Initial Environmental Examination

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IND: Rajasthan Secondary Towns Development Sector Project – Water Supply and Sewerage Subproject in Sirohi Town, District-Sirohi, 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 26 May 2020)

Currency unit – Indian rupee (₹)

₹1.00 = $0.01319

$1.00 = ₹75.7905

ABBREVIATIONS

ACM	–	Asbestos containing Material
ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
BOCW	–	Building and Other Construction Workers
CAMP	–	Comprehensive Asbestos Management Plan
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
DBOC	–	Design-Build-Operate Contractor
DPR	–	Detailed Project Report
DWC	–	Double Walled Corrugated (Pipe)
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
GLSR	–	Ground Level Service Reservoir
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
LPCD	–	Liters per Capita per Day
LSGD	–	Local Self Government Department
MCFT	–	Million Cubic Feet
CMC	–	Million Cubic Meter
MLD	–	Million Liters per Day
MOEFCC	–	Ministry of Environment, Forestand Climate Change
NHAI	–	National Highways Authority of India
NOC	–	No Objection Certificate
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
RIICO	–	Rajasthan Industrial Infrastructure Corporation

ROW	–	right-of-way
RPCB	–	Rajasthan State Pollution Control Board
RSTDSP	–	Rajasthan Secondary Towns Development Sector Program
RUIDP	–	Rajasthan Urban Infrastructure Development Project
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	–	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
WRD	–	water resources department
WTP	–	water treatment plant

WEIGHTS AND MEASURES

^{o}C	–	degree centigrade
dB	–	Decibels
dia	–	diameter
kg	–	kilo gram
Kl	–	kilolitre
km	–	kilometre
kmph	–	kilometre per hour
ha	–	hectare
HP	–	Horsepower
LPCD	–	liters per capita per day
lps	–	liters per second
m	–	meter
m^3	–	cubic meter
mg	–	milligram
mm	–	millimetre
mcm	–	million cubic meter
km^2	–	square kilometer

NOTE

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

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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 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 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 km ofsewers 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 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 kiloliters 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

[1] 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.

[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.

maintenance (O&M) of WSS services, citywide inclusive sanitation(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.[5]

Sirohi water supply and sewerage subproject is one of the subprojects proposed under the investment component of RSTDSP. Water supply at present in Sirohi is intermittent, unreliable and suffers with huge losses and quality issues. The water supply is being made through 11 open wells and 16 tube wells. The well fields are in downstream of Angor and Kameri dams, about 9 km. west of the town. No sewerage system exists in the town. Due to lack of sewerage system, most of the households depends on septic tanks for disposal of sewage. Effluents from septic tanks and sullage are let off into open drains which ultimately accumulates 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). As 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 Sewerage. The potential negative impacts were identified in relation to preconstruction, construction and operation phases. This Initial Environmental Examination (IEE) addresses the infrastructure components proposed under Sirohi water supply and sewerage subproject.

Categorization. Environmental assessment has been conducted for the Sirohi water supply and sewerage subprojects based on (i) preliminary detailed design, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklists for sewerage works and water supply and "No Mitigation Scenario Checklist". The environmental assessment of the Sirohi water supply and sewerage subprojects 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 most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

Sirohi water supply and sewerage subproject is classified as Environmental Category B as per the SPS 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 as a result of the project.

It is proposed to improve the water supply system in Sirohi under RSTDSP. This will benefit the total population of Sirohi 39,229 (2011 Census) 58,613 by 2051 (projected) with a per capita water supply rateof 135 liters per day. Proposed components include: (i) construction of two intake cum pump houses (one in Angore dam, and second in Kalkaji dam) draw 7.40 MLD water from Angore Dam and 3.90 MLD from Kalkaji dam; (ii) raw water main 13.191km; (iii)construction of new Water Treatment Plant (WTP) 9 MLD capacity at Angor Headworks, (iv) four (4) Clear Water Reservoirs

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

(CWRs) of capacity -1450 KL, 470 KL, 580 KL and 270 KL, (v) chlorinator systems at four CWRs (vi) Transmission mains of 35.625 km (100-400 mm diameter),(vii) Distribution network of 118km (75-315 mm diameter), (viii) 8,900 house service connections with meters, (ix) bulk meters, SCADA and (x) Offices for costumer relation and control centers for water supply operation. It is also proposed to rehabilitate following existing facilities to improve efficiency: (i) 11 open wells and 16 tube wells, (ii) four pump houses and (iii) three GLSR and two OHSR.

It is proposed to develop a comprehensive sewerage system in Sirohi 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. Proposed components include:(i) 93 km of sewer network (200-600 mm diameter), including manholes, (ii) house sewer connections – 8200 numbers, (iii) two Sewage Treatment Plants (STP) of capacity – 5 MLD and 1.7 MLD based on sequential batch reactor (SBR) process, (iv) two treated effluent storage reservoirs (TESR) of capacity 225 KL and 120 KL, (v) two treated effluent elevated reservoirs (TEER) of capacity 550 KL and 240 KL, (vi) outfall sewers from STPs to discharge point, to discharge excess/unused treated effluent, (vii) mobile tankers with suction and discharge arrangements to collect and convey septage from septic tanks in FSSM covered area.

Raw Water Source and Sustainability. Angore dam and Kalka Ji dams are proposed as source. Gross storage capacity of the Angore dam is 14.09 MCM and 1.781 MCM for Kalka ji Dam. Only 50 MCFT water would be used presently for the proposed scheme. Allocation of raw water of 95 MCFT (2.71 MCM) from Angore and 50 MCFT (1.43 MCM) from Kalka Ji for water supply in Sirohi town is granted by the Water Resource Directorate Jaipur. it is estimated that the Angore dam will be able to provide 7.15 MLD of water throughout the year against total demand of 8.55 MLD (2036) and 9.77 MLD (2051). As the dam is of recent origin, there is no long terms flow data to see the long-term sustainability.

Angore Dam is the main water source as Kalkaji is not a reliable source. Water will be available from Angore Dam throughout out the year at 73 % dependability, which will not be sufficient to meet the demand. There is no other feasible and dependable surface water source near Sirohi town. Therefore, it is proposed to adopt conjunctive use approach, utilizing both surface and groundwater sources to meet the demand. During the high rainfall years, entire water demand may be fulfilled by Angore and Kalkajidams, while in low rainfall years the deficit will be met by existing groundwater sources. There are existing 11 open wells and 16 tube well

Given that dams are transferred to PHED for drinking water purposes, and fully allocated to Sirohi Town, no water use conflicts envisaged. Although there is no notable aquatic life or wildlife nearby, the dams will always retain dead storage, which can be utilized. During impact assessment, it was observed that fishing activities were being undertaken at Angore Dam. On enquiry with the concerned department, it was revealed that the water quantities being extracted are so minimal that it cannot have any adverse impact on fish propagation. The dead storage is always available is sufficient for survival of fishes. No objection certificate on fisheries has been obtained from the competent authority. No notable impacts therefore envisaged.

Description of the Environment. Subproject components are located in Sirohi 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. Water intakes are proposed in Angore and Kalkaji dams. Aquatic life is limited to local common fish species, and fishing activity is conducted

periodically by the local fishing community. 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. Proposed STPs (2 nos) and the WTP will be constructed on vacant municipal land. Sites are covered with sparse tree cover, shrubs and bushes, and no notable wildlife at these sites. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations. The climatic conditions in Sirohi district is of semi-arid type. As per the seismic zoning map of India, Sirohi falls under the Zone-III, which is the Moderate earthquake risk zone in India. This zone is termed as “Moderate damage risk zone”.

Potential Environmental Impacts and Mitigation Measures. In this draft IEE, negative impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Environmental impacts as being due to the project design or location were not significant as various measures are already included in site planning and preliminary design. There are no environmentally or archeologically sensitive areas within Sirohi Town. Nearest protected area to Sirohi is Mount Abu Wildlife Sanctuary; the sanctuary boundary is about 20 km from the town. Surface water Intakes are proposed in Angore and Kalkaji Dams. These are mostly surrounded by agricultural areas, and there are no sensitive areas like forests. There is no notable aquatic life in the dams, except local common species of fishes. Various measures are included to avoid any impacts on water quality and aquatic life, especially during construction operation.

In water treatment various measures are included to safely collect, reuse / dispose the wastewater and sludge generated in the process. Few trees (6 numbers) need to be cut at WTP site. Compensatory tree plantation will be carried out. Proposed two STP sites are location away from habitations (nearest is 350 m) and surrounded by agricultural lands, therefore no impacts envisaged. Proposed SBR technology is advanced, treats sewage in a compact aerobic process, therefore issue due to bad odour is minimal. It is proposed to design the STPs to stringent discharge standards suggested by CPCB in 2015. Following the Rajasthan Sewerage and Wastewater Policy, 2016, treated effluent from STPs will be reused in various feasible purposes, and a Reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge. Excess / surplus of treated effluent will be disposed into water channels/drains, which are either dry or carry untreated wastewater at present. No impacts envisaged.

Potential impacts during construction are considered significant but temporary and are common impacts of construction in urban areas, and there are well developed methods to mitigate the same. Except laying of sewer and water pipelines, all other construction activities will be confined to the selected sites and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety (OHS) aspects. Pipe and sewer laying works will be conducted along public roads in an urban area congested with people, activities and traffic. Therefore these works may have adverse, but temporary impacts arising mainly from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to deep trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste etc. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method will be adopted for sewers deeper than 3.5 m and also at main road crossings in traffic areas.

