the isolated storage of ACM and one sampling near the encountered site. The frequency of monitoring should be bi-annually.		
	PPE's	Hard helmet, double strapped mask, safety tapes, boots(non laced), gloves, safety suits, goggles, ear plugs,	Standard make, minimum-4 sets at each site	As stated Above
	Education & Training	Awareness, New induction training and inspections	Asbestos expert/HSE Experts	As stated Above
	Medical Check up	As per norms or in consultation with Medical Practitioner.	Medical Doctor	As stated Above

Note:

Efforts should be made to minimize the existing AC water pipes. In areas where ACM are stored, it is required to have induction training of AMP, complete the formats and maintain the records.

Removals of used AC Pipes for fencing, boundary wall etchave to be carefully removed from use and stored in isolated storage.

At certain locations, it was observed that the discarded pipes was used as tree guard, when the sapling was planted as on date the tree is fully grown, in that case the removal of ACM has to be done with all precautions and use of total safety gears. Hand tools or slow-running tools producing coarse dust or chips shouldbe used where practicable rather than high-speed machines or those which cut by abrading the material after wetting. Alternatively, the same can also be bounded properly by bitumen paint.

The coarse dust and pieces in wet conditions will have to be collected in permissible plastic bags with use of all safety gears.

The collected wastes are to be labeled as stated above and disposed off to TSDF. The records of the same will have to be kept on daily basis and summarized to monthly basis.

FORM I – ASBESTOS INVENTORY, INSPECTION AND ACTION FORM **Format: RUIDP/IIA/ LOCATION/NAME OF DBO CONTRACTOR/HSE 002/YEAR**	
Location:	
Site co-ordinates:	
Elevation:	**Team:**
Date of visit	**Sign:**

Present Status		Indicate if installed, operational, in storage, etc.
Original age		Months or years since installation
Diameter		mm or inches
Length		meters
Volume		
Total packet		
Packing date		
Disposal date		
Existing Site (Photo or illustrations):		
Illustration/ Design of Activities On-site with respect to existing asbestos (include details such as size of new pipes, distance from existing AC pipes, other notable observations)		
DBO Contractor Handling Asbestos:		
Number of persons handling waste		
Medical Records		
Safety Gears		
Vocational Training Last Conducted: Number of attendees: Conducted by Schedule:		
Required Actions:		
Remarks		
Conclusion/Remark **HSE Signatory**		

FORM-II – MATRIX FOR TRAINING & RECORDS

Format: RUIDP/INSP. MATRIX/LOCATION/NAME OF DBO CONTRACTOR/HSE 001/YEAR				
S. No.	**Aspects of ACM**		**Check points**	**Remarks**
Training Schedule:				
Trainer Details:				
Date/Location of Training:				
Number of attendees:				
Training Schedule, Training Materials & Attendance Sheet, Feedback of Trainees.				
Understanding of:				
A.	**DOCUMENTS AND RECORDS**			
1.	Site Inventory			
2.	List of ACM storage and installation points			
3.	Structure of ACM management committee			
B.	**INVENTORY**			
1.	Inventorization of ACM			
	Number of ACM/ pipes			
	Dimensions of ACM/ pipes			
	Total volume of ACM/ pipes			
2.	Storage facility/ installation location:			
A.	In-use	Location		
		Condition	Intact/ damaged	
		Purpose		
		Accessibility by the workers		
		Evidence of physical damage and approximate size (length, width, volume) without coming into contact with The damaged ACM		
		Impacts on the environment (Based on Asbestos fiber Monitoring)		
3.	**LABELING AND SIGNAGE**			
	Notification to workplace safety and health			
	Working instruction			
	The risks associated with exposure to asbestos fibers			
	Cautionary statement to not disturb materials containing asbestos			
4.	**PERSONAL PROTECTIVE EQUIPMENT (PEP)**			
	Record of pep			
	Mask			
	Eye glasses			

	Gloves	
	Ear muffs	
	Others	
	Training	
	On occupational risks of asbestos to the workers	Date: Time: In-house/ external: Faculty: No of workers attended:
	Training for maintenance, repair and renovation	Date: Time: In-house/ external: Faculty: No of workers attended:
	Training for workers working with asbestos	Date: Time: In-house/ external: Faculty: No of workers attended:
	Periodic air quality monitoring records	• Within the permissible limits • Not within the permissible limits (specify the reason)
	Workers medical check-up records	Date: In-house/ external: Performed by: Remarks: No of workers attended:
Conclusion/Remark **HSE Signatory**		

The all the data required in Form-II will be filled by the DOB Operator (HSE-Officer), the records of this document has to be maintained for a pre-decided life. Details of training imparted have to be file with appropriate evidence like photographs, feedback form**,** videos etc. There has to be a proper documentation of the records kept with highest level of transparence to retrieve, trace and track the records as necessary. The records maintained by the DOB Operator, has to be audited regularly by the ACM-Expert.

Form-I has to be accompanied with Form-II. Defined period of Air Quality monitoring and health will have to be minimum twice a year. Where ever the fiber counts are found/ recorded beyond the permissible norms, corrective action, like:

- ❑ Cordon off the area of ACM
- ❑ HSE team with trained experts to be deputed for the task
- ❑ Moisten the ACM prior to handling
- ❑ Storage area of the ACM stacks to be covered
- ❑ The damaged/deteriorated ACM to be re-handled in presence of Asbestos Expert/ HSE (Trained) with all defined norms and safety gears.
- ❑ Disposal of damaged/deteriorated ACM to be done as per the Norms.
- ❑ Records of disposal to be maintained.
- ❑ Keep all requisite evidence in form of documentation, geo-tagged photographs etc

- ❑ Frequency of health monitoring at such locations to be increased.

Form-III-Air Quality Monitoring and Results

Format: RUIDP/AQMR/ LOCATION/NAME OF DBO CONTRACTOR/HSE 003/YEAR			
Vendor details **Approvals**			
S. No	**Location**	**Agency**	**Results& Permissible Norms**
Conclusion/Remark **HSE Signatory**			

FORM-IV-Medical History

Format: RUIDP/MH/ LOCATION/NAME OF DBO CONTRACTOR/HSE 004/YEAR							
Employee code:							
Employer Details:							
PPE Used:							
Insurance/ESI							
S. No	**Name**	**Age/Sex/DOB**	**Address/ Contact details:**	**Period of Employment/ Job Title**	**Pre-History**	**Doctor's comments**	**HSE Remarks**
					Height **Weight/BMI** **Blood group** **X-Ray** **CT Scan** **others** **Smoker:** **Tobacco:** **Alcohol Consumption:** **Family History:** **Medication if any:** **Eye sight:** **Hearing:** **Others:**		

FORM -V

[FORM-10- as per rule 19 (1) of Hazardous waste Handling & Management Rules-2016]

MANIFEST FOR HAZARDOUS AND OTHER WASTE

1.	Sender's name and mailing address (including Phone No. and e-mail) :		
2.	Sender's authorisation No.	•	
3.	Manifest Document No.	•	
4.	Transporter's name and address: (including Phone No. and e-mail)		
5.	Type of vehicle	•	(Truck/Tanker/Special Vehicle)

6.	Transporter's registration No.		•	
7.	Vehicle registration No.		•	
8.	Receiver's name and mailing address (including Phone No. and e-mail) :			
9.	Receiver's	Authorisation No.		
10.	Waste description		•	
11.	Total quantity No. ofContainers		•	……. . m^3 or MT ……. . Nos.
12.	Physical form			(Solid/Semi-Solid/Sludge/Oily/Tarry/Slurry/Liquid)
13.	Special handling instructions and additional information			
14.	Sender's Certificate			I hereby declare that the contents of the consignment are fully and accurately described above by proper shipping name and are categorised, packed, marked, and labeled, and are in all respects in proper conditions for transport byroad according to applicableNational Government regulations.
	Name and stamp:	Signature:	Month / Day / Year	
15.	Transporter acknowledgement of receipt of Wastes			
	Name and stamp:	Signature:	Month / Day / Year	
16.	Receiver's certification for receipt of hazardous and other waste			
	Name and stamp:	Signature:	Month / Day / Year	

FORM –VI
In-situ Storage of ACM

S. No	Activity	Number of Stacks	Area occupied	Details of ACM Pipes		Day/month/year Of storage
Site History						
For existing Stacks, details of re-handling of pipes in number or volume to be mentioned under supervision of Authorized Experts.						
Details of Location of re-handled ACM storage, new area should be • Minimum 10-15 ft away from campus habituation. • 250m away from the water sources • 500-800m away from Children play area						

• The area should be isolated and covered from all the sides with restricted Access for Authorised Experts Only. • Register to be maintained for Entry& Exit of personals. • Register to be maintained for Entry & Exit of ACM • Labels to be displayed in legible format • Specific training of ACM to be inducted in the ACM storage area for residing population in the campus.
Details of transit storage of ACM to be maintained as per norms in an isolated storage room full covered

Standard Operating Procedure-02
Asbestos Fiber Monitoring, Analysis and Identification

Principle

1. The collection of environmental samples including air must follow an appropriate sampling procedure. A review of method for sampling of asbestos fibers has been published (IPCS, 1986). The most commonly used analytical method involves phase contrast optical microscopy (PCOM) in the work place and transmission electron microscopy (TEM) in the general environment. The phase contrast optical microscopy (POCM) is universally recommended for asbestos analysis (Eache and Groff, 1997; Dion and Perrault, 1994) including Bureau of Indian Standard. POCM coupled with polarized light is largely used for asbestos analysis in solid samples (USEPA, 1993). The fiber monitoring has to be done by any NABL/MOEF&CC accredited laboratory either in-house or by third party.

Monitoring of Asbestos Fiber in Air

2. A general survey of inside and outside the storage sites of the work zone has to be conducted to choose the sampling sites. Sampling is to be carried out at visually selected locations appeared more prone to emission or possibility of release of asbestos fiber. The sample collected by drawing a measured quantity of air through cellulose ester a membrane filter by a battery operated sampling pump that was fully charged to operate continuously over the chosen sampling time. The exposed filters will then be placed into plastic petri dishes and transferred carefully to the laboratory.

3. Two types of samples are to be taken, one within the workers breathing zone that is 300 mm radius extending in front of the face, and measured from the midpoint of a line bisecting the ears called *personal samples*. The samples taken at a fixed location mostly near to the source point called *area or static samples.* Personal sampler model “XX 5700000” and low volume vacuum/pressure pump model “XX5622050” attached with monitor or cowl model “MAWP025AC” of Millipore Corporation, USA are to be used for the collection of personal and area samples, respectively. The flow rate of pump is to be adjusted to 1litre per minute. The flow rate checked before and after in each monitoring, those samples showing the difference by >10 percent from the initial flow rate are to be rejected. In both the samples filter holder (Cowl) always pointed downward position to avoid the deposition of heavy particles. An ester cellulose membrane filters “AAWP02500” having 0. 8 µm-1. 2 µm pore size diameter are to be used throughout the sampling for asbestos counts at work environment.

Mounting Procedure

4. Complete filter is to be placed on clean microscopic slide, dust side up at room temperature. Electrostatic force keeps the filter usually on the slide. Filters are to be exposed to acetone fumes and triacetin (Glycerol triacetate, Sigma). In this procedure a small quantity of acetone in round bottom flask (500-1000ml) heated at the boiling point underwater bath, the vapors condensed in a simple condensing column. When the sufficient fumes of acetone become ready then pass it throughout on the filter for 3-5 seconds at a distance of 15-25 mm. put the 1-3 drops of Glycerol Triacetate (Triacetin) on the acetone-cleared filter. Place a cover slip on cleared filter by avoiding the air bubbles. Heat the cleared filter at 50°c for 15 minutes and leave it at room temperature for 24 hours under the action of triacetin to clear entire filter. Alternatively, membrane filter can also be made transparent with immersion oil (Leica Microsystems Wetzlar GmbH, Wetzlar). Using a phase contrast microscope with polarized light, Laborlux S (of M/s Leica, Germany) and then counting has to be done at magnification 400X-500x

   C = A/a x N/n x 1/r x 1/t
   Where:
   C= concentration in fibers per cubic centimeter rounded to first place of decimal,
   N = total no. of fiber counted,
   n = number of graticule areas observed,
   A= effective filter area in mm^2
   a= graticule counting area in mm^2,
   r= flow rate of air through filter in cm^3/min. , and
   t= single sample duration in minutes

5. To rule out the probability of the air borne asbestos in the existing scenario at the said site as well as other similar sites at the different work zones, it is necessary to have the asbestos fiber monitoring and sampling counts to be recorded at regular intervals. The environmental air sampling stations will have to be minimum three at 120 degree angle, within 1000-500 m from the ACM. The sampling frequency has to be in all three stages-Pre-Construction, Construction and Post Construction, while the personal sampling has to be done as stated above.

6. Bureau of Indian Standards (BIS) Guidelines for Safe Use of Products containing Asbestos states that “Asbestos cement products (such as AC pipes) generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. The possibilities of air borne asbestos fiber will be in case of mishandling of encountered pipes with unsafe practice. During storing and installation; recommended work practices shall be followed to avoid harmful exposure”. According to Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016, any waste with asbestos concentration limit of 10, 000 mg/kg (i. e. 1%), however this will apply only if the asbestos containing substances are in a friable, powdered or finely divided state. Under the Basel Convention[53], asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste. The applicable legislation under the present scenario are:

[53] Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, adopted in 1989

Summary of Asbestos Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Remark
Clearing, transfer and disposal of ACM pipes	Possibilities of air borne asbestos if handled unsafely, cut, drilled or broken into pieces that may cause: Inflammation of the lungs Mesothelioma Peritoneial mesotherlioma Pleural plaques Asbestosis Bronchogenic Carcinoma Second hand-exposure	Implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods.	DBO Contractor /RUIDP	There has to be a suitable call to be taken for in-situ disposal if the removed ACM pipes are not damaged, full length or 4. 0 ft length not damaged.
Work in narrow streets	Possibilities of air borne asbestos if handled unsafely cut, drilled or broken into pieces that may cause: Inflammation of the lungs Mesothelioma Peritoneialmesotherlioma Pleural plaques Asbestosis Bronchogenic Carcinoma Second hand-exposure	Conduct awareness program on safety during the construction work Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches Identify risk of intervention with existing AC pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods.	DBO Contractor/RUIDP	All provision of safe working with proper signage has to be undertaken prior to work initiation, during the work and after the work.
Interventions in existing AC pipelines	Possibilities of air borne asbestos if handled unsafely cut, drilled or broken into pieces that may cause: Inflammation of the lungs	Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to	DBO Contractor/ RUIDP	Measure to avoid the encounter & removal has to be prioritized and if the same is

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Remark
	Mesothelioma Peritoneial mesotherlioma Pleural plaques Asbestosis Bronchogenic Carcinoma Second hand-exposure			not avoided then the measures stated have to be strictly followed.
Documentation /record	Unmonitored ACM might be handled incorrectly and can cause release of airborne asbestos	To be formatted and kept as mentioned in the Asbestos Management Plan	DBO Contractor/RUIDP	To be kept intact for easy tracking and reference in legible format. The same can be kept in soft format as well.

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Appendix 17: Sample Outline Spoil Management Plan

The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.

The contractor, in consultation with the ULB, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
Further precautions need to be taken in case of the contaminated spoils.

The vehicle carrying the spoil should be covered properly.
The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

Appendix 18: Sample Outline Traffic Management Plan

A. Principles for TMP around the Water Pipes/Sewer Construction Sites

1. 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; and
(v) addressing issues that may delay the project.

B. Operating Policies for TMP

2. 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 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.

3. **Figure A2 to Figure A12**illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

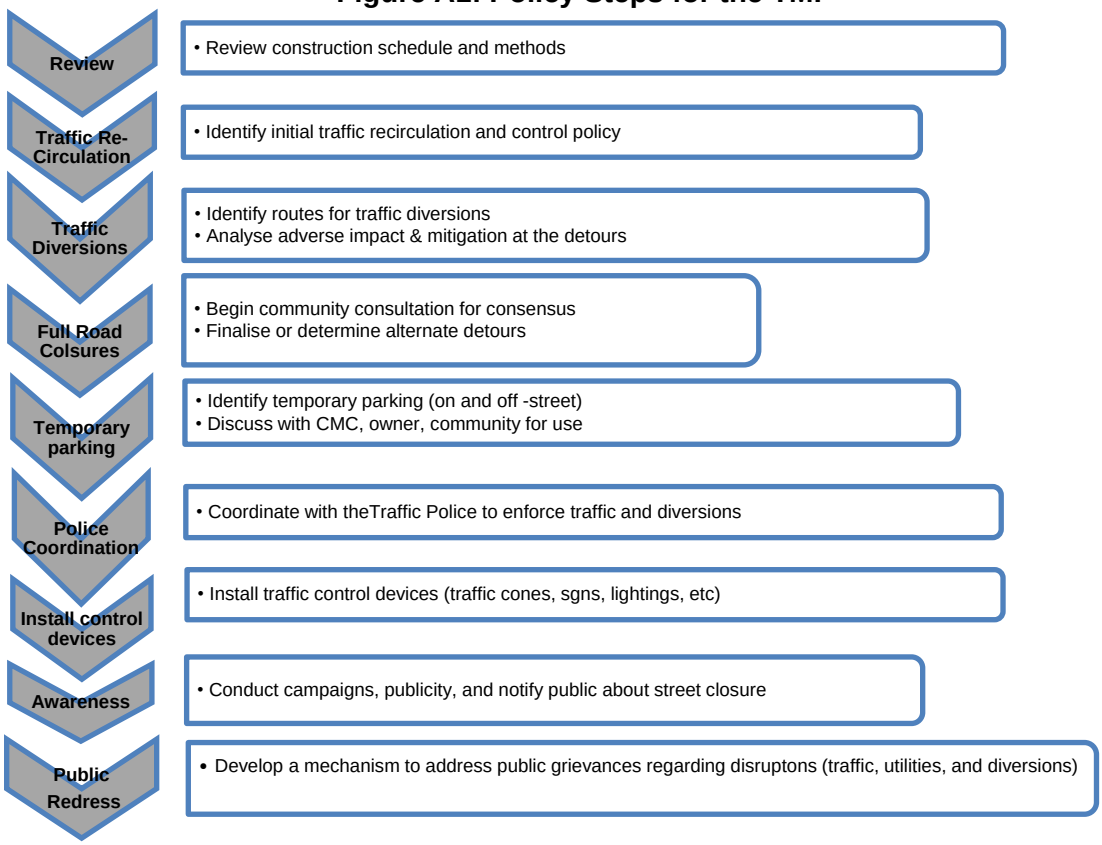
(i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc. , regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining 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.