Subproject includes rehabilitation of existing infrastructure like tube wells, pumping stations and OHSRs. Presence of asbestos containing material (ACM), mainly AC 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. Nearly 83% of the existing 130 km of underground water transmission and distribution system consists Asbestos Cement (AC) pipes of 80-250 mm diameter (109 km of total 130 km length of pipes). It is normal practice in Rajasthan that existing AC 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 AC pipes may not be possible. Various measures are suggested including development and implementation of Comprehensive Asbestos Management Plan (CAMP).

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.

Environmental Management. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. Various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) selection of construction methodology for intake on dams.; (ii) proper planning of sewer and water supply works to minimize the public inconvenience; (iii) barricading, dust suppression and control measures; (iv) traffic management measures for works along the roads and for hauling activities; (v) provision of walkways and planks over trenches to ensure access will not be impeded; and (vi) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.A copy of the updated EMP/ SEMP 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. To monitor the operation stage performance, 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 WTP and STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

This draft IEE and EMP will be included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit to PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times.

Implementation Arrangements. Government of Rajasthan's Local Self Government Department (LSGD) acting through the RUDSICO will be the project executing agency. The PMU is housed in RUDSICO's division for externally aided projects (EAP). There will be two zonal offices in Jaipur and Jodhpur, and 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 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 manage ment 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 RUIDP 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 RUIDP/PMU websites.

Conclusions. The citizens of the Sirohi will be the major beneficiaries. The subproject is primarily designed to improve environmental quality and living conditions of Sirohi 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) reduced dependence on fresh water resource due to reuse of treated wastewater, and (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

The proposed project is therefore 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. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006). To conform to government guidelines WTP and STPs requires consent to establishment (CTE) and consent to operate (CTO) from Rajasthan Pollution Control Board. CTE will be obtained prior to construction, as the detailed designs will be undertaken by contractor.

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 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 firstlevel 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 towards improving the water and wastewater services in about 14 towns.[6] RSTDSP seeks to improve water supply and sanitation (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): access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;[7] and health status of urban population, especially the poor and under-privileged improved.[8] 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 WTPs will be rehabilitated.

(ii). **Output 2**: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[9] By 2027: (i) about 1,300 kilometers (km) of sewers will be constructed, (ii) 19 sewerage treatment plants (STPs) with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 MLD 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 kiloliters 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

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[6] 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.

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

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

[9] 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.

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, citywide inclusive sanitation (CWIS), financial sustainability and gender equality and social inclusion (GESI) action plan implementation, (iii) about500 girls will report enhanced knowledge in conducting water audits in schools and households, and (iv) data platforms will be established in all project towns.[10]

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. Sirohi Town water supply and sewerage subproject is one of the subprojects proposed under RSTDSP. Water supply is currently intermittent and suffers with huge losses and quality issues. At present no sewerage system exists in the town. Most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage water is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town. It is therefore proposed to improve water supply and sewerage in the town. 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 Safeguards Policy Statement (2009). Accordingly, this Initial Environmental Examination (IEE) has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts because of the subproject.

B. Purpose of Initial Environmental Examination Report

3. 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 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 requirements for environment category B projects.

4. The Sirohi water supply and sewerage subproject is proposed 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 RUIDP (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.

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

5. 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.

6. 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

7. 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

A. Sirohi Town

8. Sirohi is one of the project towns selected for implementation of the ADB funded under RSTDSP. Under the investment component, it is proposed to improve the water supply and sewerage system in the Town. Sirohi is the headquarter town of Sirohi District, in the southern part of Rajasthan, bordering Gujarat State. Geographically It is situated at 24^{o}53'N latitude and 72^{0}53'E longitude. Spread over an area of 863.75 ha (8.637 sq. km), divided into 25 municipal wards, and has a population of 39,229 (2011 census). Urban local body is Sirohi Nagar Parishad (City Council).

B. Present Status of Water Supply and Sewerage

9. **Water Supply**. Presently the water supply is being made through 11 open wells and 16 tube wells. The well fields are in the downstream of Angor and Kameri dams about 9 kms. west of the town. The total production from above tube wells and open wells are 3624 KLD (3.52 MLD) in summer and 4180 KLD (4.18 MLD) in winter respectively. At present the total per day supply is 3020 KLD (3.02 MLD) in summer and 3483 KLD (3.48 MLD) in winter. The present service level in Sirohi town is only 70-75 lpcd which is less than the CPHEEO norms. The water is supplied for

one and half hour in duration of 48 Hrs. Since the present source of water supply is under ground water from tube wells, there is no existing WTP.

10. **Transmission Mains.** Water from Clear Water Reservoirs is being pumped to reservoirs located in various zones through transmission mains. There is about 72 km existing pumping system of various diameters (80 mm to 250 mm) and pipe materials like Asbestos Cement (AC) and uPVC connecting TWs, CWRs and OHSRs.

11. **Distribution System.** There are 25 wards in Sirohi town which are divided into 18 water supply zones. Sirohi is provided with distribution system by gravity fed from respective OHSRs. The total length of existing distribution system is approx. 58 Km and pipe material is old Asbestos Cement (AC) and uPVC lines of 80 mm to 250 mm diameter. Presently 5 nos. Clear water reservoirs, 2 GLSRs and 8 overhead service reservoirs are available in the town at different locations. The existing distribution lines of AC and uPVC pipes are very old with heavy leakages due to repeatedly breakages and joints leakages resulting heavy losses of clear water.

12. **Sewerage.** Sirohi Municipality does not have any organized sewerage system. Presently the wastewater from kitchens and 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 tank is 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.

13. In the absence of a safe disposal system for sewage, the people of Sirohi are facing unhealthy and unhygienic environmental conditions therefore public representatives are also demanding facilities of sewerage system on priority basis. Water supply is also not adequate in terms of quantity and quality therefore the town requires sound water supply and sewerage system

C. Proposed water supply and sewerage Infrastructure in Sirohi under RSTDSP

14. Water Supply Works. As described above, the existing water supply system in Sirohi suffers from various issues and resulting inadequate and intermittent supply. It is proposed to improve the water supply system in Sirohi under RSTDSP to meet the following objectives:

(i) The Subproject will benefit the total population of Sirohi - currently 39229 (based on 2011 Census) and estimated to increase to 58,613 by 2051.
(ii) Increase in per capita water supply availability for the residents of Sirohi from 70-75 lpcd to 135 LPCD;
(iii) To establish continuous pressurized water supply system to consumers with quality and quantity at required pressure.
(iv) To establish raw water intake and water treatment to reliably supply the specified quantity and quality of water.
(v) To adopt energy efficient water treatment processes and electromechanical machinery.
(vi) To reduce NRW as per performance indicators using district metering areas (DMA) approach.
(vii) To ensure 100 % house service connections with metering for water supply.

(viii) 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.

15. **Water Demand and Supply.** Per capita water supply rate of 135 liters per day is considered for Sirohi Town. Raw water demand of the town is estimated as 7.39 MLD (base year 2021), and 9.77 MLD (ultimate design year 2051). Water will be available from the surface sources namely Angore Dam and Kalkaji Dam as per the availability. Allocation of raw water of 95 MCFT from Angore and 50 MCFT from Kalka Ji dams for water supply in Sirohi town has been granted by the Water Resource Directorate (WRD).Angore Dam will provide 6.20 MLD of water per day for base year 2021 and 7.15 MLD of water per day for the ultimate design year (2051). Kalka Ji dam will provide 3.76 MLD of water per day for both base year(2021) and ultimate design year (2051) .Angore Dam is the main water source and in case of any shortage of water in Kalka Ji dam, it is proposed to meet the demand by conjunctive use of both surface and groundwater sources. The balance water demand will be meet out from existing tube well/open well sources.

(i) Angore Dam: The Water resource department (WRD) constructed the Angore dam in the year 1988. This dam is situated on the Krishnabati river in Luni Basin. This is situated on 24088’12” N latitude and 72076’92” E longitude. The dam is about 10 km from Sirohi town in the west direction. Total catchment area of the dam is 155.39 sq.km. Length of Dam is 2362.79 m. Dam is having total gross storage of 14.019 MCUM (495 MCFT) and total live storage of the dam is 13.33MCM (466 MCFT). The dam was constructed for irrigation purposes and serve irrigation facility in 3456.68 Ha, as per State Water Policy 95 MCFT water is reserved for PHE department for drinking water purposes every year. It is estimated that, at 73% dependability, the dam will provide 7.15 MLD of water throughout the year.

(ii) Kalka Ji Dam: The Water resource department (WRD) constructed the Kalka Ji dam in the year 1990. It is a masonry dam near Kalka Ji temple in Sirohi town. This dam is situated on the downstream of Akhelao and Mansarovar dam which were on Rajupura river. This is situated on 24087’23” N and 72086’44” E. The dam is within the Sirohi town in the east-west direction. Total catchment area of the dam is 20.72 sq.km. Length of Dam is 137.5 m. Dam is having total gross storage of 62 MCFT and total live storage of the dam is 53MCFT. The dam was constructed for drinking purposes and any additional/deficit water from Kalkaji can be utilized for drinking purposes for Sirohi town. Accordingly, Kalkaji has been considered as an additional source for Sirohi town, as per State Water Policy 50 MCFT water is reserved for PHE department for drinking water purposes every year.

(iii) Groundwater. Angore Dam is main water source. Water will be withdrawn from both the sources Angore Dam and Kalkaji Dam as per the availability. As per records Kalka Ji is not a reliable source and in case water is not available from Kalkaji dam, it is proposed that the remaining demands will be met by groundwater sources. This water will be available with utilizing existing ground water through refurbishment of both existing wells (11 open wells and 16 tube wells) to fulfill the ultimate demand. Given less than 100% dependability of dam, in the low rainfall years, the deficit from the dam will be met by tube wells, and accordingly the water abstraction from groundwater sources will be increased as required.

Table 1: Sirohi Population and Water Demand

Year	Stage	Population	Consumer End Water Demand	Raw Water Demand including all losses	Raw Water Available using both Dams only***	Angore Dam	Kalkaji Dam	TWs+ OWs *
			MLD					
2021	Base Year	44,365	5.93	7.39	9.96	6.20	3.76	1.00
2036	Intermediate Year	51,121	6.90	8.55	10.91	7.15*	3.76	1.43**
2051	Ultimate Year	58,613	7.91	9.77	10.91	7.15*	3.76	1.43

Note: Angore Dam is main water source. Water will be withdrawn from both the sources Angore Dam and Kalkaji Dam as per the availability.

*Clear water available against present water reservation (7.37 mld) for PHED in Angore Dam.

**Maximum water available with utilizing existing ground water trough refurbishment of Tube wells (16 nos.) and Open well (11 nos.) to keep the ground water source alive.

*** Maximum water demand considered using both dams only.

16. **Water Treatment Plant (WTP)**. 9 MLD WTP has been proposed at Existing Angor Head works. The capacity of filter plant has been designed as per availability of raw water from Angore Dam and Kalka Ji dam. Treatment Facilities will be designed as per design norms given in Manual on Water Supply and Treatment manual, Published by CPHEEO, Ministry of Urban Development, Government of India. Proposed facilities will mainly include Raw Water Inlet Channel and Pumping Station, Raw water Inlet Chamber, Raw Water Channel, Parshall Flume, Flash Mixer, Flocculation, Clarification, Filtration, Pre and post Chlorination, WTP Wastewater Recovery and Recycling System and Ancillary Systems/Structures. Facilities shall be designed so that the treated water quality always meets drinking water requirement (Appendix 2).

17. Groundwater quality is fit for drinking; therefore, only disinfection is proposed prior to supply. Chlorinator units are proposed at headworks and CWR locations in the town. These headworks will collect treated water from WTP, and groundwater from tube wells in CWRs and combined water is chlorinated prior to supply from CWRs.

18. **Water Distribution.** The entire town is divided into 7 water supply zones. Except Zone 1, 3 and 5, all the zones will be supplied by direct pumping into distribution network. In Zone 3 and 5, an existing GLSRs on a hillock will be utilized and water will be supplied via gravity. In Zone 1 an 18m staging OHSR of 150 kl capacity will be utilized. by gravity feed.

19. **Operation and maintenance (O&M) 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 raw water from Intake to the WTP including raw water pumping main and maintenance of entire raw water system.

(ii) Drawing ground water from Tube well / open well to the Clear Water reservoir through transmission main including raw water pumping main and Maintenance of entire raw water system.

(iii) Operating and maintenance of all the proposed Clear Water pumping stations to fill all the CWRs through transmission pipe lines and also direct pumping to distribution system and operation of chlorination system, maintenance of complete

system and maintaining the infrastructure and maintaining the specified Water levels at each of the reservoirs throughout the OandM period.

(iv) 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.

(v) 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. 12m pressure head shall be maintained at all ferrule points.

(vi) Meter reading, customer services and maintaining the infrastructure in water supply sector.

(vii) Meter reading, bimonthly billing, bill distribution, revenue collection and customer services and maintaining the infrastructure in water supply.

(viii) Sampling treated water received at all the CWRs and from random points within the Zones/DMA to ensure that it meets the Potable Water Specification and monitor on monthly basis;

(ix) Assessing and minimizing non-revenue water and locating the causes for high NRW and bringing down the NRW level within the 7% for DMA, and 15% of raw water.

(x) Provide consumer service connections on approval or sanction by Employer Representative

(xi) 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 Local Body.

(xii) Maintain environmental and safety norms at entire system components.

20. **Sewerage Works.** Under RSTDSP, it is proposed to develop a sewerage system in Sirohi 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.

(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.

21. 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 agreed between the government and the ADB.

22. **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. Two treatment plants of capacities 5.0 MLD and 1.70 MLD proposed to meet the demand.

23. **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
(vii) suggests use of sludge produced from the treatment as fertilizer and soil conditioner after processing.

24. 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.
(ii) promotes the use of treated wastewater as an economic resource.

25. 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. Total storage capacity of TESR and TEER at each STP is 15% of respective STP treatment capacity. Treated effluent will be chlorinated and prior to its entry into TESR/TEER.

26. Discharge of treated wastewater. The excess / surplus treated wastewater that is not reused will be discharge into nearby water channels/drains, and necessary facilities like pipelines and pumping requirements, will be developed.

27. 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.

28. Operation and maintenance (O&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 Municipal Council Sirohi
(vii) Maintaining environmental norms at entire system components.

29. **Fecal Sludge and Septage Management (FSSM)**. It is proposed to provide FSSM system 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 in areas where sewer network is not an immediate requirement, will make septage collection, treatment and effluent management environment- friendly. Of the 25 wards in Sirohi, there are 7 wards (Wards 1, 4, 7, 10, 23, 24 and 25) that have areas with scattered development and low population density. Total base year (2021) population of these wards is 15,913, of which about 22% (3635 persons) will be covered with FSSM and rest will be covered by sewer network. This is about 8% of total town population. 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. 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 bidder during the detailed design phase to comply with the treated effluent discharge standards specified in the bidding documents.

30. 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, dispose-off septage to Inlet chamber/screen chamber of STP,
(iii) Cleaning of the tank, and proper garaging of the vehicle at designated place.

D. Proposed Subproject Components

31. Table 2 shows the nature and size of the various civil works components of this water supply and sewerage subproject in Sirohi. Conceptual layout plans and alignments are shown in Figures 1 to Figure 12.

32. Subproject is proposed for implementation under (Design-Build-Operate) 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 Sirohi Municipal Council. 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.

Table 2: Proposed Sirohi Subproject Components

Infrastructure	Function	Description	Location
Water Supply			
Water intake facilities	Raw water abstraction from Angore Dam and pumping to WTP	New Capacity of intake and pumping house to abstract 7.4 MLD water Intake well cum pump house (diameter –5-7-m height –6-8m) Approach bridge / road Pumping machinery	Intake well cum pump house will be built in Angore Dam / Reservoir. Dam is under the control of Water Resources Department (WRD). Raw water pipeline will be laid underground from the intake well intake to WTP site along existing road and along river
	Raw water abstraction from Kalkaji Dam and pumping to WTP	New Capacity of intake and pumping house to abstract 3.9 MLD water Intake well cum pump house (diameter –6-8m height –9-11m) Approach bridge / road Pumping machinery	Intake well cum pump house will be built in Kalkaji Dam / Reservoir. Dam is under the control of Water Resources Department (WRD). Raw water pipeline will be laid underground from the intake well intake to WTP site along existing road and along river
Tube Wells	Abstract groundwater	Rehabilitation 11 open wells and 16 tube wells Replacement of pipes, pumps, valves, all electro-mechanical items etc.,	The existing open wells and tube wells are in the downstream of Angor and Kameri dams about 9 kms west of the town at the following locations: • Danta Dam • Angor Dam • Kameri Dam • DudhiaTalab • Aadesh Nagar • Mandawa • Kalka Ji headworks

Raw water main	Convey raw water from intake to WTP	New 13.191 km [2491m (L) and 400mm (dia.) from Angore Dam to WTP] and [10700m (L) and 300mm (Dia.) from Kalkaji Dam to WTP] - DI K-9 pipe	Along the existing roads from intake to WTP
Water Treatment Plant	Treatment of raw water to meet the drinking water standards	New 9 MLD capacity water treatment plant with arrangements: • Alum coagulation and flocculation • Sedimentation, • Rapid gravity filtration, • Disinfection with chlorination • Wash water recovery • Sludge drying beds • Laboratory, office etc., Clear water reservoir of 9MLD capacity	Proposed WTP site is located in within the existing Angore headworks Land owned by PHED (site location: 24°53'17.54"N 72°46'33.24"E)
Clear water pump houses	To provide adequate pressure in water supply system to distribute to consumers directly/transmit water to overhead tanks for gravity supply	New: 4 nos. Clear water pumphouses include the following Pumping system to feed headworks, OHSRs, GLSRs, and to direct distribution Pump rooms, with all mechanical and electrical equipment Office areas and wash/toilet facilities Rehabilitation Four existing pump houses at Rampura, Kalkaji Headworks, Teen Batti headworks and Sardulpura will be rehabilitated as required including: civil repairs, replacement of electro-mechanical items, and provision of SCADA	This will be constructed in the following existing PHED campuses. Vacant land available to construct pump houses. • Rampura • Kakaji headworks • Teen Batti headworks • Sardulpura
Transmission mains	Water transmission from intake to WTP to CWRs to distribution	New 35.59km length 100- 400 mm diameter DI pipes	Transmission pipelines will be mostly laid along the main roads. Pipes will be laid underground.
Clear water reservoirs	Store clear water for supply	New: 4 nos. with following capacity • 1450 KL • 470 KL • 580 KL	New CWRs at following places: • Rampura • Teen Batti headworks • Kakaji headworks • Sardulpura