5. 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

6. 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.

6. 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.

7. The PIU 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 behaviour along the work zones; and
(iii) reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. 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 centres. 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 PIU, 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 behaviour 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. Install traffic control devices at the work zones and traffic diversion routes

10. 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

11. 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”).

12**.** **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Lane closure on a four lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

13. 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.

14. 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. Flagggers/ 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.

16. 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.

Figure A2 & A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road

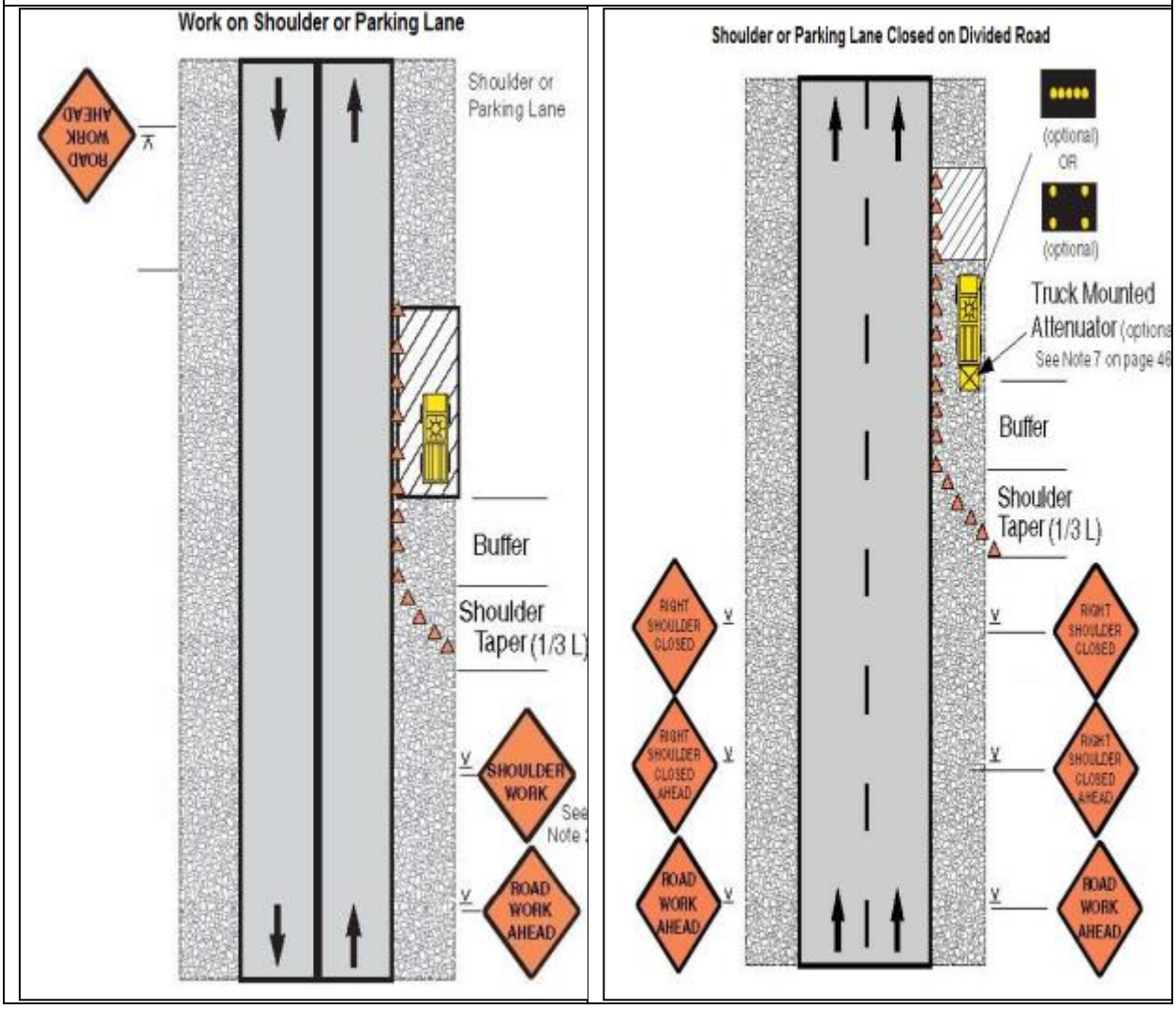
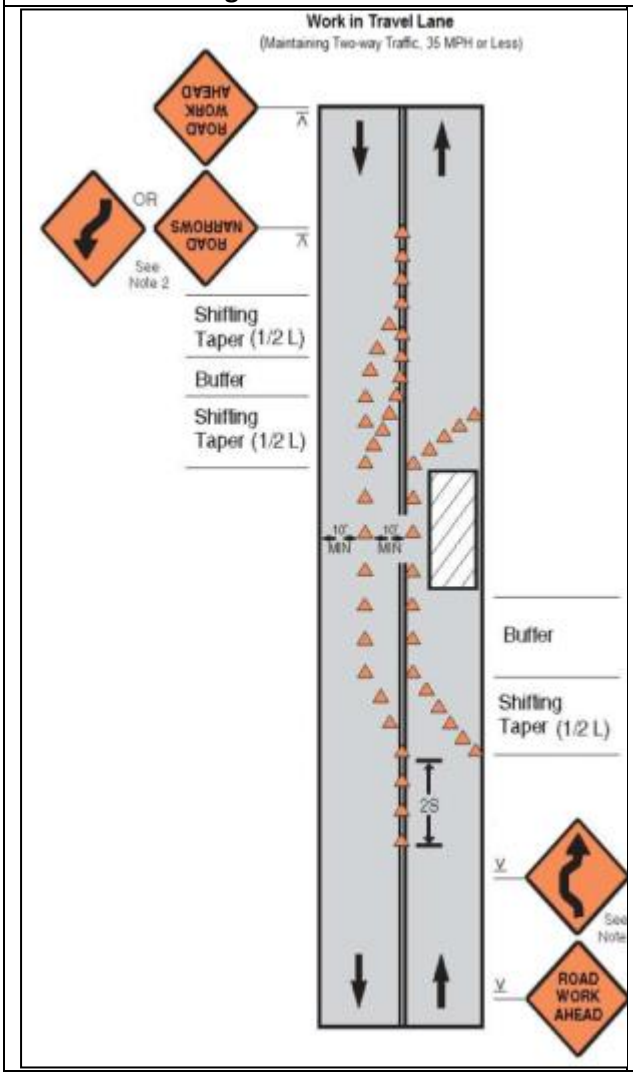


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume



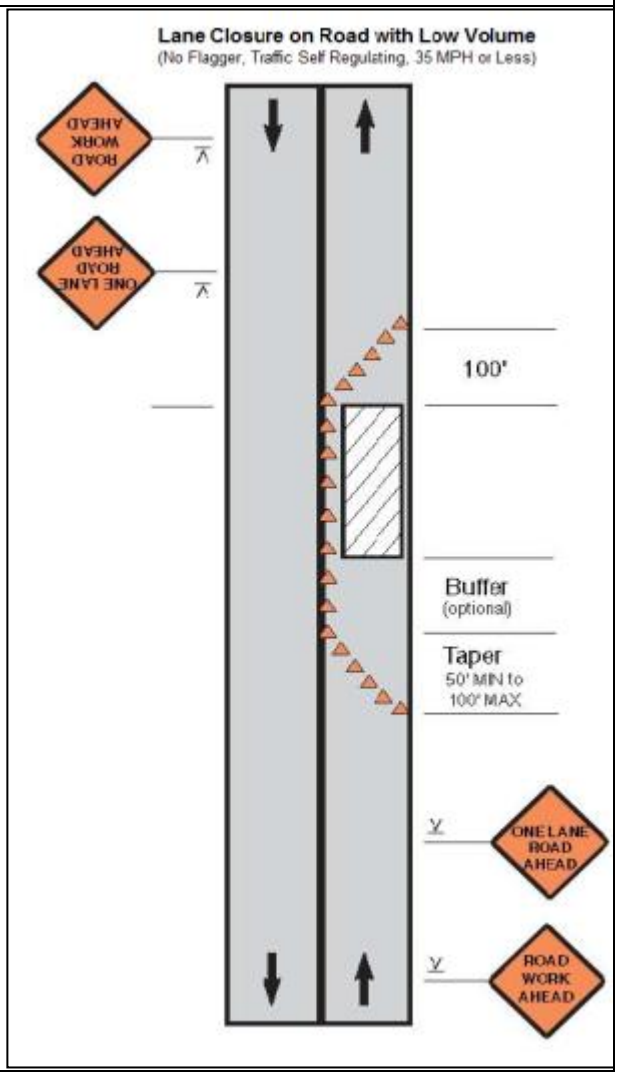
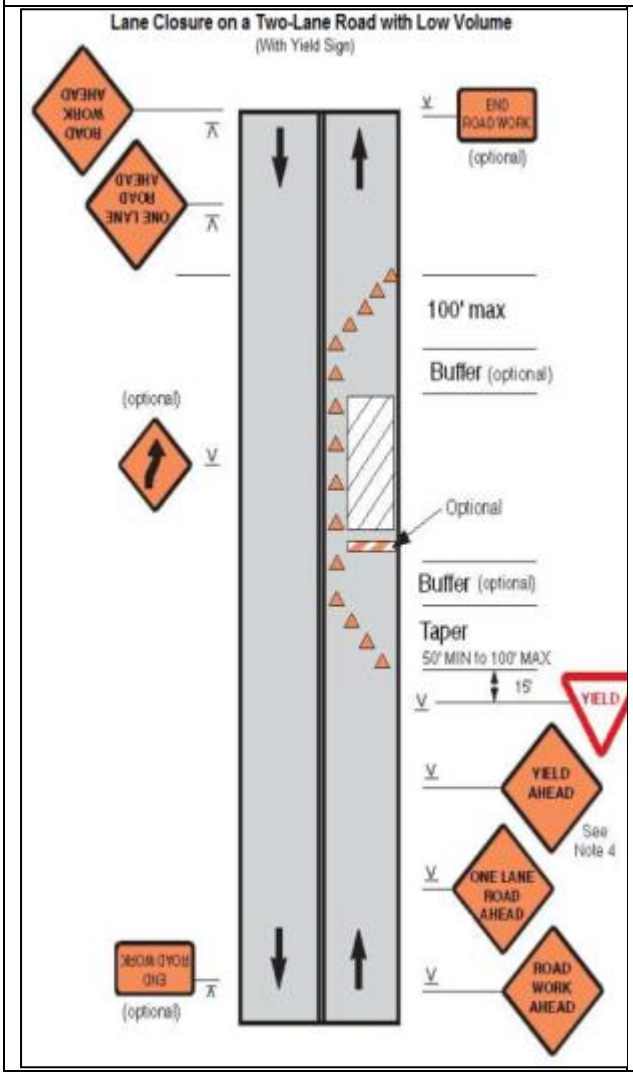