		• 270 KL Rehabilitation Existing GLSR- one at Tankania (567KL), two at Bhatkhera (200KL and 400KL) will be rehabilitated as required including civil repairs, replacement of electro-mechanical items, and provision of SCADA	Land owned by PHED
Rehabilitation of OHSRs- 2Nos.	-	Overhead Service Reservoirs 1. 150 KL 2. 150 KL	Rehabilitation of OHSRs: 1. RHB 2. Adarsh Nagar
Chlorinator system	Post chlorination / disinfection of water prior to supply	New 4 nos chlorinator room and vacuum feed chlorination system of capacity 1 kg per hour (one at each CWRs/)	Chlorinators will be installed at the following new CWRs: • Rampura • Teen Batti headworks • Kakaji headworks • Sardulpura
Distribution network	To distribute water to consumers	New 117.4 km 117 km HDPE pipes 75-250 mm diameter 0.4 km DI pipes 200 – 350 mm diameter	Pipes will be laid underground along the public roads/streets covering entire area of the town (100% coverage within Municipal area). The distribution system will be by direct pumping and also by gravity feed where OHSRs are available. 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
Bulk Water Meters	Monitor water flow in the improved network	New As per the requirement – to be finalized during the detailed design	Fixed at strategic locations in network as per the design., bulk meters will be fixed with the pipe section
Consumer connection with flow meters	Provide water to consumers and measure water usage	New Consumer connection with meters 8,900 nos,	Water delivery pipe (PE of diameter 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
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 Centres (CRMC) – 2 nos. Central Control Centre (CCC) – 1 nos Master Control Centre- 1 nos.	CRMCs and CCC will be constricted on government owned lands MCC will be constructed at Angore WTP

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 93 km of diameter 200-553 mm 79 km HDPE DWC pipes 4 km RCC pipes 10 km HDPE PN6 pipes Manholes House sewer connections (8200 numbers)	Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the centre 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 centre without distributing the water pipes. It is proposed that 10 km length of sewers will be laid by trenchless method; these will include highway /main road crossings, and the sewers to be laid deeper than 3.5 m
Sewage Treatment Plant (STP)	Treatment of collected wastewater to meet stipulated discharge standards	New – 2 STPs 5.0 MLD 1.7 MLD Components SBR (sequential 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.,	Proposed STP sites are located at: Near Nehru Nagar; land owned by Sirohi Municipal Council (SMC) (Location: 24°54'4.51"N 72°50'48.39"E) Near Revdar Road; land owned by SMC (Location: 24°51'56.99"N 72°50'23.49"E)
Treated wastewater storage tanks	Store the treated wastewater for reuse, and also provide adequate pressure / elevation for supply	New • Treated Effluent Storage Reservoir (TESR)– 2 nos (1 each at STPs) – 225 KL and 120 KL • Treated Effluent Elevated Reservoir (TEER) – 2 nos (1 each at STPs) – 550 KL and 240 KL • Provision for mobile tanker filling points and rising mains/ distribution system, bypass/overflow	At two STPs - Revdar road and near Nehru Nagar

		arrangements at the TEER to facilitate reuse • Instrumentation, automation, SCADA etc.	
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 outlets to a natural drainage channels along government owned vacant lands / existing roads
FSSM			
Truck mounted mobile desludging equipment	Desludging of septage from household pits/ septic tanks, transportation and discharge to STP	mobile tankers with suction and discharge arrangements – number of tankers to be procured will be estimated during the detailed design	Mobile equipment

E. Subproject Benefits

33. The subproject is primarily designed to improve environmental quality and living conditions of Sirohi 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.

F. Implementation Schedule

34. After the completion feasibility study /preliminary designs, bids were invited in Aug 2019 for the subproject to be implemented under the DBO (design-build-operate) modality. Bids will be awarded in January/February 2020. Successful bidder then will carry out detailed designs and construction is likely to take about 24 months. After completion of construction and commissioning, scheme will be operated by DBO contractor for 10 years, and after which the operation and maintenance will be carried out by Sirohi Municipal Council.

Figure 1: Water Supply System Diagram of Sirohi

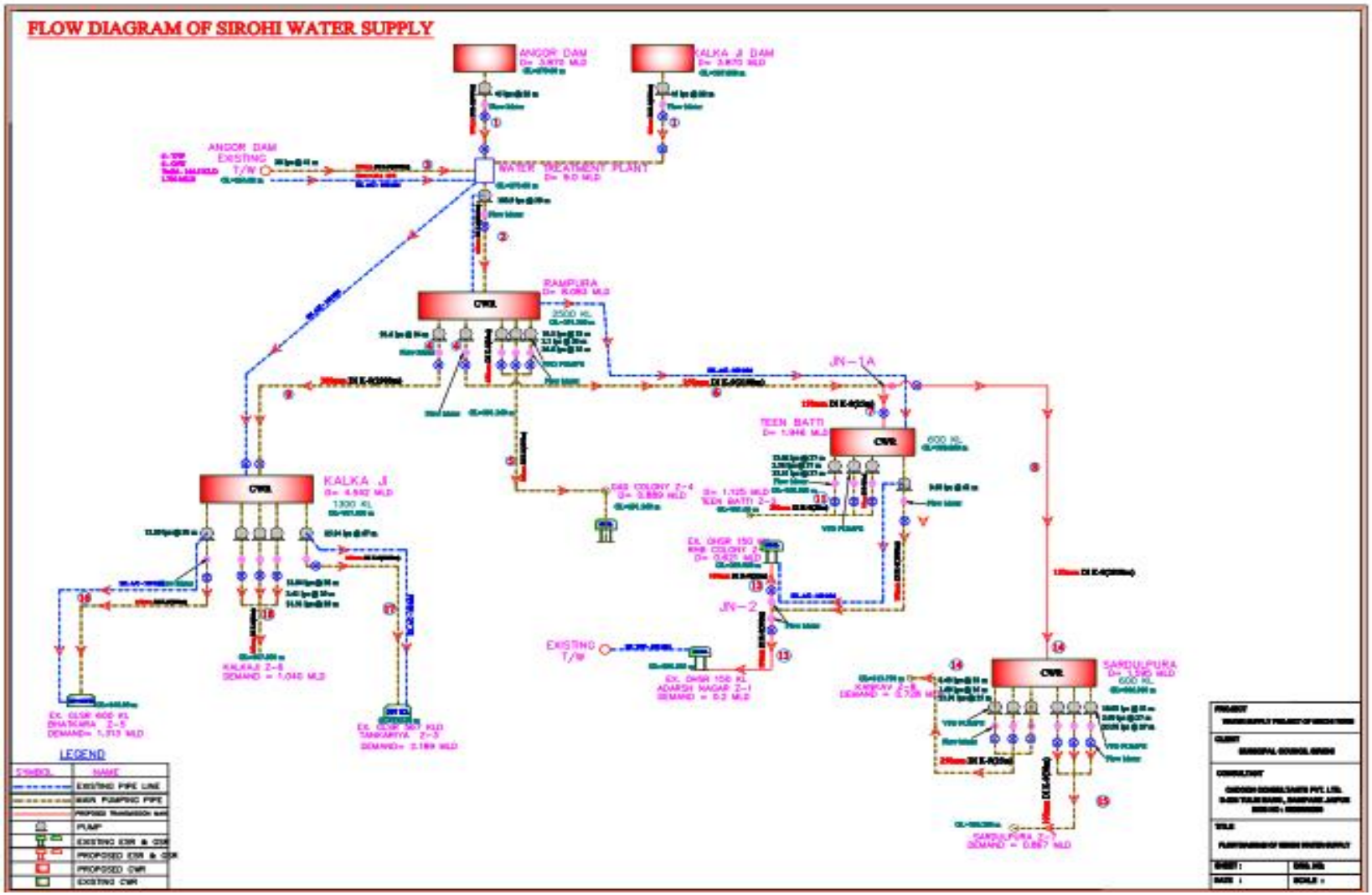


Figure 2: Location of Proposed Water Supply Components

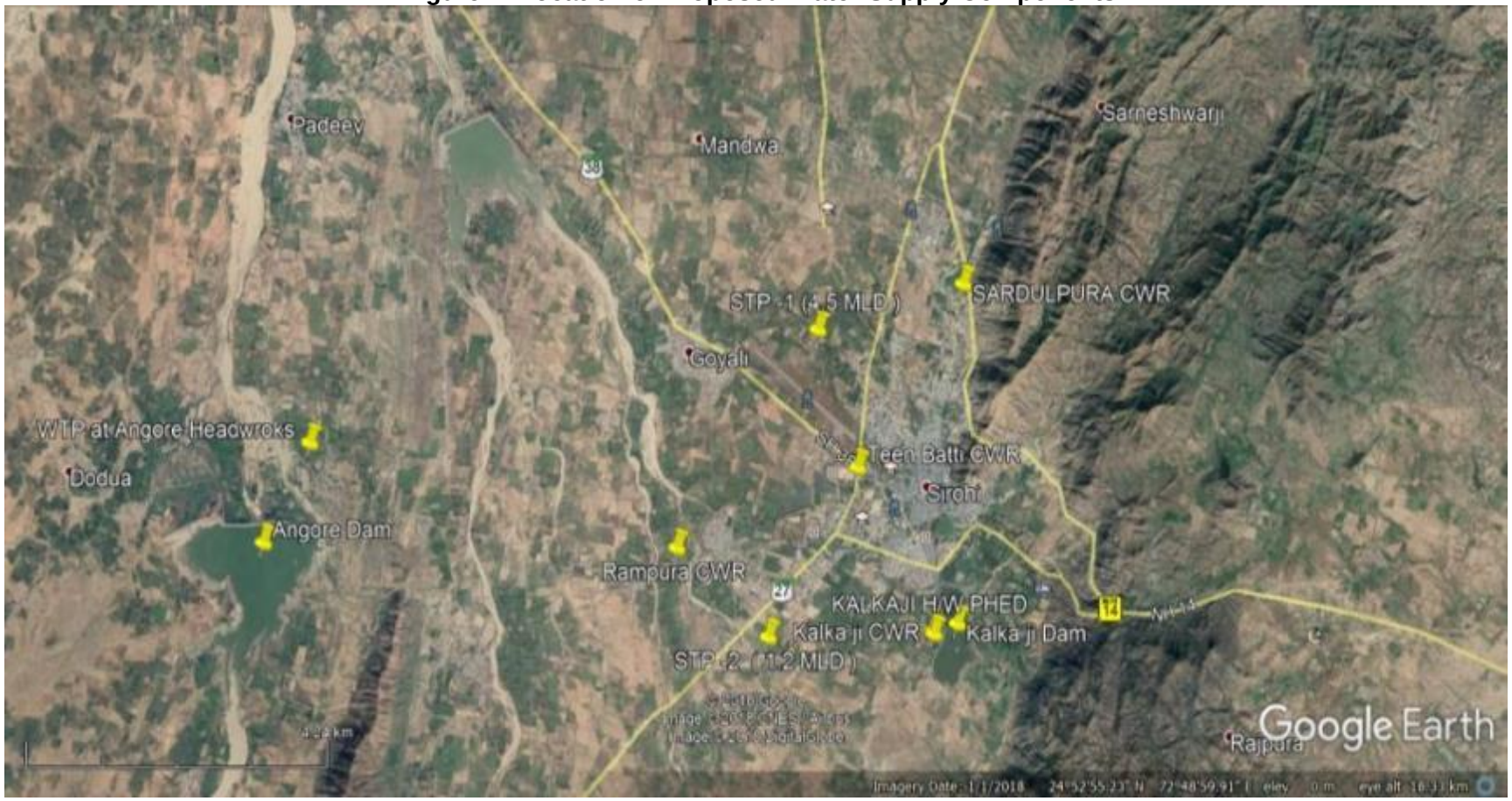


Figure 3: Proposed Water Supply Transmission Mains

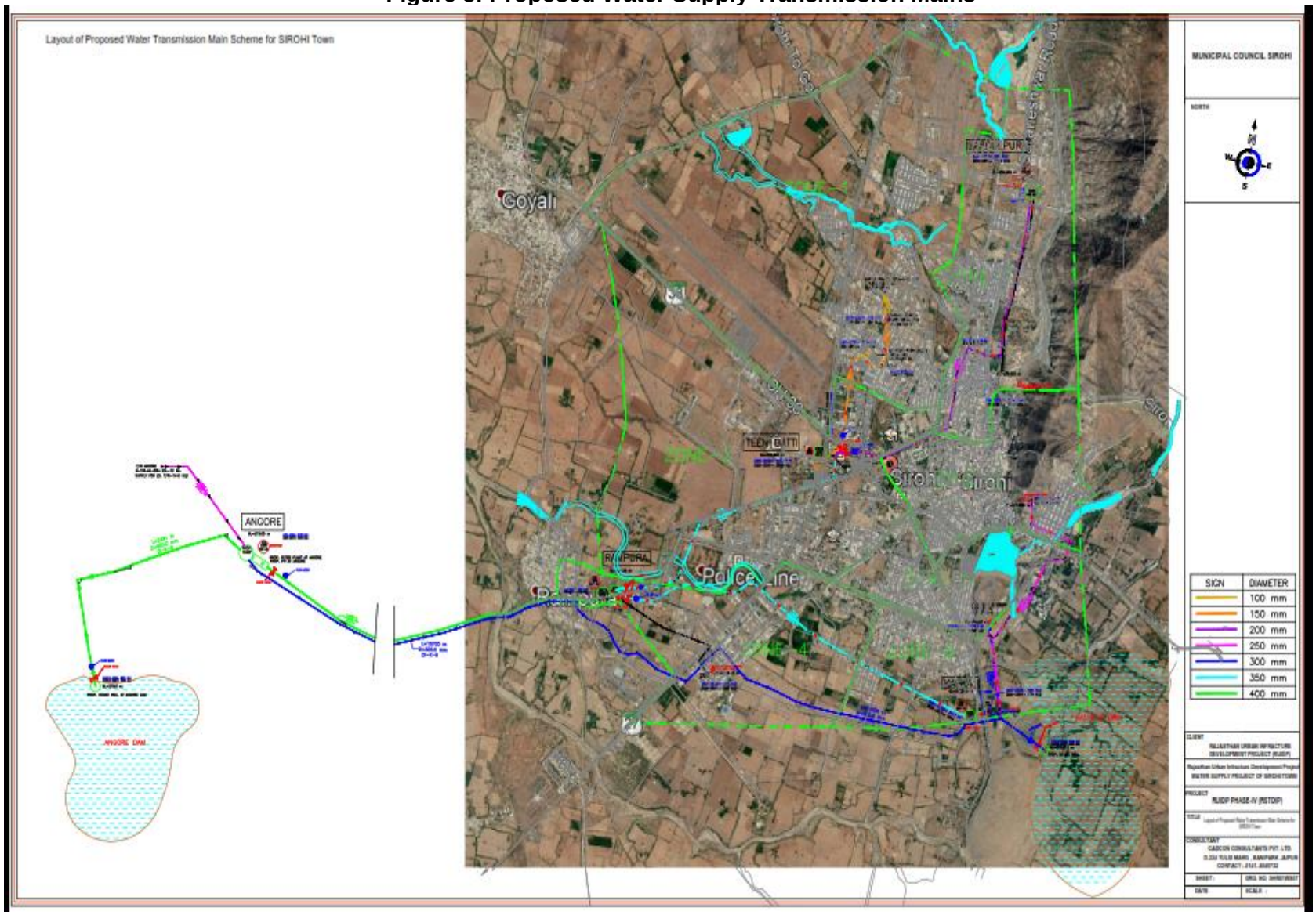