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



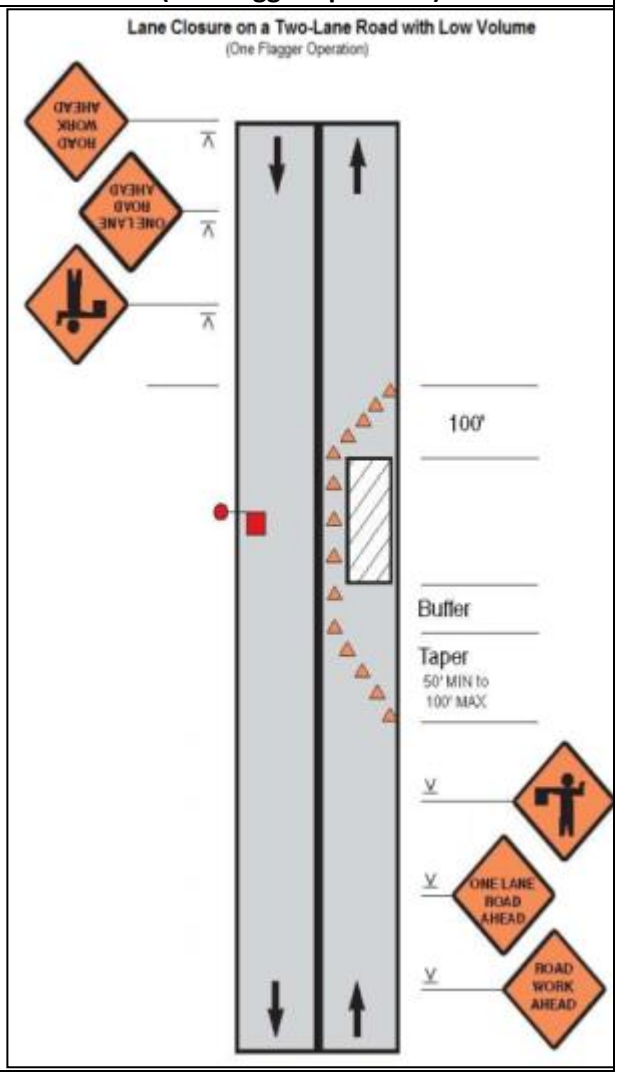


Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

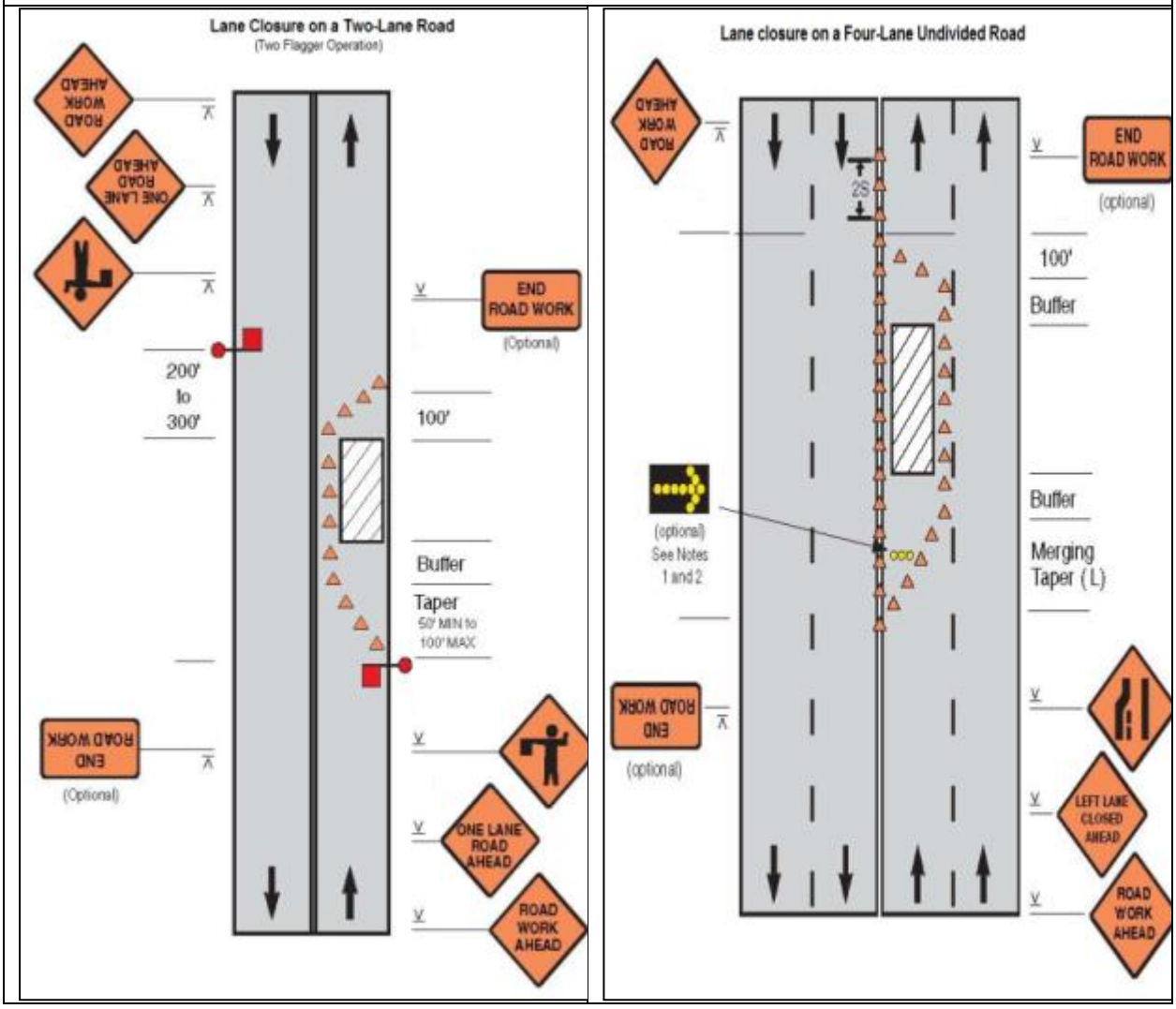
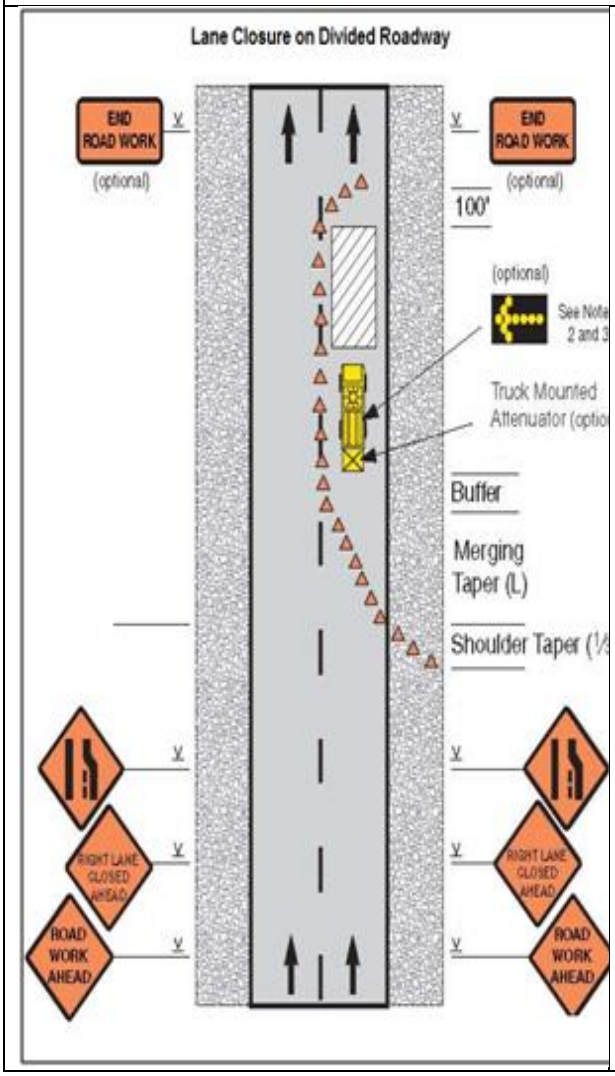


Figure A10 & A11: Lane Closure On Divided Roadway & Half Road Closure On Multi-Lane Roadway



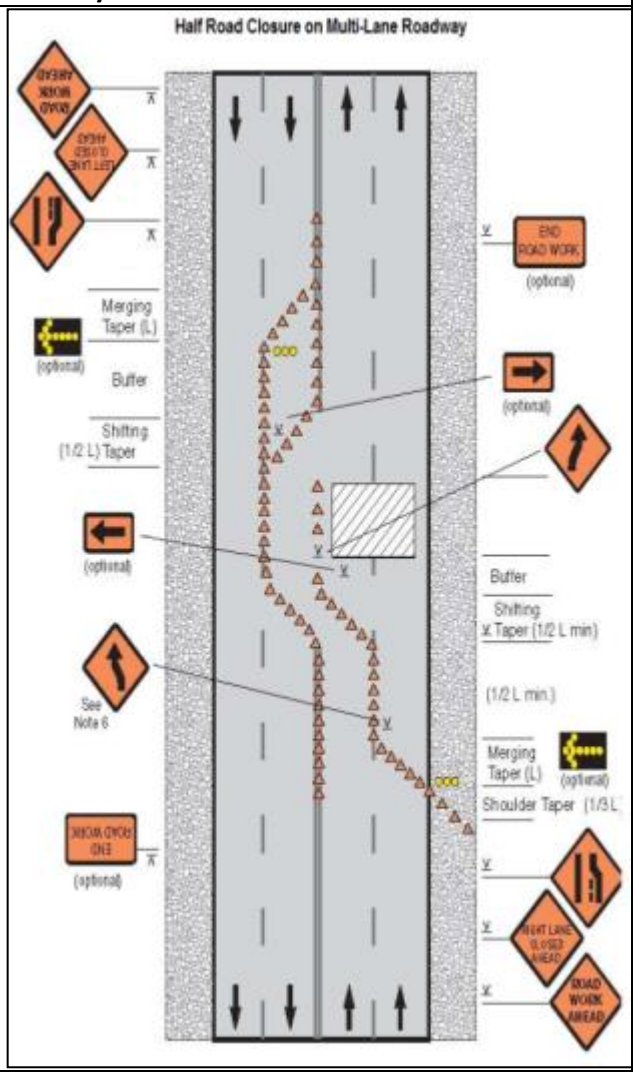
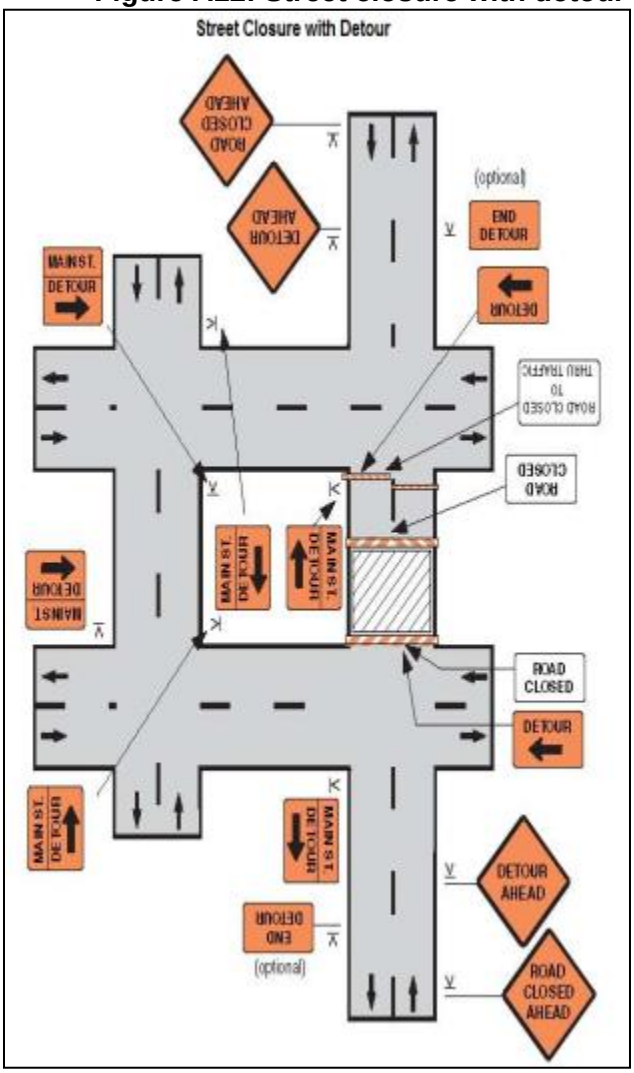


Figure A12: Street closure with detour



Appendix 19: WHO Interim Guidance on Water, Sanitation, Hygiene, and Waste management for the COVID-19 virus

World Health Organization

unicef

Water, sanitation, hygiene, and waste management for the COVID-19 virus

Interim guidance
19 March 2020

Background

This interim guidance supplements the infection prevention and control (IPC) documents by summarizing WHO guidance on water, sanitation and health care waste relevant to viruses, including coronaviruses. It is intended for water and sanitation practitioners and providers and health care providers who want to know more about water, sanitation and hygiene (WASH) risks and practices.

The provision of safe water, sanitation, and hygienic conditions is essential to protecting human health during all infectious disease outbreaks, including the COVID-19 outbreak. Ensuring good and consistently applied WASH and waste management practices in communities, homes, schools, marketplaces, and health care facilities will help prevent human-to-human transmission of the COVID-19 virus.

The most important information concerning WASH and the COVID-19 virus is summarized here.

- Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus. WASH practitioners should work to enable more frequent and regular hand hygiene by improving facilities and using proven behavior-change techniques.
- WHO guidance on the safe management of drinking-water and sanitation services applies to the COVID-19 outbreak. Extra measures are not needed. Disinfection will facilitate more rapid die-off of the COVID-19 virus.
- Many co-benefits will be realized by safely managing water and sanitation services and applying good hygiene practices.

Currently, there is no evidence about the survival of the COVID-19 virus in drinking-water or sewage. The morphology and chemical structure of the COVID-19 virus are similar to those of other human coronaviruses for which there are data about both survival in the environment and effective inactivation measures. This document draws upon the evidence base and WHO guidance on how to protect against viruses in sewage and drinking-water. This document will be updated as new information becomes available.

1. COVID-19 transmission

There are two main routes of transmission of the COVID-19 virus: respiratory and contact. Respiratory droplets are generated when an infected person coughs or sneezes. Any person who is in close contact with someone who has respiratory symptoms (sneezing, coughing) is at risk of being exposed to potentially infective respiratory droplets.[1] Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission (contact transmission).

Approximately 2–10% of cases of confirmed COVID-19 disease present with diarrhoea,[2-4] and two studies detected COVID-19 viral RNA fragments in the faecal matter of COVID-19 patients.[5,6] However, only one study has cultured the COVID-19 virus from a single stool specimen.[7] There have been no reports of faecal–oral transmission of the COVID-19 virus.

2. Persistence of the COVID-19 virus in drinking-water, faeces and sewage and on surfaces.

Although persistence in drinking-water is possible, there is no evidence from surrogate human coronaviruses that they are present in surface or groundwater sources or transmitted through contaminated drinking water. The COVID-19 virus is an enveloped virus, with a fragile outer membrane. Generally, enveloped viruses are less stable in the environment and are more susceptible to oxidants, such as chlorine. While there is no evidence to date about survival of the COVID-19 virus in water or sewage, the virus is likely to become inactivated significantly faster than non-enveloped human enteric viruses with known waterborne transmission (such as adenoviruses, norovirus, rotavirus and hepatitis A). For example, one study found that a surrogate human coronavirus survived only 2 days in dechlorinated tap water and in hospital wastewater at 20°C.[8] Other studies concur, noting that the human coronaviruses transmissible gastroenteritis coronavirus and mouse hepatitis virus demonstrated a 99.9% die-off in from 2 days[9] at 23°C to 2 weeks[10] at 25°C. Heat, high or low pH, sunlight, and common disinfectants (such as chlorine) all facilitate die off.

It is not certain how long the virus that causes COVID-19 survives on surfaces, but it seems likely to behave like other coronaviruses. A recent review of the survival of human

coronaviruses on surfaces found large variability, ranging from 2 hours to 9 days.[11] The survival time depends on a number of factors, including the type of surface, temperature, relative humidity, and specific strain of the virus. The same review also found that effective inactivation could be achieved within 1 minute using common disinfectants, such as 70% ethanol or sodium hypochlorite (for details, see Cleaning practices).

3. Keeping water supplies safe

The COVID-19 virus has not been detected in drinking-water supplies, and based on current evidence, the risk to water supplies is low.[12] Laboratory studies of surrogate coronaviruses that took place in well-controlled environments indicated that the virus could remain infectious in water contaminated with faeces for days to weeks.[10] A number of measures can be taken to improve water safety, starting with protecting the source water; treating water at the point of distribution, collection, or consumption; and ensuring that treated water is safely stored at home in regularly cleaned and covered containers.

Conventional, centralized water treatment methods that use filtration and disinfection should inactivate the COVID-19 virus. Other human coronaviruses have been shown to be sensitive to chlorination and disinfection with ultraviolet (UV) light.[13] As enveloped viruses are surrounded by a lipid host cell membrane, which is not robust, the COVID-19 virus is likely to be more sensitive to chlorine and other oxidant disinfection processes than many other viruses, such as coxsackieviruses, which have a protein coat. For effective centralized disinfection, there should be a residual concentration of free chlorine of $\geqslant$0.5 mg/L after at least 30 minutes of contact time at pH <8.0.[12] A chlorine residual should be maintained throughout the distribution system.

In places where centralized water treatment and safe piped water supplies are not available, a number of household water treatment technologies are effective in removing or destroying viruses, including boiling or using high-performing ultrafiltration or nanomembrane filters, solar irradiation and, in non-turbid waters, UV irradiation and appropriately dosed free chlorine.

4. Safely managing wastewater and faecal waste

There is no evidence that the COVID-19 virus has been transmitted via sewerage systems with or without wastewater treatment. Further, there is no evidence that sewage or wastewater treatment workers contracted the severe acute respiratory syndrome (SARS), which is caused by another type of coronavirus that caused a large outbreak of acute respiratory illness in 2003. As part of an integrated public health policy, wastewater carried in sewerage systems should be treated in well-designed and well-managed centralized wastewater treatment works. Each stage of treatment (as well as retention time and dilution) results in a further reduction of the potential risk. A waste stabilization pond (an oxidation pond or lagoon) is generally considered a practical and simple wastewater treatment technology particularly well suited to destroying pathogens, as relatively long retention times (20 days or longer) combined with sunlight, elevated pH levels, biological activity, and other factors serve to accelerate pathogen destruction. A final disinfection step may be considered if existing wastewater treatment plants are not optimized to remove viruses. Best practices for protecting the health of workers at sanitation treatment facilities should be followed. Workers should wear appropriate personal protective equipment (PPE), which includes protective outerwear, gloves, boots, goggles or a face shield, and a mask; they should perform hand hygiene frequently; and they should avoid touching eyes, nose, and mouth with unwashed hands.

WASH in health care settings

Existing recommendations for water, sanitation and hygiene measures in health care settings are important for providing adequate care for patients and protecting patients, staff, and caregivers from infection risks.[14] The following actions are particularly important: (i) managing excreta (faeces and urine) safely, including ensuring that no one comes into contact with it and that it is treated and disposed of correctly; (ii) engaging in frequent hand hygiene using appropriate techniques; (iii) implementing regular cleaning and disinfection practices; and (iv) safely managing health care waste. Other important measures include providing sufficient safe drinking-water to staff, caregivers, and patients; ensuring that personal hygiene can be maintained, including hand hygiene, for patients, staff and caregivers; regularly laundering bedsheets and patients' clothing; providing adequate and accessible toilets (including separate facilities for confirmed and suspected cases of COVID-19 infection); and segregating and safely disposing of health care waste. For details on these recommendations, please refer to Essential environmental health standards in health care.[14]

1. Hand hygiene practices

Hand hygiene is extremely important. Cleaning hands with soap and water or an alcohol-based hand rub should be performed according to the instructions known as "My 5 moments for hand hygiene".[15] If hands are not visibly dirty, the preferred method is to perform hand hygiene with an alcohol-based hand rub for 20–30 seconds using the appropriate technique.[16] When hands are visibly dirty, they should be washed with soap and water for 40–60 seconds using the appropriate technique.[17] Hand hygiene should be performed at all five moments, including before putting on PPE and after removing it, when changing gloves, after any contact with a patient with suspected or confirmed COVID-19 infection or their waste, after contact with any respiratory secretions, before eating, and after using the toilet.[18] If an alcohol-based hand rub and soap are not available, then using chlorinated water (0.05%) for handwashing is an option, but it is not ideal because frequent use may lead to dermatitis, which could increase the risk of infection and asthma and because prepared dilutions might be inaccurate.[19] However, if other options are not available or feasible, using chlorinated water for handwashing is an option.

Functional hand hygiene facilities should be present for all health care workers at all points of care and in areas where PPE is put on or taken off. In addition, functional hand hygiene facilities should be available for all patients, family members, and visitors, and should be available within 5 m of toilets, as well as in waiting and dining rooms and other public areas.

2. Sanitation and plumbing

People with suspected or confirmed COVID-19 disease should be provided with their own flush toilet or latrine that has a door that closes to separate it from the patient's room. Flush toilets should operate properly and have functioning drain traps. When possible, the toilet should be flushed with the lid down to prevent droplet splatter and aerosol clouds. If it is not possible to provide separate toilets, the toilet should be cleaned and disinfected at least twice daily by a trained cleaner wearing PPE (gown, gloves, boots, mask, and a face shield or goggles). Further, and consistent with existing guidance, staff and health care workers should have toilet facilities that are separate from those used by all patients.

WHO recommends the use of standard, well-maintained plumbing, such as sealed bathroom drains, and backflow valves on sprayers and faucets to prevent aerosolized faecal matter from entering the plumbing or ventilation system,[20] together with standard wastewater treatment.[21] Faulty plumbing and a poorly designed air ventilation system were implicated as contributing factors to the spread of the aerosolized SARS coronavirus in a high-rise apartment building in Hong Kong in 2003.[22] Similar concerns have been raised about the spread of the COVID-19 virus from faulty toilets in high-rise apartment buildings.[23] If health care facilities are connected to sewers, a risk assessment should be conducted to confirm that wastewater is contained within the system (that is, the system does not leak) before its arrival at a functioning treatment or disposal site, or both. Risks pertaining to the adequacy of the collection system or to treatment and disposal methods should be assessed following a safety planning approach,[24] with critical control points prioritized for mitigation.

For smaller health care facilities in low-resource settings, if space and local conditions allow, pit latrines may be the preferred option. Standard precautions should be taken to prevent contamination of the environment by excreta. These precautions include ensuring that at least 1.5 m exists between the bottom of the pit and the groundwater table (more space should be allowed in coarse sands, gravels, and fissured formations) and that the latrines are located at least 30 m horizontally from any groundwater source (including both shallow wells and boreholes).[21] If there is a high groundwater table or a lack of space to dig pits, excreta should be retained in impermeable storage containers and left for as long as feasible to allow for a reduction in virus levels before moving it off-site for additional treatment or safe disposal, or both. A two-tank system with parallel tanks would help facilitate inactivation by maximizing retention times, as one tank could be used until full, then allowed to sit while the next tank is being filled. Particular care should be taken to avoid splashing and the release of droplets while cleaning or emptying tanks.

3. Toilets and the handling of faeces

It is critical to conduct hand hygiene when there is suspected or direct contact with faeces (if hands are dirty, then soap and water are preferred to the use of an alcohol-based hand rub). If the patient is unable to use a latrine, excreta should be collected in either a diaper or a clean bedpan and immediately and carefully disposed of into a separate toilet or latrine used only by suspected or confirmed cases of COVID-19. In all health care settings, including those with suspected or confirmed COVID-19 cases, faeces must be treated as a biohazard and handled as little as possible. Anyone handling faeces should follow WHO contact and droplet precautions[18] and use PPE to prevent exposure, including long-sleeved gowns, gloves, boots, masks, and goggles or a face shield. If diapers are used, they should be disposed of as infectious waste as they would be in all situations. Workers should be properly trained in how to put on, use, and remove PPE so that these protective barriers are not breached.[25] If PPE is not available or the supply is limited, hand hygiene should be regularly practiced, and workers should keep at least 1 m distance from any suspected or confirmed cases.

If a bedpan is used, after disposing of excreta from it, the bedpan should be cleaned with a neutral detergent and water, disinfected with a 0.5% chlorine solution, and then rinsed with clean water; the rinse water should be disposed of in a drain or a toilet or latrine. Other effective disinfectants include commercially available quaternary ammonium compounds, such as cetylpyridinium chloride, used according to manufacturer's instructions, and peracetic or peroxyacetic acid at concentrations of 500–2000 mg/L.[26]

Chlorine is ineffective for disinfecting media containing large amounts of solid and dissolved organic matter. Therefore, there is limited benefit to adding chlorine solution to fresh excreta and it is possible that this may introduce risks associated with splashing.

4. Emptying latrines and holding tanks, and transporting excreta off-site.

There is no reason to empty latrines and holding tanks of excreta from suspected or confirmed COVID-19 cases unless they are at capacity. In general, the best practices for safely managing excreta should be followed. Latrines or holding tanks should be designed to meet patient demand, considering potential sudden increases in cases, and there should be a regular schedule for emptying them based on the wastewater volumes generated. PPE (long-sleeved gown, gloves, boots, masks, and goggles or a face shield) should be worn at all times when handling or transporting excreta offsite, and great care should be taken to avoid splashing. For crews, this includes pumping out tanks or unloading pumper trucks. After handling the waste and once there is no risk of further exposure, individuals should safely remove their PPE and perform hand hygiene before entering the transport vehicle. Soiled PPE should be put in a sealed bag for later safe laundering (see Cleaning practices). Where there is no off-site treatment, in-situ treatment can be done using lime. Such treatment involves using a 10% lime slurry added at 1-part lime slurry per 10 parts of waste.

5. Cleaning practices

Recommended cleaning and disinfection procedures for health care facilities should be followed consistently and correctly.[19] Laundry should be done and surfaces in all environments in which COVID-19 patients receive care (treatment units, community care centres) should be cleaned at least once a day and when a patient is discharged.[27] Many disinfectants are active against enveloped viruses, such as the COVID-19 virus, including commonly used hospital disinfectants. Currently, WHO recommends using:

- 70% ethyl alcohol to disinfect small areas between uses, such as reusable dedicated equipment (for example, thermometers);
- sodium hypochlorite at 0.5% (equivalent to 5000 ppm) for disinfecting surfaces.

All individuals dealing with soiled bedding, towels, and clothes from patients with COVID-19 infection should wear appropriate PPE before touching soiled items, including heavy duty gloves, a mask, eye protection (goggles or a face shield), a long-sleeved gown, an apron if the gown is not fluid resistant, and boots or closed shoes. They should perform hand hygiene after exposure to blood or body fluids and after removing PPE. Soiled linen should be placed in clearly labelled, leak-proof bags or containers, after carefully removing any solid excrement and putting it in a covered bucket to be disposed of in a toilet or latrine. Machine washing with warm water at 60–90°C (140–194°F) with laundry detergent is recommended. The laundry can then be dried according to routine procedures. If machine washing is not possible, linens can be soaked in hot water and soap in a large drum using a stick to stir and being careful to avoid splashing. The drum should then be emptied, and the linens soaked in 0.05% chlorine for approximately 30 minutes. Finally, the laundry should be rinsed with clean water and the linens allowed to dry fully in sunlight.

If excreta are on surfaces (such as linens or the floor), the excreta should be carefully removed with towels and immediately safely disposed of in a toilet or latrine. If the towels are single use, they should be treated as infectious waste; if they are reusable, they should be treated as soiled linens. The area should then be cleaned and disinfected (with, for example, 0.5% free chlorine solution), following published guidance on cleaning and disinfection procedures for spilled body fluids.[27]

6. Safely disposing of greywater or water from washing PPE, surfaces and floors.

Current WHO recommendations are to clean utility gloves or heavy duty, reusable plastic aprons with soap and water and then decontaminate them with 0.5% sodium hypochlorite solution after each use. Single-use gloves (nitrile or latex) and gowns should be discarded after each use and not reused; hand hygiene should be performed after PPE is removed. If greywater includes disinfectant used in prior cleaning, it does not need to be chlorinated or treated again. However, it is important that such water is disposed of in drains connected to a septic system or sewer or in a soakaway pit. If greywater is disposed of in a soakaway pit, the pit should be fenced off within the health facility grounds to prevent tampering and to avoid possible exposure in the case of overflow.

7. Safe management of health care waste

Best practices for safely managing health care waste should be followed, including assigning responsibility and sufficient human and material resources to dispose of such waste safely. There is no evidence that direct, unprotected human contact during the handling of health care waste has resulted in the transmission of the COVID-19 virus. All health care waste produced during the care of COVID 19 patients should be collected safely in designated containers and bags, treated, and then safely disposed of or treated, or both, preferably on-site. If waste is moved off-site, it is critical to understand where and how it will be treated and destroyed. All who handle health care waste should wear appropriate PPE (boots, apron, long-sleeved gown, thick gloves, mask, and goggles or a face shield) and perform hand hygiene after removing it. For more information refer to the WHO guidance, Safe management of wastes from health-care activities.[28]

Considerations for WASH practices in homes and communities.

Upholding best WASH practices in the home and community is also important for preventing the spread of COVID-19 and when caring for patients at home. Regular and correct hand hygiene is of particular importance.

1. Hand hygiene

Hand hygiene in non–health care settings is one of the most important measures that can prevent COVID 19 infection. In homes, schools and crowded public spaces – such as markets, places of worship, and train or bus stations – regular handwashing should occur before preparing food, before and after eating, after using the toilet or changing a child's diaper, and after touching animals. Functioning handwashing facilities with water and soap should be available within 5 m of toilets.

2. Treatment and handling requirements for excreta.

Best WASH practices, particularly handwashing with soap and clean water, should be strictly applied and maintained because these provide an important additional barrier to COVID-19 transmission and to the transmission of infectious diseases in general.[17] Consideration should be given to safely managing human excreta throughout the entire sanitation chain, starting with ensuring access to regularly cleaned, accessible, and functioning toilets or latrines and to the safe containment, conveyance, treatment, and eventual disposal of sewage.

When there are suspected or confirmed cases of COVID-19 in the home setting, immediate action must be taken to protect caregivers and other family members from the risk of contact with respiratory secretions and excreta that may contain the COVID-19 virus. Frequently touched surfaces throughout the patient's care area should be cleaned regularly, such as beside tables, bed frames and other bedroom furniture. Bathrooms should be cleaned and disinfected at least once a day. Regular household soap or detergent should be used for cleaning first and then, after rinsing, regular household disinfectant containing 0.5% sodium hypochlorite (that is, equivalent to 5000 ppm or 1-part household bleach with 5% sodium hypochlorite to 9 parts water) should be applied. PPE should be worn while cleaning, including mask, goggles, a fluid-resistant apron, and gloves,[29] and hand hygiene with an alcohol-based hand rub or soap and water should be performed after removing PPE.

References

1. Coronavirus disease (COVID-19) advice for the public. Geneva: World Health Organization; 2020 (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public, accessed 3 March 2020).
2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395:497–506. doi:10.1016/S0140-6736(20)30183-5.

3. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395:507–13. doi:10.1016/S0140-6736(20)30211-7.
4. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. 2020. Feb 7. doi:10.1001/jama.2020.1585.
5. Xiao E, Tang M, Zheng Y, Li C, He J, Hong H, et al. Evidence for gastrointestinal infection of SARS-CoV. medRxiv. doi:10.1101/2020.02.17.20023721.
6. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H et al. for the Washington State 2019-nCoV Case Investigation Team. First case of 2019 novel coronavirus in the United States. N Engl J Med. 2020. Jan 31. doi:10.1056/NEJMoa2001191.
7. Zhang Y, Chen C, Zhu S et al. [Isolation of 2019-nCoV from a stool specimen of a laboratory-confirmed case of the coronavirus disease 2019 (COVID-19)]. China CDC Weekly. 2020;2(8):123-4. (In Chinese.)
8. Wang XW, Li JS, Zhen B, Kong QX, Song N, Xiao WJ et al. Study on the resistance of severe acute respiratory syndrome-associated coronavirus. J Virol Methods. 2005;126:171–7. doi:10.1016/j.jviromet.2005.02.005.
9. Gundy P, Gerba CP, Pepper IL. Survival of coronaviruses in water and wastewater. Food Environ Virol. 2009;1:10-14. doi:10.1007/s12560-008-9001-6.
10. Casanova L, Rutalal WA, Weber DJ, Sobsey MD. Survival of surrogate coronaviruses in water. Water Res. 2009;43(7):1893–8. doi:10.1016/j.watres.2009.02.002.
11. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect. 2020;104(3):246−51. doi:10.1016/j.jhin.2020.01.022.
12. Guidelines for drinking-water quality, fourth edition, incorporating the first addendum. Geneva: World Health Organization; 2017 (http://apps.who.int/iris/bitstream/10665/254637/1/9789241549950-eng.pdf, accessed 3 March 2020).
13. SARS-CoV-2 − water and sanitation. Adelaide: Water Research Australia; 2020 (http://www.waterra.com.au/_r9544/media/system/attrib/file/2199/WaterRA_FS_Coronavirus_V10.pdf, accessed 3 March 2020).
14. Essential environmental health standards in health care. Geneva: World Health Organization; 2008 (https://apps.who.int/iris/bitstream/handle/10665/43767/9789241547239_eng.pdf?sequence=1&isAllowed=y, accessed 3 March 2020).
15. My 5 moments for hand hygiene. In: WHO/Infection prevention and control [website]. Geneva: World Health Organization; 2020 (https://www.who.int/infection-prevention/campaigns/clean-hands/5moments/en/, accessed 3 March 2020).
16. Siddharta A, Pfaender S, Vielle NJ, Dijkman R, Friesland M, Becker B, et al. Virucidal activity of World Health Organization-recommended formulations against enveloped viruses, including Zika, Ebola, and emerging coronaviruses. J Infect Dis. 2017;215(6):902–6. doi:10.1093/infdis/jix046.
17. WHO guidelines on hand hygiene in health care settings. Geneva: World Health Organization; 2009 (https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1&isAllowed=y, accessed 3 March 2020).
18. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected: interim guidance, 25 January 2020. Geneva: World Health Organization (https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125, accessed 3 March 2020).
19. Q&A on infection prevention and control for health care workers caring for patients with suspected or confirmed 2019-nCoV. In: WHO/Newsroom [website]. Geneva: World Health Organization; 2020 (https://www.who.int/news-room/q-a-detail/q-a-on-infection-prevention-and-control-for-health-care-workers-caring-for-patients-with-suspected-or-confirmed-2019-ncov, accessed 3 March 2020).
20. Health aspects of plumbing. Geneva: World Health Organization; 2006. (https://apps.who.int/iris/handle/10665/43423, accessed 3 March 2020).
21. Guidelines on sanitation and health. Geneva: World Health Organization; 2018(https://apps.who.int/iris/bitstream/handle/10665/274939/9789241514705-eng.pdf?ua=1, accessed 3 March 2020).
22. Yu ITS, Li Y, Wong TW, Tam W, Chan A, Lee JHW, et al. Evidence of airborne transmission of the severe acute respiratory syndrome virus. N Engl J Med. 2004;350(17): 1731-9. doi:10.1056/NEJMoa032867.
23. Regan H. How can the coronavirus spread through bathroom pipes? Experts are investigating in Hong Kong. CNN. 12 February 2020 (https://edition.cnn.com/2020/02/12/asia/hong-kong-coronavirus-pipes-intl-hnk/index.html).
24. Sanitation safety planning: manual for safe use and disposal of wastewater, greywater and excreta. Geneva: World Health Organization; 2015. (https://apps.who.int/iris/handle/10665/171753, accessed 3 March 2020).
25. How to put on and take off personal protective equipment. Geneva: World Health Organization; 2008 (https://apps.who.int/iris/handle/10665/70066, accessed 3 March 2020).
26. Chemical disinfectants: guideline for disinfection and sterilization in healthcare facilities (2008). In: CDC/Infection Control [website]. Atlanta: US Centers for Disease Control and Prevention; 2019. https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/chemical.html, accessed 3 March 2020).

27. Best practices for environmental cleaning in healthcare facilities in resource-limited settings. Atlanta: US Centers for Disease Control and Prevention; 2019 (https://www.cdc.gov/hai/pdfs/resource-limited/environmental-cleaning-508.pdf, accessed 3 March 2020).
28. Safe management of wastes from health-care activities: a summary. Geneva: World Health Organization; 2017 (https://apps.who.int/iris/handle/10665/259491, accessed 3 March 2020).
29. Home care for patients with suspected novel coronavirus (COVID-19) infection presenting with mild symptoms, and management of their contacts: interim guidance, 4 February 2020. (https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts, accessed 3 March 2020).

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WHO continues to monitor the situation closely for any changes that may affect this interim guidance. Should any factors change, WHO will issue a further update. Otherwise, this interim guidance document will expire 2 years after the date of publication.

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Appendix 20: IFC benchmark standards for workers accommodation

PART II: STANDARDS FOR AND MANAGEMENT OF WORKERS' ACCOMMODATION

I. Standards for workers' accommodation

This section looks at the principles and standards applicable to the location and construction of workers' accommodation, including the transport systems provided, the general living facilities, rooms/dormitories facilities, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities.

A. National/local standards

The key standards that need to be taken into consideration, as a baseline, are those contained in national/local regulations. Although it is quite unusual to find regulations specifically covering workers' accommodation, there may well be general construction standards which will be relevant. These may include the following standards:

- Building construction: for example, quality of material, construction methods, resistance to earthquakes.
- Housing and public housing: in some countries regulations for housing and public housing contain requirements on issues such as the basic amenities, and standards of repair.
- General health, safety and security: requirements on health and safety are often an important part of building standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion.
- Fire safety: requirements on fire safety are common and are likely to apply to housing facilities of any type. This can include provision on fire extinguishers, fire alarms, number and size of staircases and emergency exits, restrictions on the use of certain building materials.
- Electricity, plumbing, water and sanitation: national design and construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment.

Benchmark

1. The relevant national and local regulations have been identified and implemented.

B. General living facilities

Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. It is also important that workers' accommodation is unaffected by the environmental or operational impacts of the worksite (for example noise, emissions or dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to the worksite. Living facilities should be built using adequate materials and should always be kept in good repair, clean and free from rubbish and other refuse.

Benchmarks

1. Living facilities are located to avoid flooding and other natural hazards.

2. Where possible, living facilities are located within a reasonable distance from the worksite.

3. Transport from the living facilities to worksite is safe and free.

4. The living facilities are built with adequate materials, kept in good repair and kept clean and free from rubbish and other refuse.

Drainage

The presence of stagnant water is a factor of proliferation of potential disease vectors such as mosquitoes, flies and others, and must be avoided.

Benchmarks

1. The building site is adequately drained to avoid the accumulation of stagnant water.

Heating, air conditioning, ventilation and light
Heating, air-conditioning and ventilation should be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.

Benchmarks

1. For facilities located in cold weather zones, the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation.

2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.

3. Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.