Figure 4: Conceptual Layout Plan of Proposed WTP

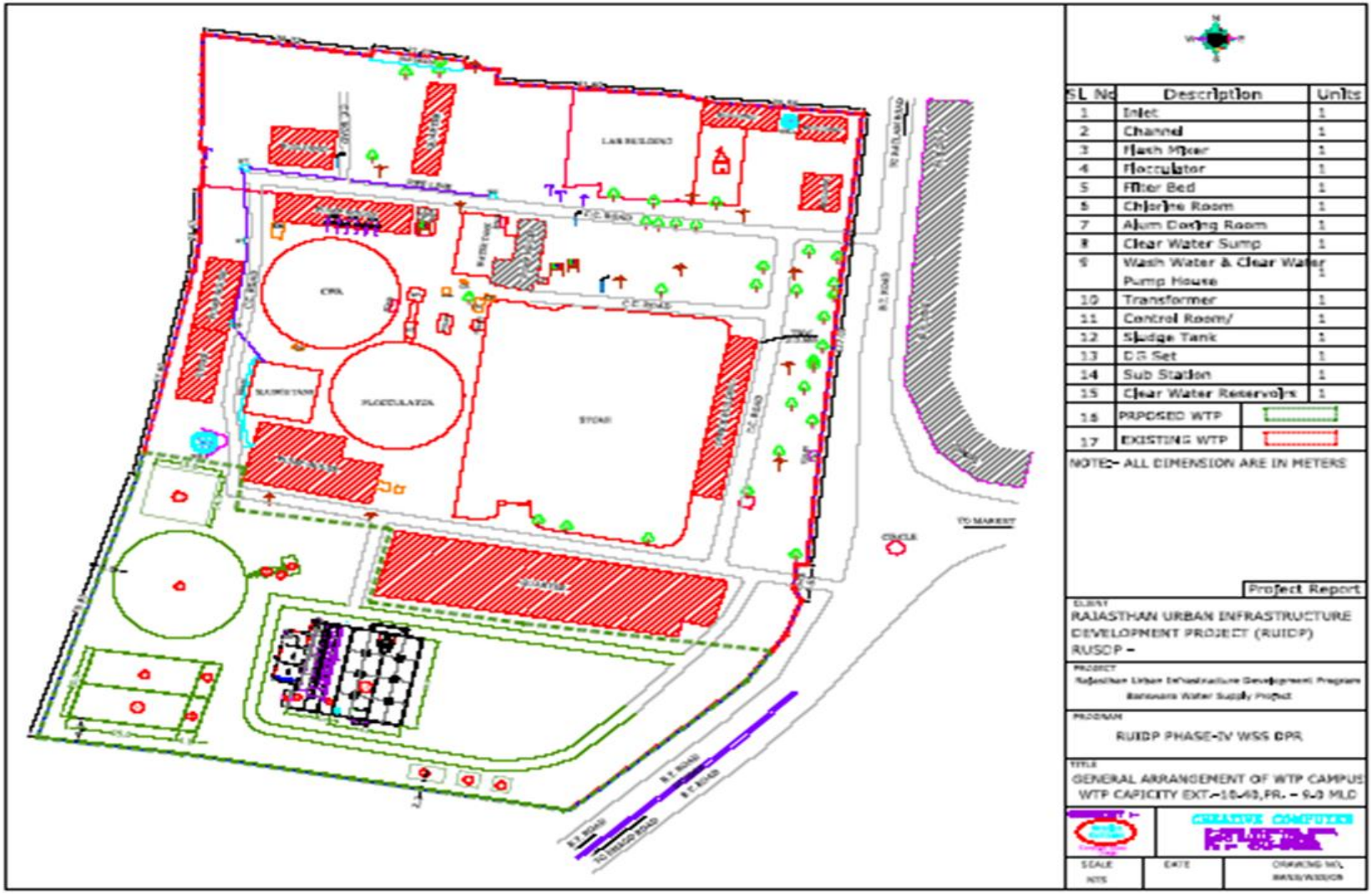


Figure 5: Location of Proposed Sewerage System Components on Google

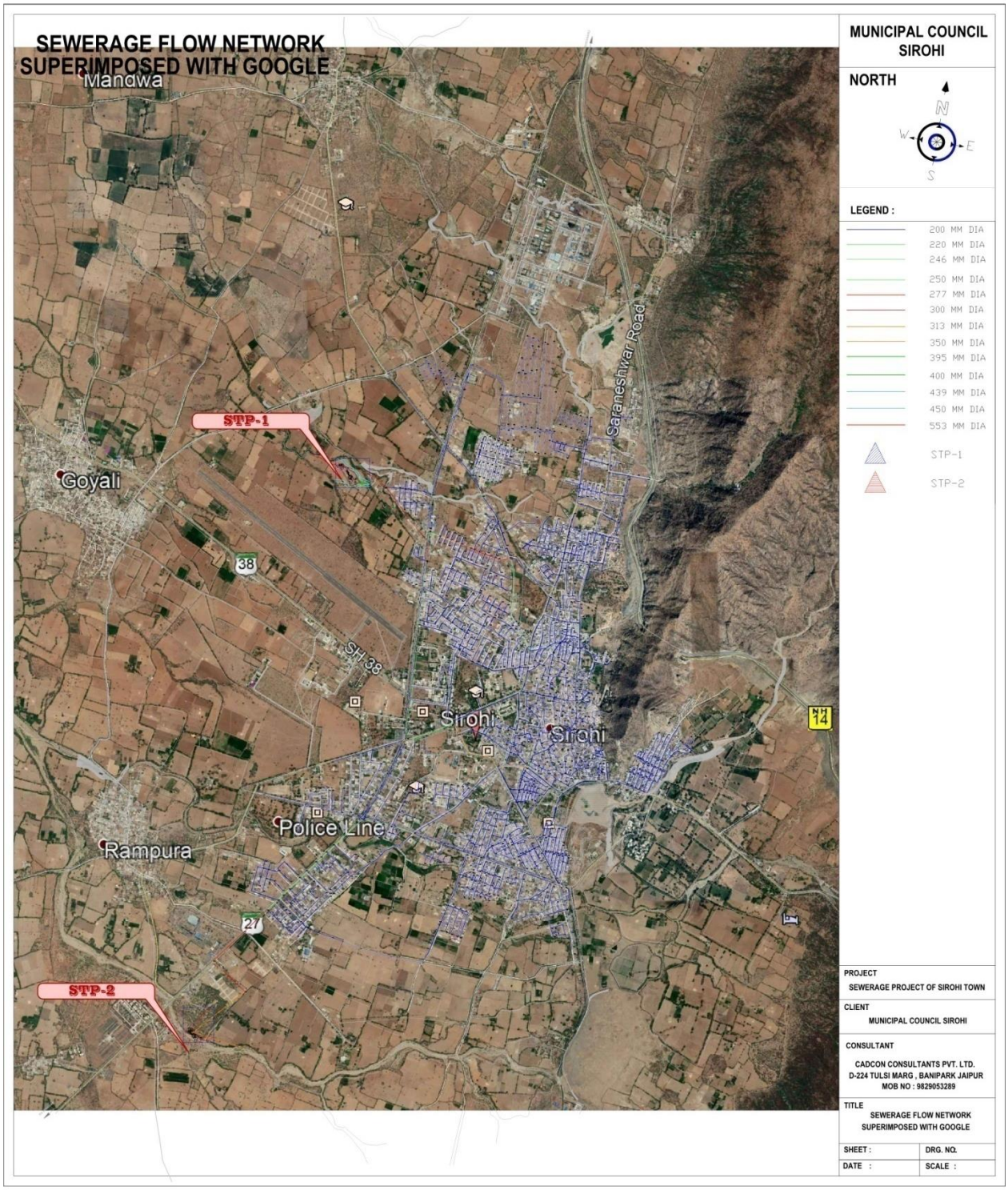


Figure 6: Proposed STP1 Site near Nehru Nagar

Figure 7: Proposed STP 2 Site near Revdar Road

Figure 8: Proposed Sewer Network Coverage on SOI Toposheet