Water
Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers should always have easy access to a source of clean water. An adequate supply of potable water must be available in the same buildings where bedrooms or dormitories are provided. Drinking water must meet local or WHO drinking water standards[7] and water quality must be monitored regularly. Depending on the local context, it could either be produced by dedicated catchment and treatment facilities or tapped from existing municipal facilities if their capacity and quality are adequate.

Benchmarks

1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day are available.

2. Drinking water meets national/local or WHO drinking water standards.[8]

3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or contaminated.

4. Drinking water quality is regularly monitored.

Wastewater and solid waste
Wastewater treatment and effluent discharge as well as solid waste treatment and disposal must comply with local or World Bank effluent discharge standards[9] and be adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Depending on the local context, treatment and disposal services can be either provided by dedicated or existing municipal facilities.

Benchmarks

1. Wastewater, sewage, food and any other waste materials are adequately discharged, in compliance with local or World Bank standards – whichever is more stringent – and without causing any significant impacts on camp residents, the biophysical environment or surrounding communities.

2. Specific containers for rubbish collection are provided and emptied on a regular basis. Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents. In addition it is best practice to locate rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.

3. Pest extermination, vector control and disinfection are carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

7. www.who.int/water_sanitation_health/dwq/en/
8. ibid

9. As per the "Pollution Prevention and Abatement Handbook", World Bank Group, July 1998, available from www.worldbank.org

C. Room/dormitory facilities

The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work-related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of privacy. Resorting to dormitories should be minimised and single or double rooms are preferred. Dormitories and rooms must be single-sex.

Benchmarks

1. Rooms/dormitories are kept in good condition.

2. Rooms/dormitories are aired and cleaned at regular intervals.

3. Rooms/dormitories are built with easily cleanable flooring material.

4. Sanitary facilities are located within the same buildings and provided separately for men and women.

5. Density standards are expressed either in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface).

6. A minimum ceiling height of 2.10 metres is provided.

7. In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.

8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant.

9. There should be mobile partitions or curtains to ensure privacy.

10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light.

11. Separate sleeping areas are provided for men and women, except in family accommodation.

Additional issue

Irrespective of whether workers are supposed to keep their facilities clean, it is the responsibility of the accommodation manager to ensure that rooms/dormitories and sanitary facilities are in good condition.

Bed arrangements and storage facilities

The provision of an adequate numbers of beds of an appropriate size is essential to provide workers with decent, safe and hygienic conditions to rest and sleep. Here again, particular attention should be paid to privacy. Consideration should be given to local customs so beds could be replaced by hammocks or sleeping mats for instance.

Benchmarks

1. A separate bed for each worker is provided. The practice of "hot-bedding" should be avoided.

2. There is a minimum space between beds of 1 metre.

3. Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from to 0.7 to 1.10 metres.

4. Triple deck bunks are prohibited.

5. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding.

6. Bed linen is washed frequently and applied with repellents and disinfectants where conditions warrant (malaria).

7. Facilities for the storage of personal belongings for workers are provided. Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 metre of shelf unit.

8. Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.

D. Sanitary and toilet facilities

It is essential to allow workers to maintain a good standard of personal hygiene but also to prevent contamination and the spread of diseases which result from inadequate sanitary facilities. Sanitary and toilet facilities will always include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities should be kept in a clean and fully working condition. Facilities should also be constructed of materials that are easily cleanable and ensure privacy. Sanitary and toilet facilities are never shared between male and female residents, except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women.

Benchmarks

1. Sanitary and toilet facilities are constructed of materials that are easily cleanable.

2. Sanitary and toilet facilities are cleaned frequently and kept in working condition.

3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.

4. Sanitary and toilet facilities are not shared between men and women, except in family accommodation.

Toilet facilities

Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease.

Benchmarks

1. An adequate number of toilets is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.

2. Toilet facilities are conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located. Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.

Showers/bathrooms and other sanitary facilities

Hand wash basins and showers should be provided in conjunction with rooms/dormitories. These facilities must be kept in good working condition and cleaned frequently. The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging, drying and airing clothes. Suitable light, ventilation and soap should be provided. Lastly, hand washing, shower and other sanitary facilities should be located within a reasonable distance from other facilities and from sleeping facilities in particular.

Benchmarks

1. Shower/bathroom flooring is made of anti-slip hard washable materials.

2. An adequate number of handwash facilities is provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.

3. An adequate number of shower/bathroom facilities is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.

4. Showers/bathrooms are conveniently located.

5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.

E. Canteen, cooking and laundry facilities

Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. Adequate canteen, cooking and laundry facilities and equipments should also be provided. When caterers are contracted to manage kitchens and canteens, special attention should be paid to ensure that contractors take into account and implement the benchmarks below, and that adequate reporting and monitoring mechanisms are in place. When workers can individually cook their meals, they should be provided with a space separate from the sleeping areas. Facilities must be kept in a clean and sanitary condition. In addition, canteen, kitchen, cooking and laundry floors, ceilings and walls should be made of easily cleanable materials.

Benchmarks

1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials.

2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.

3. If workers can cook their own meals, kitchen space is provided separate from sleeping areas.

Laundry facilities

Providing facilities for workers to wash both work and non-work related clothes is essential for personal hygiene. The alternative is for the employer to provide a free laundry service.

Benchmarks

1. Adequate facilities for washing and drying clothes are provided. Standards range from providing sinks or tubs with hot and cold water, cleaning soap and drying lines to providing washing machines and dryers.

2. When work clothes are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.

Additional issue

When workers are provided with facilities allowing them to individually do their laundry or cooking, it should be the responsibility of each worker to keep the facilities in a clean and sanitary condition. Nonetheless, it is the responsibility of the accomodation manager to make sure the standards are respected and to provide an adequate cleaning, disinfection and pest/vector control service when necessary.

Additional issue

When the employer provides family accommodation, it is best practice to provide each family with a private kitchen or the necessary cooking equipment to allow the family to cook on their own.

Canteen and cooking facilities

Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements.

Benchmarks

1. Canteens have a reasonable amount of space per worker. Standards range from 1 square metre to 1.5 square metres.

2. Canteens are adequately furnished. Standards range from providing tables, benches, individual drinking cups and plates to providing special drinking fountains.

3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation.

4. Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.

5. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

6. All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.

7. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface.

8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.

9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.

F. Standards for nutrition and food safety

When cooking for a number of workers, hygiene and food safety are absolutely critical. In addition to providing safe food, providing nutritious food is important as it has a very direct impact on workers' productivity and well-being. An ILO study demonstrates that good nutrition at work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs.[10]

Benchmarks

1. The WHO 5 keys to safer food or an equivalent process is implemented (see Box 6 below).

2. Food provided to workers contains an appropriate level of nutritional value and takes into account religious/cultural backgrounds; different choices of food are served if workers have different cultural/ religious backgrounds.

3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.

Box 6 - Five keys to safer food

Keep clean	
Wash your hands before handling food and often during food preparation. Wash your hands after going to the toilet. Wash and sanitise all surfaces and equipment used for food preparation. Protect kitchen areas and food from insects, pests and other animals.	While most micro organisms do not cause disease, dangerous micro organisms are widely found in soil, water, animals and people. These micro organisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause food borne diseases.
Separate raw and cooked	
Separate raw meat, poultry and seafood from other foods. Use separate equipment and utensils such as knives and cutting boards for handling raw foods. Store food in containers to avoid contact between raw and prepared foods.	Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous micro organisms which may be transferred onto other foods during food preparation and storage.
Cook thoroughly	
Cook food thoroughly, especially meat, poultry, eggs and seafood. Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer. Reheat cooked food thoroughly.	Proper cooking kills almost all dangerous micro organisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.
Keep food at safe temperatures	
Do not leave cooked food at room temperature for more than 2 hours. Refrigerate promptly all cooked and perishable food (preferably below 5°C). Keep cooked food piping hot (more than 60°C) prior to serving. Do not store food too long even in the refrigerator. Do not thaw frozen food at room temperature.	Micro organisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of micro organisms is slowed down or stopped. Some dangerous micro organisms still grow below 5°C.
Use safe water and raw materials	
Use safe water or treat it to make it safe. Select fresh and wholesome foods. Choose foods processed for safety, such as pasteurised milk. Wash fruits and vegetables, especially if eaten raw. Do not use food beyond its expiry date.	Raw materials, including water and ice, may be contaminated with dangerous micro organisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Take care in selection of raw materials and implement simple measures such as washing.

Source: World Health Organization, Food Safety

www.who.int/foodsafety/publications/consumer/en/5keys_en.pdf

10. C. Wanjek (2005). "Food at Work – Workplace solutions for malnutrition, obesity and chronic disease", International Labour Organization, Geneva.

G. Medical facilities

Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. The availability or level of medical facilities provided in workers' accommodation is likely to depend on the number of workers living on site, the medical facilities already existing in the neighbouring communities and the availability of transport. However, first aid must always be available on site.

First aid facilities
Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones.

Other medical facilities
Depending on the number of workers living on site and the medical services offered in the surrounding communities, it is important to provide workers with additional medical facilities. Special facilities for sick workers and medical services such as dental care, surgery, a dedicated emergency room can, for instance, be provided.

Benchmarks

1. A number of first aid kits adequate to the number of residents are available.

2. First aid kits are adequately stocked. Where possible a 24/7 first aid service/facility is available.

3. An adequate number of staff/workers is trained to provide first aid.

4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are provided (nurse rooms, dental care, minor surgery).

Box 7 - UK/HSE First Aid facilities

What should be in a first aid kit?

There is no standard list and it very much depends on the assessment of the needs in a particular workplace:

- a leaflet giving general guidance on first aid, for example HSE leaflet *Basic advice on first aid at work*
- individually wrapped sterile adhesive dressings (assorted sizes)
- two sterile eye pads
- four individually wrapped triangular bandages (preferably sterile)
- six safety pins
- six medium-sized (approximately 12 cm x 12 cm) individually wrapped sterile unmedicated wound dressings
- two large (approximately 18 cm x 18 cm) sterile individually wrapped unmedicated wound dressings
- one pair of disposable gloves.

What should be kept in the first aid room?

The room should contain essential first aid facilities and equipment. Typical examples of these are:

- a sink with hot and cold running water
- drinking water and disposable cups
- soap and paper towels
- a store for first aid materials
- foot-operated refuse containers, lined with disposable yellow clinical waste bags or a container for the safe disposal of clinical waste
- a couch with waterproof protection, clean pillows and blankets
- a chair
- a telephone or other communication equipment
- a record book for recording incidents where first aid has been given.

Source: UK Health and Safety Executive

H. Leisure, social and telecommunication facilities

Basic leisure and social facilities are important for workers to rest and also to socialise during their free time. This is particularly true where workers' accommodation is located in remote areas far from any communities. Where workers' accommodation is located in the vicinity of a village or a town, existing leisure or social facilities can be used so long as this does not cause disruption to the access and enjoyment of local community members. But in any case, social spaces should also be provided on site. Exercise and recreational facilities will increase workers' welfare and reduce the impact of the presence of workers in the surrounding communities. In addition it is also important to provide workers with adequate means to communicate with the outside world, especially when workers' accommodation is located in a remote location or where workers live on site without their family or are migrants. Consideration of cultural attitudes is important. Provision of space for religious observance needs to be considered, taking account of the local context and potential conflicts in certain situations.

Benchmarks

1. Basic collective social/rest spaces are provided to workers. Standards range from providing workers multi-purpose halls to providing designated areas for radio, TV, cinema.

2. Recreational facilities are provided. Standards range from providing exercise equipment to providing a library, swimming pool, tennis courts, table tennis, educational facilities.

3. Workers are provided with dedicated places for religious observance if the context warrants.

4. Workers have access to public phones at affordable/public prices (that is, not inflated).

5. Internet facilities can also be provided, particularly where large numbers of expatriates/Third Country Nationals (TCNs) are accommodated.

Box 8 - Examples of social/leisure facilities

In Qatar there is a newly built 170-hectare complex which accommodates contractors and more than 35,000 workers for a project run by a major oil company. At the heart of this complex, the recreation area includes extensive sport facilities, a safety-training centre, an outdoor cinema and a park. The purpose of those facilities goes beyond providing adequate accommodation to the large numbers of contractors and workers on this project but is designed to provide the same level of services as a small town. The accommodation complex has a mayor, as well as a dedicated welfare team which is responsible for the workers' welfare, cultural festivals and also acts as the community's advocates.

II. Managing workers' accommodation

Once the living facilities have been constructed and are operational, effective ongoing management of living facilities is essential. This encompasses issues such as the physical maintenance of buildings, security and consultation with residents and neighbouring communities in order to ensure the implementation of the housing standards in the long term.

A. Management and staff

Worker camps and housing facilities should have a written management plan, including management policies or plans on health and safety, security, living conditions, workers' rights and representation, relationships with the communities and grievance processes. Part of those policies and plans can take the form of codes of conduct. The quality of the staff managing and maintaining the accommodation facilities will have a decisive impact on the level of standards which are implemented and the well-being of workers (for instance on the food safety or overall hygiene standards). It is therefore important to ensure that managers are competent and other workers are adequately skilled. The manager will be responsible for overseeing staff, for ensuring the implementation of the accommodation standards and for the implementation of the management plans. It is important the accommodation manager has the corresponding authority to do so.

If the facility is being managed by a contractor, as is often the case, the expected housing and management standards should be specified in the relevant contract, and mechanisms to ensure that those standards are implemented should be set up. As part of this process, the accommodation manager (or contractor) should have a duty to monitor the application of the accommodation standards and to report frequently on their implementation to the client.

Benchmarks

1. There are management plans and policies especially in the field of health and safety (with emergency responses), security, workers' rights, relationships with the communities.

2. An appointed person with the adequate background and experience is in charge of managing the workers' accommodation.

3. If contractors are being used, there are clear contractual management responsibilities and monitoring and reporting requirements.

4. Depending on the size of the accommodation, there is a sufficient number of staff in charge of cleaning, cooking and of general maintenance.

5. Such staff are recruited from the local communities.

6. Staff have received basic health and safety training.

7. Persons in charge of the kitchen are trained in nutrition and food-handling and adequately supervised.

B. Charging fees for accommodation and services

Charging fees for the accommodation or the services provided to workers such as food or transport should be avoided where workers do not have the choice to live or eat anywhere else, or if deemed unavoidable, should take into account the specific nature of workers' accommodation. Any charges should be transparent, discussed during recruitment and specified in workers' contracts. Any such charges should still leave workers with sufficient income and should never lead to a worker becoming indebted to an employer.

Benchmarks

1. When fees are charged, workers are provided with clear information and a detailed description of all payments made such as rent, deposit and other fees.

2. When company housing is considered to be part of workers' wages, it is best practice that workers are provided with an employment contract clearly specifying housing arrangements and regulations, in particular rules concerning payments and fees, facilities and services offered and rules of notice.

3. When fees are charged, the renting arrangements are fair and do not cost the worker more than a small proportion of income and never include a speculative profit.

4. Food and other services are free or are reasonably priced, never above the local market price.

5. The provision of accommodation or other services by employers as a payment for work is prohibited.

Additional issue

To avoid that fair renting arrangements turn into unfair ones, any deposit of advance should be set at a reasonable level and it is best practice that renting prices include a fixed fee covering the water needed and the use of the energy required to the functioning of the heating/cooling/ventilation/ cooking systems. However, in such cases it might be necessary to raise workers' awareness to ensure that workers will use the facilities responsibly, particularly in areas where water is scarce.

C. Health and safety on site

The company or body in charge of managing the workers' accommodation should have the prime responsibility for ensuring workers' physical well-being and integrity. This involves making sure that the facilities are kept in good condition (ensuring that sanitary standards or fire regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented.

Benchmarks

1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully designed and are implemented.

2. The person in charge of managing the accommodation has a specific duty to report to the health authorities the outbreak of any contagious diseases, food poisoning and other important casualties.

3. An adequate number of staff/workers is trained to provide first aid.

4. A specific fire safety plan is prepared, including training of fire wardens, periodic testing and monitoring of fire safety equipment and periodic drills.

5. Guidance on the detrimental effects of the abuse of alcohol and drugs and other potentially harmful substances and the risk and concerns relating to HIV/AIDS and of other health risk-related activities is provided to workers. It is best practice to develop a clear policy on this issue.

6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers.

8. Emergency plans on health and fire safety are prepared. Depending on the local context, additional emergency plans are prepared as needed to handle specific occurrences (earthquakes, floods, tornadoes).

D. Security of workers' accommodation

Ensuring the security of workers and their property on the accommodation site is of key importance. To this end, a security plan must be carefully designed including appropriate measures to protect workers against theft and attacks. Policies regarding the use of force (force can only be used for preventive and defensive purposes in proportion to the nature and the extent of the threat) should also be carefully designed. To implement those plans, it may be necessary to contract security services or to recruit one or several staff whose main responsibility is to provide security to safeguard workers and property. Before making any security arrangements, it is necessary to assess the risks of such arrangements to those within and outside the workers' accommodation and to respect best international practices, including IFC PS4 and EBRD PR4 and applicable law.[11] Particular attention should be paid to the safety and security of women workers.

Benchmarks

1. A security plan including clear measures to protect workers against theft and attack is implemented.

2. A security plan including clear policies on the use of force has been carefully designed and is implemented.

3. Security staff have been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders are recruited.

4. Security staff have a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers.

5. Security staff have received adequate training in dealing with domestic violence and the use of force.

6. Security staff have a good understanding about the importance of respecting workers' rights and the rights of the communities.

7. Body searches are only allowed in specific circumstances and are performed by specially trained security staff using the least-intrusive means possible. Pat down searches on female workers can only be performed by female security staff.

8. Security staff adopt an appropriate conduct towards workers and communities.

9. Workers and members of the surrounding communities have specific means to raise concerns about security arrangement and staff.

11. See for instance the Voluntary Principles on Security and Human Rights. www.voluntaryprinciples.org/principles

E. Workers' rights, rules and regulations on workers' accommodation

Freedoms and human rights of workers should be recognised and respected within their living quarters just as within the working environment. House rules and regulations should be reasonable and non discriminatory. It is best practice that workers' representatives are consulted about those rules. House rules and regulations should not prevent workers from exercising their basic rights. In particular, workers' freedom of movement needs to be preserved if they are not to become effectively "trapped". To this end it is good practice to provide workers with 24/7 access to the accommodation and free transport services to and from the surrounding communities. Any restriction to this freedom of movement should be limited and duly justified. Penalties for breaking the rules should be proportional and implemented through a proper procedure allowing workers to defend themselves and to challenge the decision taken. The relationship between continuing employment and compliance with the rules of the workers' accommodation should be clear and particular attention should be paid to ensure that housing rules do not create indirect limitation of the right to freedom of association. Best practice might include a code of conduct relating to the accommodation to be signed together with the contract of employment.

Box 9 - Dole housing plantation regulation in Costa Rica

In every plantation there is an internal accommodation regulation that every worker is required to sign together with his/her employment contract. That document describes the behaviour which is expected from workers at all times and basic rules such as the prohibition of alcohol and the interdiction to make noise after a certain time at night. In case there is any problem concerning the application of those internal rules, a set of disciplinary procedures which have been designed with the workers' representatives can be enforced. Workers are absolutely free to enter or leave the site and do not have any restrictions in relation to accessing their living quarters. Families are not allowed in the living quarters unless they have been registered for a visit.

Benchmarks

1. Restriction of workers' freedom of movement to and from the site is limited and duly justified. It is good practice to provide workers 24/7 access to the accommodation site. Any restrictions based on security reasons should be balanced by the necessity to respect workers' freedom of movement.

2. Where possible, an adequate transport system to surrounding communities is provided. It is good practice to provide workers with free transportation to and from local communities.

3. Withholding workers' ID papers is prohibited.

4. Freedom of association is expressly respected. Provisions restricting workers' rights on site should take into account the direct and indirect effect on workers' freedom of association. It is best practice to provide trade union representatives access to workers in the accommodation site.

5. Workers' gender and religious, cultural and social backgrounds are respected. In particular, workers should be provided with the possibility of celebrating religious holidays and observances.

6. Workers are made aware of their rights and obligations and are provided with a copy of the internal workers' accommodation rules, procedures and sanction mechanisms in a language or through a media which they understand.

7. Housing regulations, including those relating to allocation of housing, should be non-discriminatory. Any justifiable discriminatory rules – for example all-male dormitories – should be strictly limited to the rules which are necessary to ensure the smooth running of the worker camp and to maintain a good relationship with the surrounding communities.

8. Where possible, visitor access should be allowed.

9. Decisions should be made on whether to prohibit alcohol, tobacco and third party access or not from the camp and the relevant rules should be clearly communicated to all residents and workers.

10. A fair and non-discriminatory procedure exists to implement disciplinary procedures including the right of workers to defend themselves (see also next section).

F. Consultation and grievance mechanisms

All residents should be made aware of any rules governing the accommodation and the consequences of breaking such rules. Processes that allow for consultation between site management and the resident workers will assist in the smooth running of an accommodation site. These may include a dormitory or camp committee as well as formal processes that allow workers to lodge any grievances about their accommodation.

Benchmarks

1. Mechanisms for workers' consultation have been designed and implemented. It is best practice to set up a review committee which includes representatives elected by workers.

2. Processes and mechanisms for workers to articulate their grievances are provided to workers. Such mechanisms are in accordance with PS2/PR2.

3. Workers subjected to disciplinary proceedings arising from behaviour in the accommodation should have access to a fair and transparent hearing with the possibility to contest decisions and refer the dispute to independent arbitration or relevant public authorities.

4. In case conflicts between workers themselves or between workers and staff break out, workers have the possibility of easily accessing a fair conflict resolution mechanism.

5. In cases where more serious offences occur, including serious physical or mental abuse, there are mechanisms to ensure full cooperation with the police authority (where adequate).

Additional issue

Alcohol is a complex issue and requires a very clear policy from the workers' accommodation management. If a non-alcohol policy is taken, special attention should be paid to clearly communicate the interdiction, how it applies and the consequences for breaching this rule. Special attention should also be paid to enforce it adequately.

G. Management of community relations

Workers' living facilities have various ongoing impacts on adjacent communities. In order to manage these, it is good practice to design a thorough community relations management plan. This plan will contain the processes to implement the findings of the preliminary community impact assessment and to identify, manage, mitigate or enhance ongoing impacts of the workers' accommodation on the surrounding communities. Issues to be taken into consideration include:

- community development – impact of workers' camp on local employment, possibility of enhancing local employment and income generation through local sourcing of goods and services
- community needs – ways to identify and address community needs related to the arrival of specific infrastructures such as telecommunications, water sanitation, roads, health care, education, housing
- community health and safety – addressing and reducing the risk in the increase in communicable diseases, corruption, trade in illegal substances such as drugs, alcohol (in the Muslim context), petty crimes and other sorts of violence, road accidents
- community social and cultural cohesion – ways to mitigate the impact of the presence of large numbers of foreign workers, often males, with different cultural and religious background, ways to mitigate the possible shift in social, economic and political structures due to changes in access to income generation opportunities.

Benchmarks

1. Community relations plans addressing issues around community development, community needs, community health and safety and community social and cultural cohesion have been designed and implemented.

2. Community relations plans include the setting up of a liaison mechanism allowing a constant exchange of information and consultation with the local communities in order to identify and respond quickly to any problems and maintain good working relationships.

3. A senior manager is in charge of implementing the community relations management plan and liaising with the community.

4. The impacts of workers' accommodation on local communities are periodically reviewed, mitigated or enhanced.

5. Community representatives are provided with an easy means to voice their opinions and to lodge complaints.

6. There is a transparent and efficient process for dealing with community grievances, in accordance with PS1/PR10.

Box 10 - Examples of community relations management

Community consultation in the Baku-Tbilisi-Ceyhan (BTC) pipeline

The BTC pipeline's Environment and Social Management Plans incorporated a Worker Camp Management Plan to be implemented by the construction contractor. As part of ongoing community liaison over the project as a whole, community liaison officers were appointed for worker camps who were responsible for meeting regularly with communities, identifying issues and addressing community concerns. A particular responsibility was to review HR records and disciplinary logs at worker camps to assess that rules were being implemented effectively and that any community liaison after any incidents was effective.

Appendix 21: Drinking Water Standards

Group	National Standards for Drinking Water[a]			WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011[b]	Applicable Per ADB SPS [c, d]
	Parameter	Unit	Max. Concentration Limits[d]		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6. 5 – 8. 5	none	6. 5 – 8. 5
	Color	Hazen units	5 (15)	none	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2, 000)	-	500 (2, 000)
	Iron	mg/l	0. 3	-	0. 3
	Manganese	mg/l	0. 1 (0. 3)	-	0. 1 (0. 3)
	Arsenic	mg/l	0. 01 (0. 05)	0. 01	0. 01
	Cadmium	mg/l	0. 003	0. 003	0. 003
	Chromium	mg/l	0. 05	0. 05	0. 05
	Cyanide	mg/l	0. 05	none	0. 05
	Fluoride	mg/l	1 (1. 5)	1. 5	1 (1. 5)
	Lead	mg/l	0. 01	0. 01	0. 01
	Ammonia	mg/l	0. 5	none established	0. 5
Chemical	Chloride	mg/l	250 (1, 000)	none established	250 (1, 000)
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0. 05 (1. 5)	2	0. 05 (1. 5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0. 001	0. 006	0. 001
	Aluminum	mg/l	0. 1 (0. 3)	none established	0. 1 (0. 3)
	Residual Chlorine	mg/l	0. 2	5	0. 2
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			
Group	**National Standards for Drinking Water[a]**			**WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011[b]**	**Applicable Per ADB SPS [c, d]**
	Parameter	**Unit**	**Max. Concentration Limits[d]**		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6. 5 – 8. 5	none	6. 5 – 8. 5
	Color	Hazen units	5 (15)	none	5 (15)

Group	National Standards for Drinking Water[a]			WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011[b]	Applicable Per ADB SPS [c, d]
	Parameter	Unit	Max. Concentration Limits[d]		
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2, 000)	-	500 (2, 000)
	Iron	mg/l	0. 3	-	0. 3
	Manganese	mg/l	0. 1 (0. 3)	-	0. 1 (0. 3)
	Arsenic	mg/l	0. 01 (0. 05)	0. 01	0. 01
	Cadmium	mg/l	0. 003	0. 003	0. 003
	Chromium	mg/l	0. 05	0. 05	0. 05
	Cyanide	mg/l	0. 05	none	0. 05
	Fluoride	mg/l	1 (1. 5)	1. 5	1 (1. 5)
	Lead	mg/l	0. 01	0. 01	0. 01
	Ammonia	mg/l	0. 5	none established	0. 5
Chemical	Chloride	mg/l	250 (1, 000)	none established	250 (1, 000)
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0. 05 (1. 5)	2	0. 05 (1. 5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0. 001	0. 006	0. 001
	Aluminum	mg/l	0. 1 (0. 3)	none established	0. 1 (0. 3)
	Residual Chlorine	mg/l	0. 2	5	0. 2
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			

[a] Bureau of India Standard 10500: 2012.

[b] Health-based guideline values.

[c] Per ADB SPS, the government shall achieve whichever of the standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

[d] Figures in parenthesis are maximum limits allowed in the absence of alternate source. IS10500 :2012 indicates these values in parenthesis may be tolerated only if there are no other sources that could meet the base acceptable limit.

Appendix 23: Consultations Conducted During Project/ IEE Preparation

S. No	Number of Person consulted	Male	Female	Issues Discussed	Outcome
1	52	42	10	Present water supply and sewerage system of the town, Project components, sewerage system, property connection, Willingness to pay	Public in general were satisfied with the components identified and assured for required support. , People are willing to pay for the improved services of water and sewerage in the town.

A. Public Consultation in Mandawa Dated 08/10/2018

S. No	Name of Persons	Location	Topic Discussed	Outcome
1	Gopal, Krishan Kumar, Lal Chand Saini, Mahaveer Singh, Dr. P. S. Dhaka, Bahadur Singh & Cap. Raj Singh Dhaka	Near CWR, PH & SPS Near PHED Office	Awareness of the project–including Project Coverage area, Present condition of water supply Present drinking water problem-quantity and quality Present condition of Sewerage in the town Presence of any forest, wild life or any sensitive/unique environmental components nearby the project, Presence of historical/ cultural/ religious sites nearby. Unfavorable climatic condition Occurrence of flood, earthquake etc. Present solid waste collection and disposal problem Foul Smell and vector borne diseases problem Dust and noise pollution and disturbances during construction work	Some people are aware of the proposed Project. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor. People demand 24x7 supply connections to be provided to their area under the proposed. Present water supply is from tube wells and lift canal, supply is very erratic. The water quality of tube well is poor. People are concerned about the poor sewerage conditions in the town. There is not any forest, wildlife or any sensitive /unique environmental, component nearby the project. There are not any historical/cultural and religious sites in nearby the subproject area. Climate is dry except during monsoon season.

S. No	Name of Persons	Location	Topic Discussed	Outcome
			Safety of residents during construction phase and applying of vehicle for construction activities. Availability of Labour during construction time Perception of villagers on tree felling and afforestation. Requirement of enhancement of other facilities Treated water management released from STP Willingness to pay for improved services	No Natural disaster /incidences occurred such as flood and earthquake in recent past. Solid waste collection facility is poor in this area. By the proposed SPS, the problems of foul smell and vector borne diseases will be mitigate. Contractor should use modern machinery and water sprinkler system to control dust and noise during construction phase. PPE's such earmuff will be provided to labour engaged at site. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPPC and outreach team of contractor before start of work in particular area. Sufficient labour is available in nearby communities. People requested to engage the local people during construction phase. They want afforestation programme to be carried out in the RSTDIP to increase the green cover. The local feels that Parks play grounds and community halls are required in this town and in addition.

S. No	Name of Persons	Location	Topic Discussed	Outcome
				Treated water will be reuse in agricultural activities in nearby area. People are willing to pay for improved services in the town.
2	Ramdev Tanwar, Surendra Kumar, Mohammad Javed, Akid, Sazid Khan, Sharuk Khan & Mohammad Hanif	Near STP Bisau Road	Awareness of the project-including Project Coverage area, Present condition of water supply & Sewerage Present condition of water supply In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Presence of historical/ cultural/ religious sites nearby. Occurrence of flood/earthquake if any Drainage and sewerage problem facing. Present drinking water problem-quantity and quality Present solid waste collection and disposal problem. Safety of residents during construction phase and applying of vehicle for construction activities. Dust and noise pollution and disturbances during construction work Foul smell and vector borne diseases problem in the nearby area Treated water management Sludge management Requirement of enhancement of other facilities Willingness to pay for improved services	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage & water quality conditions. Water quality is not fit for drinking. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor. People demand 24x7 supply connections to be provided to their area under the proposed. They want to engage with the project as a job opportunity and want to become beneficiaries. There is no such environmental sensitive components in the vicinity of project area. No historical/ cultural religious sites nearby the subproject area. No such incidences of natural disaster such as flood and earthquake occurred in recent past. Drainage and Sewerage are major problems in this area. These should be sort out immediately. Presently water supply is from tube wells and lift

S. No	Name of Persons	Location	Topic Discussed	Outcome
				canal and supply is erratic. The water quality of tube well is poor & not fit for drinking. Solid waste collection facility is poor in this area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPPC and outreach team of contractor before start of work in particular area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. Foul smell and vector borne diseases will be controlled or removed by the treatment and management of city sewage. Treated water from STP will be used in Agricultural activities etc. Sludge will be use as manure in agriculture. The locals feels that Parks, play grounds and Community halls are required in this town and in addition. People are interested to pay for improved services in the town.

Photographs of Public Consultation
















Near STPsite nearBissau Road



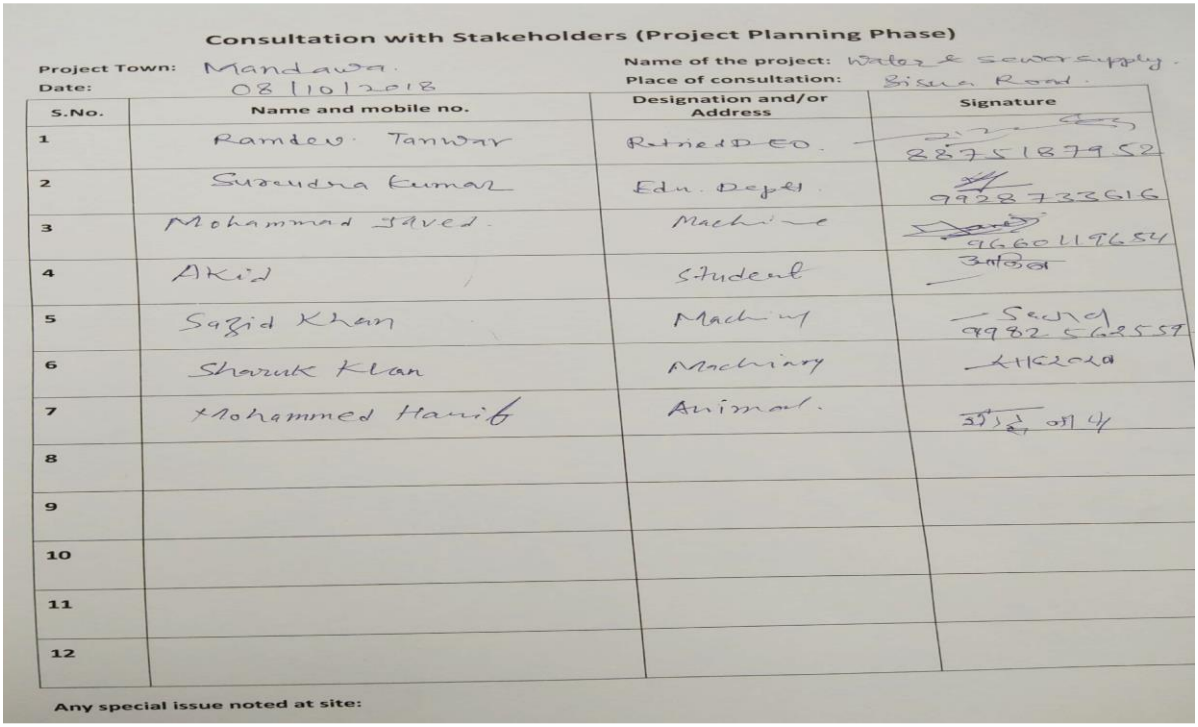







Near CWR, PH & SPS (Near PHED J. En. Office)

Attendance Sheet



Consultation with Stakeholders (Project Planning Phase)

Project Town: Mandawa. Name of the project: Water & Sewer Supply.
Date: 08/10/2018 Place of consultation: Bisau Road.