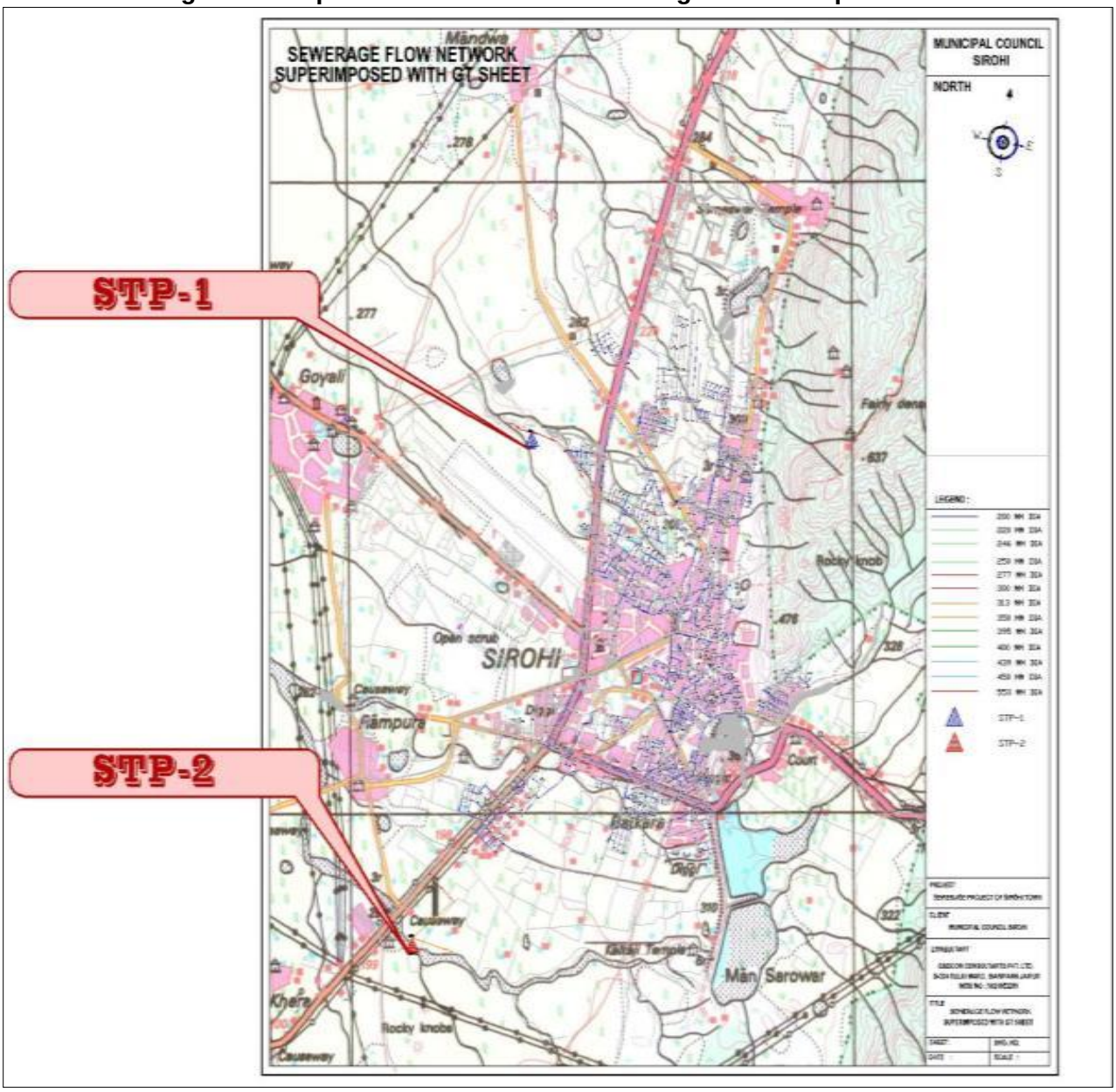


Figure 9: Schematic Layout of Proposed STPs

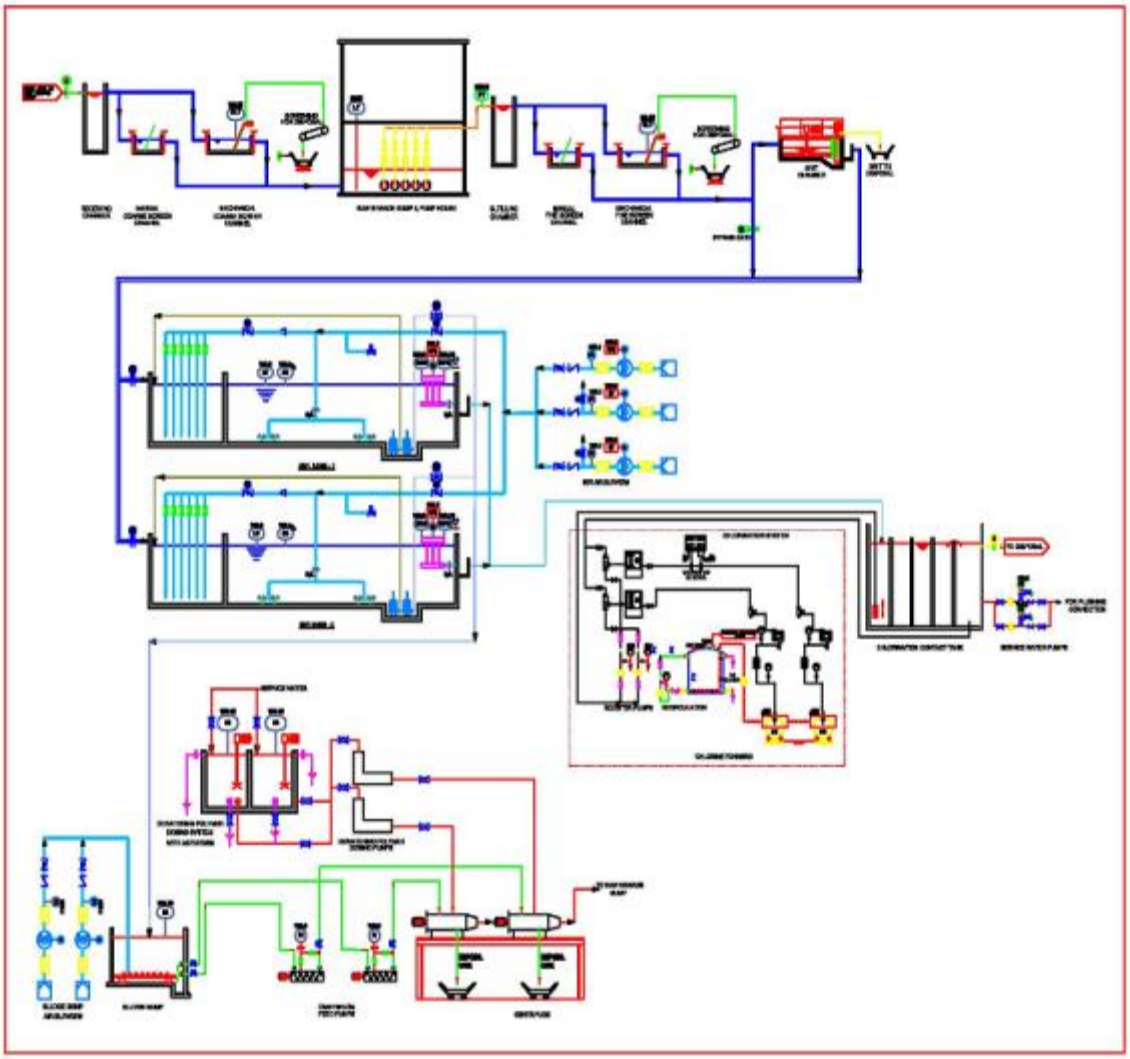


Figure 10: Layout Plan of Proposed STPs

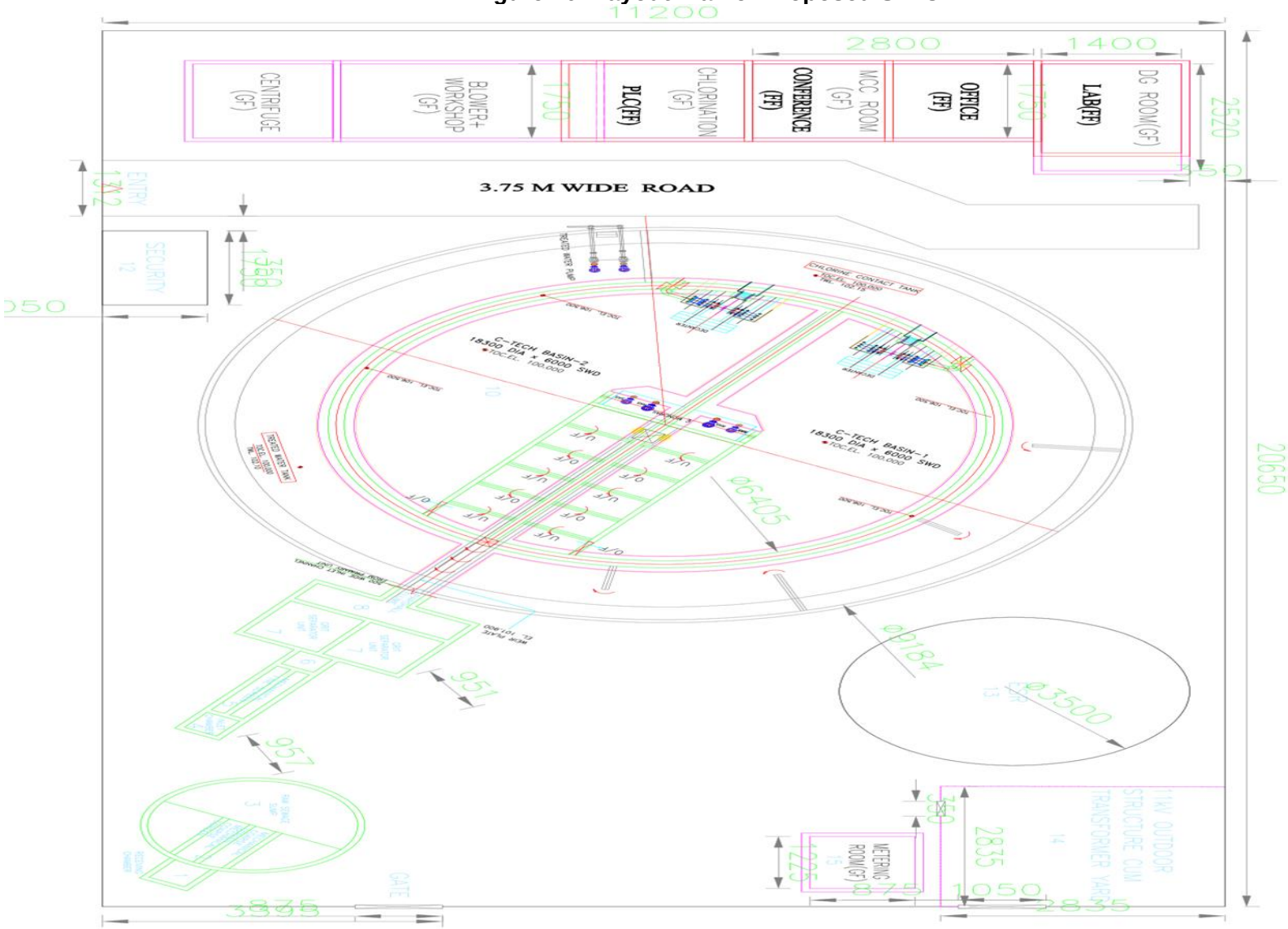


Figure 11: Layout of the Treated Effluent Elevated Reservoir (TEER)