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	Ramdev Tanwar	Retired EO.	8875187952
2	Surendra Kumar	Edu. Deptt.	9928733616
3	Mohammad Javed	Machine	9660119654
4	Akil	Student	
5	Sajid Khan	Machine	Sajid 9982562559
6	Sharuk Khan	Machinary	8/10/2018
7	Mohammed Hanif	Animal.	
8			
9			
10			
11			
12			

Any special issue noted at site:

Consultation with Stakeholders (Project Planning Phase)

Project Town: Mandawa. Name of the project: Sewer & Water

Date: 8/10/2018 Place of consultation: (CWR, SPS, PH)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	Gopal	Shop	9887017
2	Krishan Kumar	pandit ji.	32
3	Lal Chand Saini	shop.	Lal
4	Yogesh	shop.	
5	Mahveer singh	Showroom	9119127015
6	Dr. P.S. Dhaka	Weightkanta.	9413049265
7	Bhadwar Singh.	"	
8	~~Bulakhpandeta~~ Capt Rajsingh Dhaka	"	
9			
10			
11			
12			

Any special issue noted at site:

B. Consultations Conducted in July 2018

S. No	Nameof Persons	Location	Topic Discussed	Outcome
1	Radheyshyam Dhabhai, Chairman, Sandip Sharma, Ward Parshad, Ward no. 6 Bharat Kumar Haritwal, Executive Officer, Kapil Sharma, Computer operator, (All from Mandawa Nagar Palika Mandal)	Office of Nagar Palika Mandal, Mandawa	Present water supply in town, Understanding about the project, Religious place in Mandawa town, Industrial development in town, employment status Solid Waste Management conditions Wild life (flora and fauna) found in town Transport facilities History and culture	• It was informed that presently Water Supply is being done alternate day, for half hour to one hour • People are not aware about the project but Nagar Palika Mandal is well aware about the project • No sewerage system in the town, septic tank being used. • Solid waste management in town is done through 5 SW collection and transport tipper, SW is collected manually from houses and dumped open at Aikhyan Beed • Congested roads in old city • Road transport is the only means of transport, nearest railway stations is at Mukundgarh (30 Kms) from Mandawa • Mostly agriculture and business activities exist in town. No industrial development in Mandawa only small business and handicrafts works in town • There are many old heritage private buildings in town and Mandawa is famous for heritage and tourism among foreigners and famous for may hindi and regional film shootings
2	Mr. Nitesh Jangid, J. En. , Neki Ram Pump Operator, Keshav Dev, Pump operator,	1.	• Present Status of Water Supply in the town • Work Proposed by RUIDP • Quality of present Water Supply and present sewerage system • Willingness to pay for improved services	• Present system of water supply is very old and OHSRs and CWR along with pumping machinery is very old due to which there is need of refurbishment or replacement of these structures, and pipe lines are profusely leaking and there is huge loss of water. • People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. • People are not aware about the project but supportive of the project. • People are willing to pay for improved services. • No sewerage system exist in town

S. No	Nameof Persons	Location	Topic Discussed	Outcome
3	Sattar Khan, Sakaru, Bablu	Bishan Chouraha	• Present Status of Water Supply in the town • Work Proposed by RUIDP • Quality of present Water Supply. • Status of Sewerage • Willingness to pay for improved services	• People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. There is no sewerage system in the town. • People are supportive of the project. • People are willing to pay for improved services.
4	Kamlesh, Arjun	Near Nagar Palika	• Present Status of Water Supply in the town • Work Proposed by RUIDP • Quality of present Water Supply. • Status of Sewerage • Willingness to pay for improved services	• Water supply is intermittent and on alternate days. No sewerage in town. • People are willing to pay for the improved quality of water.
5	Nathumal, Ganeshjee Saini, Sanju Saini, Molaram Saini, Sitaramjee Saini, Motilal, Sitaramjee, Ladduram, Mubarak, Ramkumar, Ramesh, Khatun, Amar Singh	Main Market	• Present Status of Water Supply in the town • Work Proposed by RUIDP • Quality of present Water Supply. • Status of Sewerage • Willingness to pay for improved services	• People are supportive of the project and indicated their willingness to participate in the project to make it successful. (especially women) • People understand direct benefits along with latent benefits of the project

Photographs of consultations



Consultation at PHED campus



Consultation at PHED campus



Consultation with Executive Officer of Nagar Palika Mandal, Mandawa



Public consultations at town



Consultations with vendors in the town

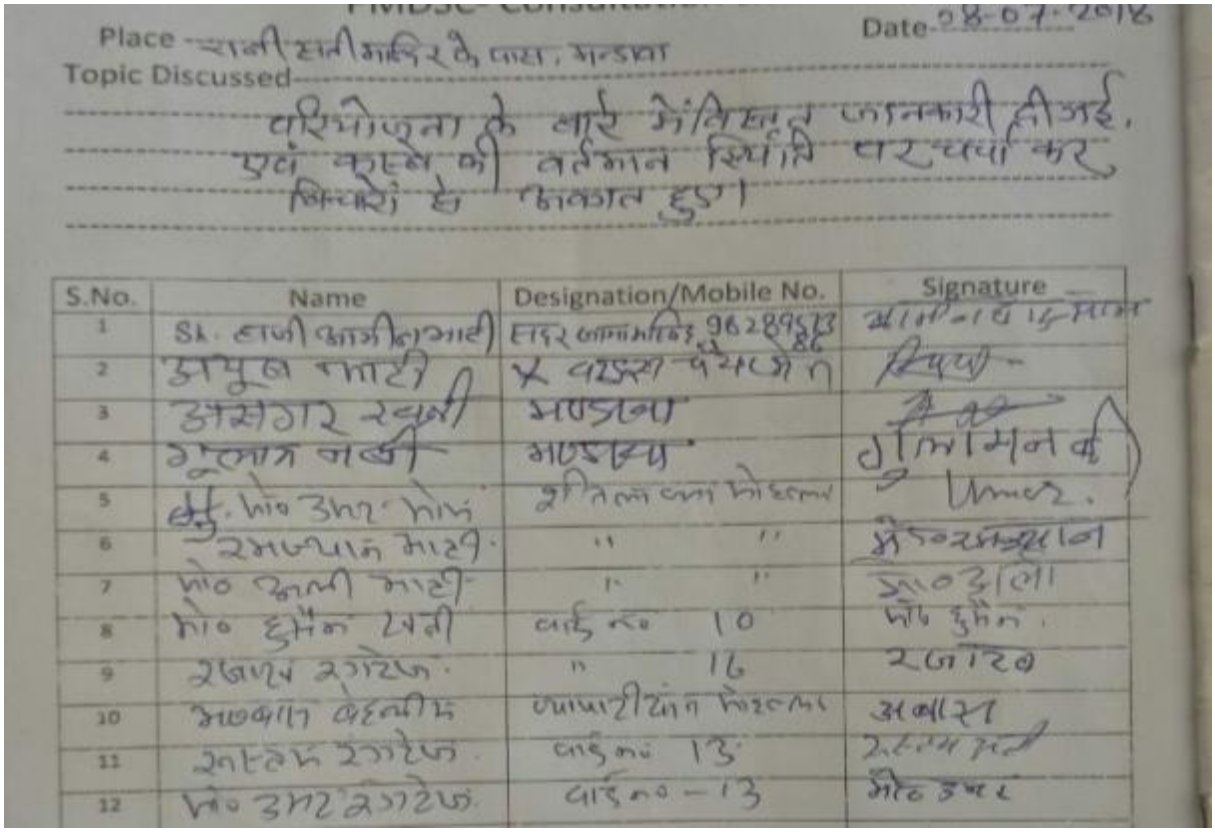


Consultations with vendors in the town

Public consultation at Mandawa

<table>
<tr><td colspan="2">   </td></tr>
<tr><td colspan="2">Public consultation at Rani Sati Mandir on dt 08. 07. 2018</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Public consultation at Sunrise Circle on dated 08. 07. 2018</td><td>Consultation with Roadside Vendors near Nagar Palika</td></tr>
</table>

Attendance Sheet



PMDSC- Consultation

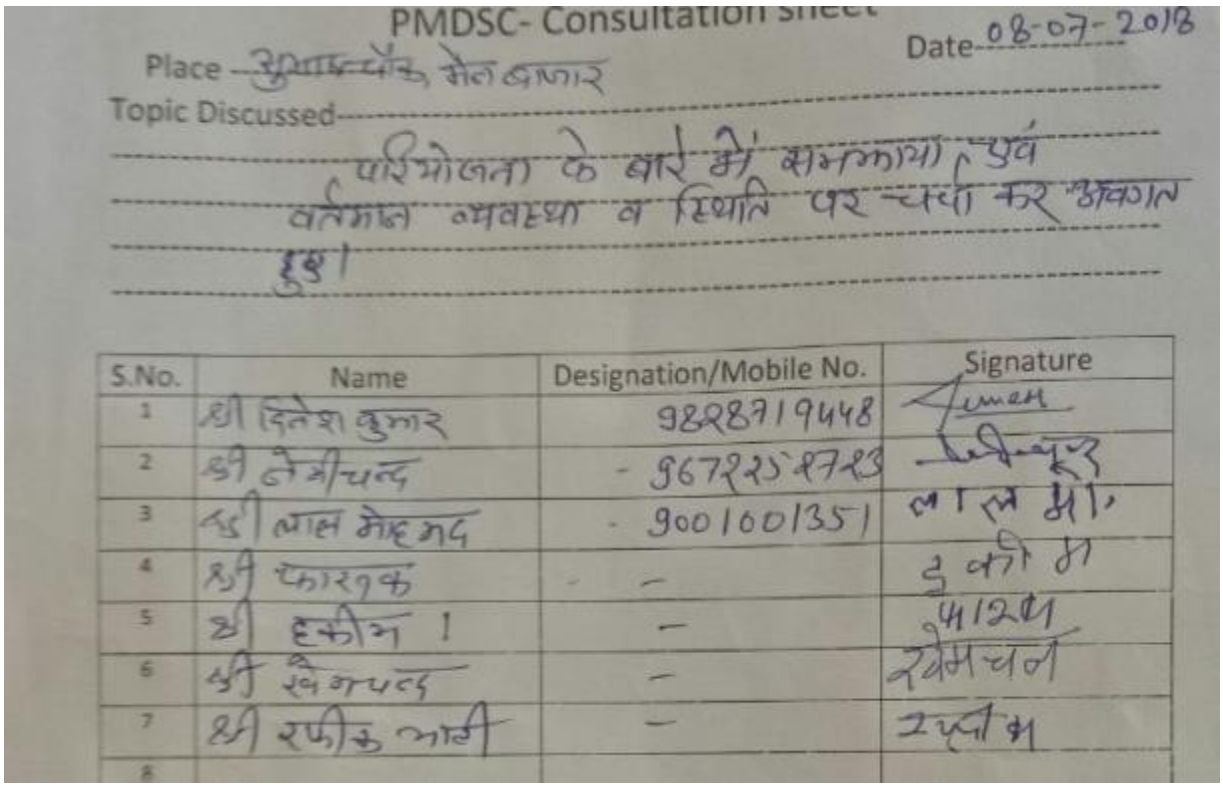
Place -छानी हनी मंदिर के पास, मन्डया

Date-28-07-2018

Topic Discussed-

परियोजना के बारे में विस्तृत जानकारी दी गई, एवं क्षेत्र की वर्तमान स्थिति पर चर्चा कर विचारों से अवगत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	Sh. हाजी कासीमभाई	सदर जमातमंडिर, 9825495386	
2	अयुब भाटी	X वार्डस पंचायत सदस्य	
3	असगर रंगरी	मण्डया	
4	गुलाम नबी	मण्डया	
5	श्री. मो० उमर भोमं	ट्रीतला वार्ड मोहल्ला	
6	रमजान भाटी	" "	
7	मो० अली भाटी	" "	
8	मो० हुसैन रंगरी	वार्ड नं० 10	
9	रजाक रंगरेज	" 16	
10	मुख्तार वहनीक	व्यापारीयान मोहल्ला	
11	अकबर रंगरेज	वार्ड नं 13	
12	मो० उमर रंगरेज	वार्ड नं० - 13	



PMDSC- Consultation sheet

Place -~~जुमाखाँ~~ मेल बाजार

Date-08-07-2018

Topic Discussed-

परियोजना के बारे में समझाया एवं वर्तमान अवस्था व स्थिति पर चर्चा कर अवगत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	श्री दिनेश कुमार	9828719448	
2	श्री हेमीचन्द	- 9672253723	
3	श्री लाल मोहम्मद	- 9001001351	
4	श्री फारुक	-	
5	श्री हकीम	-	
6	श्री खेमचन्द	-	
7	श्री रफीक भाई	-	
8			

Appendix 24: Minutes of City level Stakeholder Committee (CLC) Meeting

City Level Committee (CLC) meeting was held on 02. 01. 2018 in Jhunjhunu under chairmanship of District Collector, in which various stakeholders- public representatives, officials of Municipal council, RUIDP, PHED etc, were present. RUIDP officers explained about the proposed works in Mandawa under RUIDP Phase-IV. All the members were agreed about the the proposed works. Their suggestions were noted by the DPR consultants and RUIDP to incorporate in detail designs. CLC members given their consent about the proposed works. Minutes of CLC meeting is attached as under-

Photographs of CLC meeting for Mandawa at Jhunjhunu





Newspaper Coverage of CLC meeting



अबकी खबर

आरयूआईडीपी के चौथे चरण में होने वाले कार्यों को लेकर कलेक्टर की अध्यक्षता में हुई बैठक

मंडावा में 116 करोड़ की सीवरेज का काम फरवरी में शुरू होगा

35 करोड़ 32 लाख से बनेगा वाटर सप्लाई प्रोजेक्ट

Minutes of CLC Meeting held at Jhunjhunu on 02. 01. 2018

राजस्थान सरकार

कार्यालय अधीक्षण अभियन्ता आर.यू.आई.डी.पी. फैज III झुन्झूनूं (राज.)

C/o श्री जगमाल सिंह लाम्बा, वार्डनं. 10, तहसील के पास, झुन्झूनूं(राज.)

कमांक 1219-33 दिनांक 11/01/2018

मीटिंग कार्यवाही विवरण

श्रीमान जिला कलक्टर की अध्यक्षता में दिनांक 02.01.2018 को जिला परिषद सभागार में शहर खेतडी एवं मण्डावा में पेयजल एवं सिवरेज कार्यो की डीपीआर हेतु सीएलसी की मीटिंग आयोजित की गई जिसमें निम्नलिखित अधिकारी/प्रतिनिधि उपस्थित हुये:-

श्री दिनेश कुमार यादव,	जिला कलेक्टर, अध्यक्ष
➢ श्री पूरणमल सैनी	विधायक खेतडी
➢ श्री नरेन्द्र कुमार खीचड	विधायक मण्डावा
➢ श्री राधेश्याम	सभापति नगरपालिका मण्डावा
➢ श्री उमाराव सिंह	सभापति नगरपालिका खेतडी
➢ डॉ डी.आर. जांगिड़	अधीक्षण अभियन्ता (WW) आरयूआईडीपी जयपुर
➢ प्रवीण आंकोदिया	अधीक्षण अभियन्ता (WS) आरयूआईडीपी जयपुर
➢ श्री मोहनलाल मीना	अधीक्षण अभियंता, आरयूआईडीपी झुन्झुनू
➢ श्री सी0एल0जाटव	अधीक्षण अभियन्ता जन स्वा0 अभि0 विभाग झुन्झुनू
➢ श्री रमेश चन्द्र सैनी	अधिशाषी अभियंता, आरयूआईडीपी झुन्झुनू
➢ श्री अनिल जोनवाल	अधिशाषी अधिकारी नगरपालिका खेतडी
➢ श्री भरत कुमार	अधिशाषी अधिकारी नगरपालिका मण्डावा
➢ श्री रणवीर सिंह	सूचना अधिकारी झुन्झुनू
➢ श्री विनय कुमार	सहायक अभियंता, जन स्वा0 अभि0 विभाग खेतडी
➢ श्री मोहन तंवर	कन्सलटैट सीटीएस जयपुर
➢ श्री घड़सीराम सैनी	सहायक अभियंता, पीएचईडी उपखण्ड सूरजगढ
➢ श्री धर्मेन्द्र सिंह	पार्षद खेतडी
➢ श्री महेन्द्र सिंह	केयूएमएस
➢ श्री सुरजीत सरण	एसडीई सीएपीसी झुन्झुनू

श्रीमान अध्यक्ष महोदय की आज्ञा से श्री प्रवीण आंकोदिया अधीक्षण अभियन्ता (WS) आरयूआईडीपी जयपुर ने डीपीआर के विभिन्न घटकों/अवयवों के बारे में विस्तार से अवगत करवाया तथा डीपीआर (खेतडी राशि रू0 87.94 करोड एवं मण्डावा राशि रू0 115.71 करोड)के अनुमोदन हेतु उपस्थित सदस्यों से निवेदन किया। उपस्थित समस्त अधिकारीगण एवं प्रतिनिधिगणों द्वारा डीपीआर का ध्वनिमत में अनुमोदन किया गया।

अन्त में बैठक में उपस्थिति सभी अधिकारीगण/प्रतिनिधिगण का आभार व्यक्त किया गया।
मीटिंग कार्यवाही विवरण श्रीमान जिला कलक्टर झुन्झुनू से अनुमोदित है।

अधीक्षण अभियन्ता
आरयूआईडीपी फैज III झुन्झुनू

कमांक 1219-33 दिनांक 11/01/2018

1. माननीया सांसद महोदया,संसदीय क्षेत्र झुन्झुनू
2. श्रीमान पुलिस अधीक्षक झुन्झुनू।
3. माननीय विधायक महोदय, विधानसभा क्षेत्र मण्डावा/खेतडी
4. निजी सचिव ,श्रीमान परियोजना निदेशक आरयूआईडीपी जयपुर।
5. सभापति, नगरपालिका, मडावा/खेतडी
6. अधिशाषी अधिकारी, नगरपालिका, मडावा/खेतडी
7. अधीक्षण अभियन्ता जन स्वा0 अभि0 विभाग (वृत/प्रोजेक्ट)
8. अधीक्षण अभियंता, सार्वजनिक निर्माण विभाग, झुन्झुनू
9. नगर नियोजक , झुन्झुनू
10. स्थानीय गैर सरकारी संस्थान प्रतिनिधि/सीबीओस

अधीक्षण अभियन्ता
आरयूआईडीपी फैज III झुन्झुनू

English Transcript of Minutes of CLC meeting for Mandawa

No:1219-33 Dtd. 11. 01. 2018

Minutes of Meeting

CLC meeting was held for Khetri and Mandawa towns under the chairmanship of District Collector, Jhunjhunu in conference hall of Municipal Council, in which following members were present-

Mr. Dinesh Kumar Yadav-	District Collector, Chairman
Mr. Puranmal Saini-	MLA, Khetri
Mr. Narendra Kumar Khichad-	MLA, Mandawa
Mr. Radheysham-	Chairman, Municipal Council, Mandawa
Mr. Umrao Singh-	Chairman, Municipal Council, Khetri
Dr. D. R. Jangid-	SE, WW, RUIDP, Jaipur
Mr. Praveen Ankodia-	SE, WS, RUIDP, Jaipur
Mr. Mohanlal Meena-	SE, RUIDP, Jhunjhunu
Mr. C. L. Jatav-	SE, PHED, Jhunjhunu
Mr. Ramesh Chandra Saini-	Executive Engineer, RUIDP, Jhunjhunu
Mr. Anil Jonwal-	Executive Officer, Municipal Council, Khetri
Mr. Bharat Kumar-	Executive Officer, Municipal Council, Mandawa
Mr. Ranvir Singh-	District Information Offier, Jhunjhunu
Mr. Vinay Kumar-	Assistant Engineer, PHED, Khetri
Mr. Mohan Tanwar-	Consultant, CTS, Jaipur
Mr. Ghadsiram Saini-	Assistant Engineer, PHED, sub-division, Surajgarh
Mr. Dharmendra Singh-	Councilor, Khetri
Mr. Mahendra Singh-	KUMS
Mr. Surjeet Saran-	SDE, CAPC, Jhunjhunu

Mr. Praveen Ankodia, SE, WS, RUIDP, Jaipur explained in detail about the various project components of DPR of Khetri (87. 94 crore)and Mandwa (115. 71 crore) and requested for its approval from all the attendees. All the officers and representatives approved the DPR.

Vote of thanks given to all the officers and representatives at the end of meeting.

These minutes bears approval of District Collector, Jhunjhunu.

Signed by
SE, RUIDP Phase-III, Jhunjhunu

Appendix 25: Semi Annual Environmental Monitoring Report Format

I. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status

- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[a]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[a] If on-going construction, include %physical progress and expected date of completion.

II. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[a]

Package No.	Subproject Name	Statutory Environmental Requirements[b]	Status of Compliance[c]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[d]

[a] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[c] Specify if obtained, submitted and awaiting approval, application not yet submitted.

[d] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

(i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

(ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)[a]

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						

[a] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/EMP

No.	Sub-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 and Additional Measures Required

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. 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 (Monitoring Results)			
			PM10 µg/m^3	PM2.5 µg/m^3	SO2 µg/m^3	NO2 µg/m^3

Surface Water Quality Results

S. No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Turbidity			
3.	Total Hardness			
4.	DO			
5.	BOD			
6.	COD			
7.	Chloride			
8.	Iron			
9.	TSS			
10.	Arsenic			
11.	Cadmium			

12.	Fluoride			
13.	Potassium			
14.	Sodium			
15.	Calcium			
16.	Zn			
17.	Cr^{+6}			
18.	Magnesium			
19.	Copper			
20.	Manganese			
21.	Sulphate			
22.	Cyanide			
23.	Nitrate			
24.	Lead			
25.	Boron			
26.	Selenium			
27.	Aluminium			
28.	Totalresidual Chlorine			

Ground Water Quality Results

S. No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Total Alkalinity			
3.	Total Hardness			
4.	Chloride			
5.	Iron			
6.	TDS			
7.	Arsenic			
8.	Fluoride			
9.	Zn			
10.	Cr+6			
11.	Copper			
12.	Manganese			
13.	Sulphate			
14.	Phosphate			
15.	Nitrate			
16.	Lead			
17.	Phenolic Compound			

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

VII. ASBESTOS MANAGEMENT

Information on encountered or potential asbestos materials and capacity building activities on project sites should be included in this section.

FORM I – ASBETOS INVENTORY, INSPECTION AND ACTION FORM **Format: RUIDP/IIA/ LOCATION/NAME OF DBO CONTRACTOR/HSE 002/YEAR**		
Location:		
Site coordinates:		
Elevation:	**Team:**	
Date of visit:	**Sign:**	
Present Status		Indicate if installed, operational, in storage, etc.
Original age		Months or years since installation
Diameter		mm or inches
Length		meters
Volume		
Total packet		
Packing date		
Disposal date		
Existing Site (Photo or illustrations):		
Illustration/ Design of Activities On-site with respect to existing asbestos (include details such as size of new pipes, distance from existing AC pipes, other notable observations)		
DBO Contractor Handling Asbestos:		
Number of persons handling waste		
Medical Records		
Safety Gears		
Vocational Training Last Conducted: Number of attendees: Conducted by Schedule:		
Required Actions:		
Remarks		
Conclusion/Remark **HSE Signatory**		

MATRIX FOR TRAINING & RECORDS

Format: RUIDP/INSP. MATRIX/LOCATION/NAME OF DBO CONTRACTOR/HSE 001/YEAR			
S. No.	**Aspects of Asbestos Materials**	**Check points**	**Remarks**
Training Schedule:			
Trainer Details:			
Date/Location of Training:			

Number of attendees:				
Training Schedule, Training Materials & Attendance Sheet, Feedback of Trainees.				
Understanding of:				
C. DOCUMENTS AND RECORDS				
4.	Site Inventory			
5.	List of Asbestos materials storage and installation points			
6.	Structure of Asbestos materials management committee			
D. INVENTORY				
1.	Inventory of Asbestos materials			
	Number of Asbestos materials/ pipes			
	Dimensions of Asbestos materials/ pipes			
	Total volume of Asbestos materials/ pipes			
2.	Storage facility/ installation location:			
A.	In-use	Location		
		Condition	Intact/ damaged	
		Purpose		
		Accessibility by the workers		
		Evidence of physical damage and approximate size (length, width, volume) without coming into contact with The damaged Asbestos materials		
		Impacts on the environment (Based on Asbestos fiber Monitoring)		
3.	**LABELING AND SIGNAGE**			
	Notification to workplace safety and health			
	Working instruction			
	The risks associated with exposure to asbestos fibers			
	Cautionary statement to not disturb materials containing asbestos			
4.	**PERSONAL PROTECTIVE EQUIPMENT (PPE)**			
	Record of PPE			
	Mask			
	Eye glasses			
	Gloves			
	Ear muffs			
	Others			
	Training			
	On occupational risks of asbestos to the workers		Date: Time: In-house/ external: Faculty: No of workers attended:	
	Training for maintenance, repair and renovation		Date: Time:	

		In-house/ external: Faculty: No of workers attended:
	Training for workers working with asbestos	Date: Time: In-house/ external: Faculty: No of workers attended:
	Periodic air quality monitoring records	• Within the permissible limits • Not within the permissible limits (specify the reason)
	Workers medical check-up records	Date: In-house/ external: Performed by: Remarks: No of workers attended:
Conclusion/Remark: **EHS Officer Signatory:**		

ASBESTOS MANAGEMENT
In-situ Storage of Asbestos materials

S. No	Activity	Number of Stacks	Area occupied	Details of Asbestos materials Pipes	Day/month/year Of storage
Site History					
For existing Stacks, details of re-handling of pipes in number or volume to be mentioned under supervision of Authorized Experts.					
Details of Location of re-handled Asbestos materials storage, new area should be • Minimum 10-15 ft away from campus habituation. • 250m away from the water sources • 500-800m away from Children play area • The area should be isolated and covered from all the sides with restricted Access for Authorised Experts Only. • Register to be maintained for Entry& Exit of personals. • Register to be maintained for Entry & Exit of Asbestos materials					

• Labels to be displayed in legible format • Specific training of Asbestos materials to be inducted in the Asbestos materials storage area for residing population in the campus.
Details of transit storage of Asbestos materials to be maintained as per norms in an isolated storage room full covered

VIII. 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
- Other

Appendix 26: Sample Environmental Site Inspection Report

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER:

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable(NA) / Partially Implemented (PI)	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc. ,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as & when required only	
Tarpaulins used to cover sand & other loose material when transported by vehicles	
After unloading, wheels & undercarriage of vehicles cleaned prior to leaving the site	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying & backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided & public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	

Children safety measures(barricades, security)in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard & safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Monitoring Items	**Compliance**
Toilet facility provided at the site	
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet & bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

_____

Sign off

_____ _____

Name **Name**
Position **Position**

Appendix 27: Environmental Monitoring for Ambient Air, Noise, Water and soil

1. Under RUIDP works Environmental Monitoring will done for ambient air, noise, surface water, ground water and soils with following parameters-
   A. Ambient Air Quality- Particulate Matters PM_{10}, Particulate Matter $PM_{2.5}$, SO_x, NO_x, Carbon Monoxide (CO) as per methods and norms approved by CPCB
   B. Ambient Noise Quality- L_{day} and L_{night} (in LeqdBA) 24 hrs basisas per methods and norms approved by CPCB
   C. Surface Water Quality- pH, Turbidity, Total Hardness, DO, BOD, COD, Chloride, Hg, Iron, TDS, TSS, Calcium, Zn, Cr^{+6}, Magnesium, Copper, Manganese, Sulphate, Cyanide, Nitrate, Sodium, Potassium, Fluoride, Cadmium, Arsenic, Lead, Boron, Selenium, Aluminium, Total residual Chlorine
   D. Ground Water Quality- pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Suplhate, Nitrate, Fluiride, Hg, Cadmium, Cr^{+6}, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound
   E. Soil quality- pH, Elect. Conductivity (at 25^0C), Moisture (at 105^0C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO4), Potassium (as K), Organic Matter, oil and grease
2. During pre-construction stage monitoring is required to establish baseline at following sites-

Environmental Monitoring in Pre-Construction Period

S. N.	Type of monitoring	Location of monitoring and no. of samples	Total No. of samples
1	Ambient Air Monitoring	STP site -1 CWR site – 1 SPS-1 (PHED Campus beside SPS site) Pipe laying site within the town preferably near sensitive receptor - 1	4
2.	Ambient Noise monitoring	STP site -1 CWR site – 1 SPS-1(PHED Campus beside SPS site) Pipe laying site within the town preferably near sensitive receptor - 1	4
3	Ground Water quality	STP site -1 CWR site – 1 SPS-1	3
4.	Soil Quality	STP site -1 CWR site – 1 SPS-1	3

3. During construction stage below monitoring should be done on minimum quarterly basis at the following sites-

Environmental Monitoring in Construction Period

Proposed sites	Ambient Air quality	Ambient Noise quality	Surface water quality	Ground Water Quality	Soil Quality
STP site	One	One	Nil	One	One
CWR site	One	One	Nil	One	One
Pipe laying site within the town preferably near sensitive receptor*	One	One	Nil	Nil	Nil
Construction camp/storage yards	One	One	Nil	One	One
SPS site	One	One	Nil	One	One
Total number of samples in each quarter (A)	5	5	0	4	4
Total number of samples in construction period (B)	40	40	0	32	32

Calculation of total Number of samples-

Project duration= 3 years=12 quarters

Pre-construction phase= 3 months=1quarter

Monsoon period in each year=3 months=1 quarter (July-Sept)

Monsoon period in project duration=3 quarter

Effective period of environmental monitoring (C) = 12-1-3=8 quarters

Total number of samples in construction period (B) = AxC

Note -

i. All the tests should be done by labs approved by CPCB and/or RPCB and should be accredited by NABL
ii. All the tests should be done as per the norms and methods approved by CPCB/RPCB
iii. All the meteorological data like weather, wind, location, nearby features etc. should be recorded during sampling and indicated in the report for ambient air quality
iv. For air quality monitoring, if any two sites are within the distance of 2 kms from each other, only one sampling can be done at any site

* Sensitive receptors are hospitals, schools, any major religious place etc

Appendix 28: Sample Grievance Registration Form

(To be available in Hindi and English)

The _____Project welcomes complaints, suggestions, queries and comments regarding project implementation.
Aggravated persons may provide grievance with their name and contact information to enable us to get in touch for clarification and feedback.
In case, someone chooses not to include personal details and wants that the information provided to remain confidential, please indicate by writing/typing *(CONFIDENTIAL)* above Grievance Format.
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 included 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: (Name 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:	

Appendix 29: Office Order for establishing GRM

167

RUIDP

Government of Rajasthan
Office of Project Director
Rajasthan Urban Infrastructure Development Project
AVS Building, Jawahar Circle, JLN Marg, Jaipur - 302017
Tel No.: 0141-2721966, Fax No.: 0141-2721919, email : mail@ruidp.gov.in, web site : www.ruidp.gov.in

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1282 Dated: ~~04.2018~~ 04/05/18

Office - Order

Subject:- **Grievance Redress Mechanism for Rajasthan Secondary Town Development Investment Program (RSTDIP) - RUIDP Phase IV**

Reference: - Agreed Resettlement & Environmental framework -3183 IND (RUIDP Phase III) - https://www.adb.org/projects/42267-026/main#project-documents

It is directed that Grievance Mechanism of RUIDP Phase III will be replicated in RUIDP Phase IV and accordingly, PIU will maintain/ ensure proper records of safeguard related Grievances received in their town. PIU will also ensure that the safeguard related Grievances received are resolved as per Grievance Redress Mechanism (GRM) prescribed in RP which is summarized as under (for ready reference):-

Methodology of multi-tier GRM	Responsibility/Action to be taken	Time Frame	Record Keeping
1st level: Grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel from PIU will provide the most easily accessible or first level of contact for quick resolution of grievances	SE/EE PIU will resolve issues in consultation with supervision personnel, Contractor.	PIU will resolve issues within 3 days of receipt of a complaint/ grievance.	The grievance register will be endorsed by all field agencies involved in implementation of EMP and RP.
2nd level: All grievances that cannot be redressed within 3 days at field will be referred to PMU through PO Social/Environment by PIU.	Project Officers (Environment/Social) PMU in consultation with PMU, PIUand the Contractor will resolve the issued referred.	PMU will resolve issues within 7 days of receipt of a complaint/ grievance	PIU will keep records of the matter referred to PMU and will documents the outcome of each grievance resolved in the Grievance Register.
3rd level: All the grievances that are not addressed by PMU within 7 days, will be brought to the notice of Grievance Redress Committee (GRC). The City Level Committee (CLC), which will be established in every project town will act as GRC	SE/EE PIU will coordinate with PO Social/ PO Environment or other official of PMUand will prepare agenda for the GRC meeting accordingly and ensure keeping the same in GRC.	The GRC will resolve the grievance within 15 days of receiving the complaint	PIU will be responsible to see through the process of redress of each grievance and document the outcomes.
4th level: Very major issues that are beyond the jurisdictional authority of the CLC or those that have the potential to cause social conflicts or environmental damage or those that remain unresolved at PMU/CLC level, will be referred to the Empowered Committee (EC).	SE/EE PIU will assist PMU officials to prepare agenda for the Empowered committee meeting.		SE/EE PIU will keep records of Empowered committee meeting and will ensure documentation of outcome.
Please note that 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.			

PIUs will be responsible to ensure redressal of grievances as per GRM procedures summarized above and intimate to the complainant.

Contractor's will keep information board depicting Grievance registration numbers at each working site,Grievance registration form andwill maintain Grievance Registers(refer annexure 1 &2).

(G. S. Hada) 5/18
Addl. Project Director, RUIDP

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1283-84 Dated: ~~04.2018~~ 04/05/18

Copy to following for information and necessary action.
1) PA to PD /CE /FA/DyPD(A)/SE(WS)/SE(WW)/PO(Environment)/PO(Social)/, RUIDP, Jaipur
2) All EE, PIU, Phase-IV for ensureing maintenance of the Grievance register and helpline and for resolving of Grievances.

(K. M. Mandawaria)
PO(Co-ord.&Social)