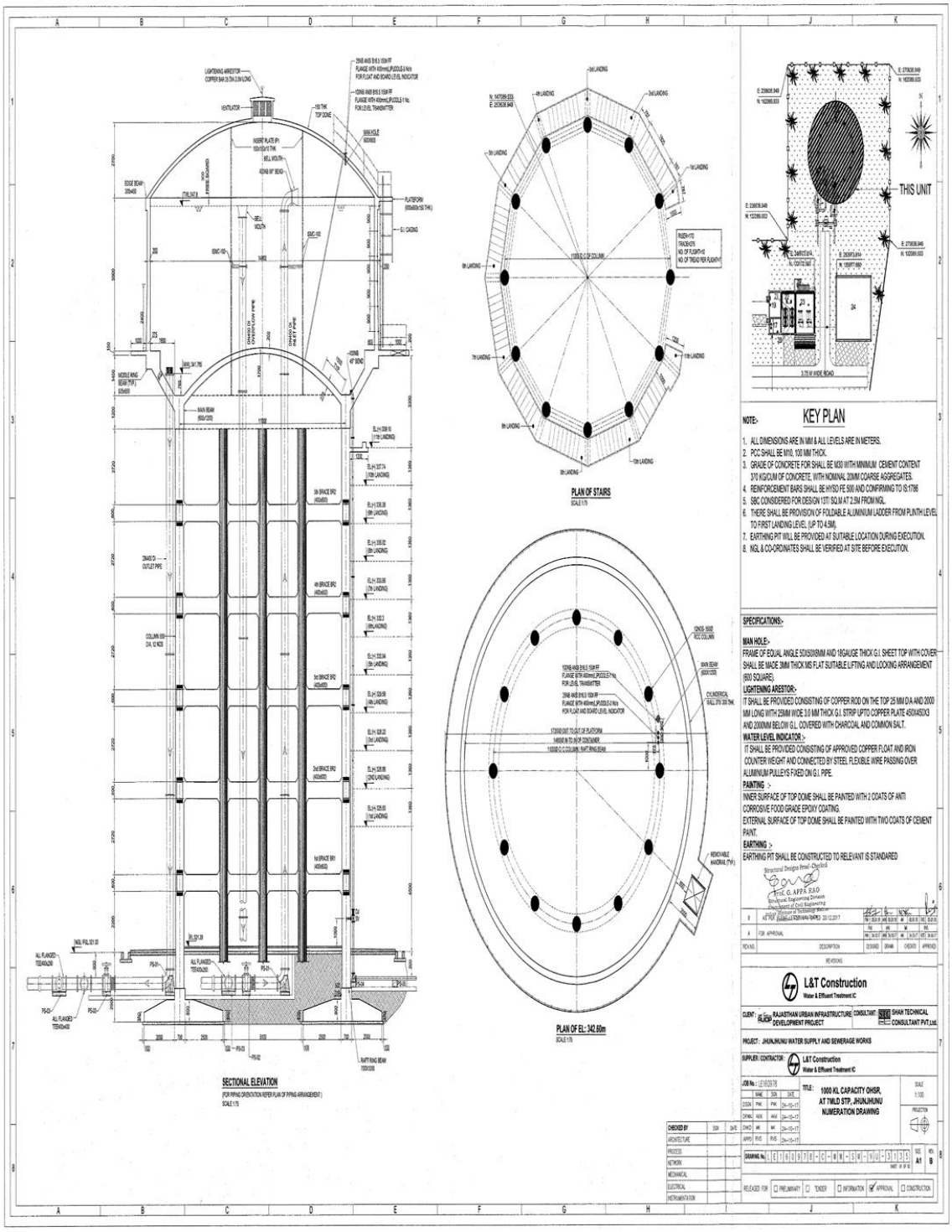
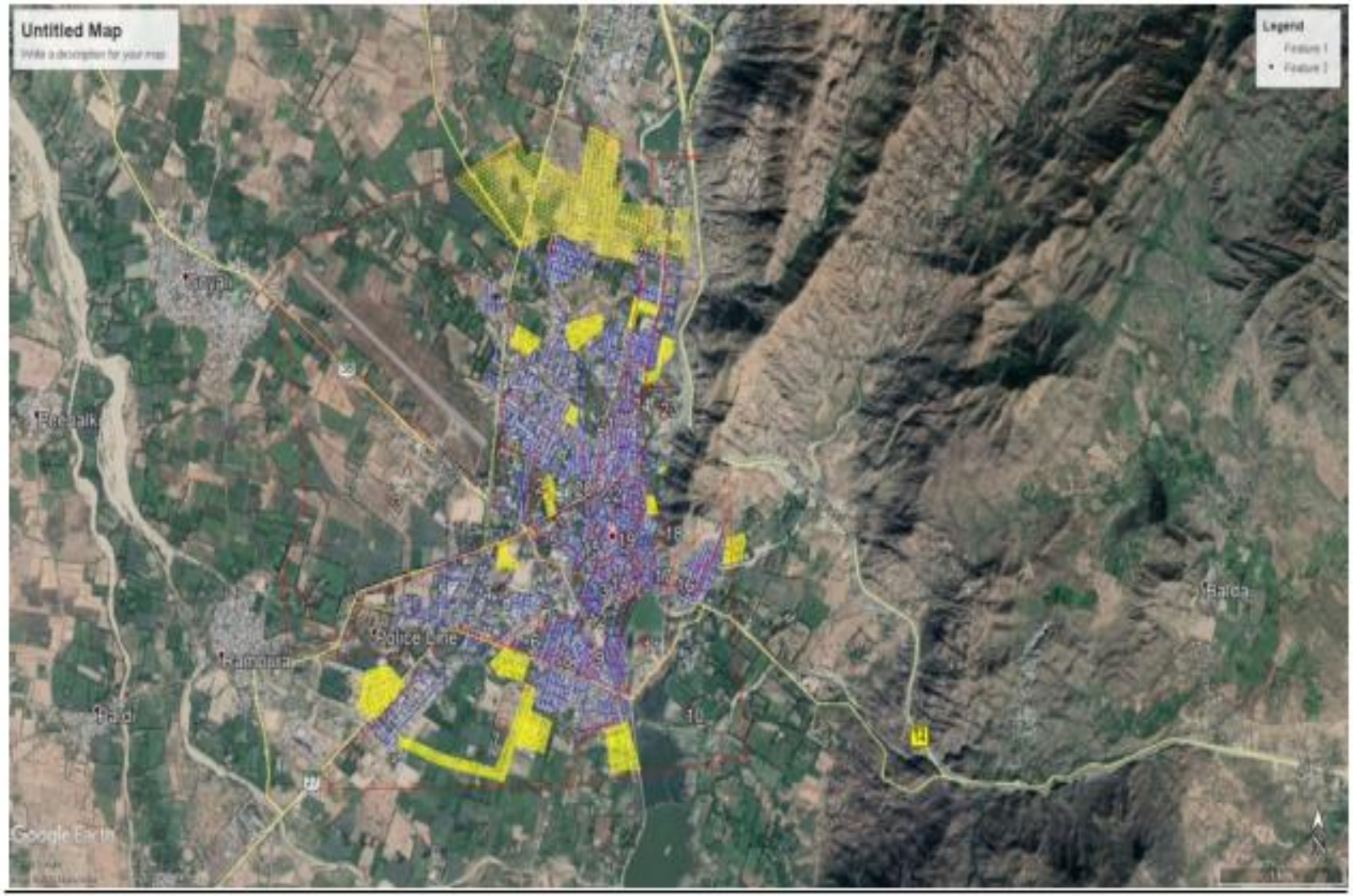


Figure 12: Area to be covered under FSSM System



III. ANALYSIS OF ALTERNATIVES

35. 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 Sirohi 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.

36. The proposed water supply subproject component in Sirohi 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.

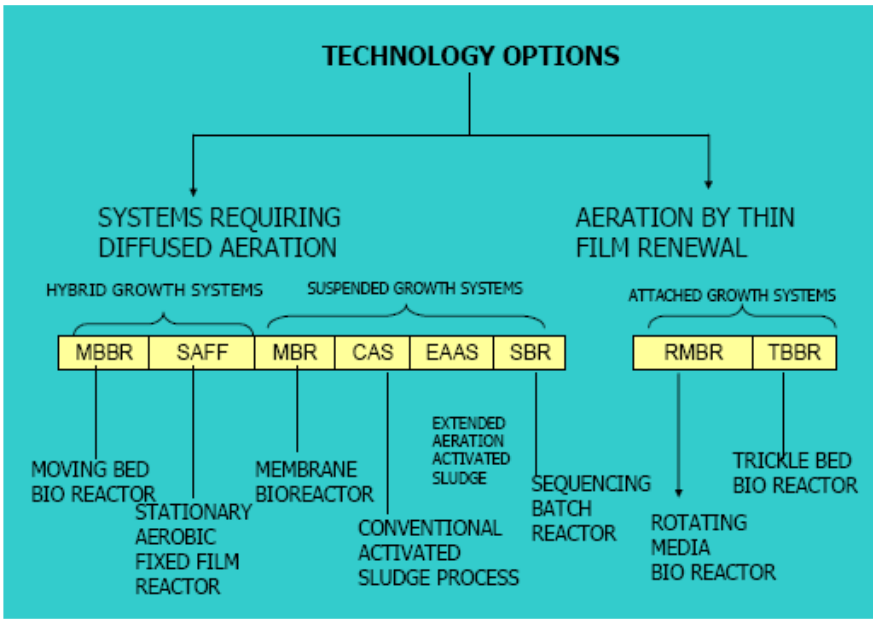
Table 3: Analysis of Alternatives

1.	**Project Need – No Project Alternative**
Type of alternative	'No project' / 'with project' alternative
Description of alternatives	No project alternative Sirohi subproject is proposed to improve the service levels of basic infrastructure – water supply and sewerage, which will ultimately improve At present, Sirohi Town residents suffer from inadequate, intermittent and low-pressure supply at a rate of 55 to 70 liters per capita per day (lpcd), which is considerably less than the norm of 135 lpcd. Water is supplied on alternative days, for a duration of just 1.5 hours. System is old, inefficient, and leakages are frequent in water pipes, and consequently water losses are high. At present there is no sewerage system in the town; households depend on individual septic tanks or direct discharge into open drains that meant for surface drainage. There are no soak pits, and the effluent discharge into open drains. The untreated / partially treated sewage flow in the open drains through habitation areas and discharged into rivers/streams. 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

	With project alternative The proposed RSTDSP, will support the ongoing efforts of the Government of Rajasthan (the government) towards improving water supply and sewerage systems in the project towns. The project will rehabilitate and expand the water supply network for the reduction of nonrevenue water (NRW), provide 24x7 water supply, rehabilitate and expand the sewerage network, modernize and construct new water supply and waste water treatment plants, and improve fecal sludge management, and decentralized waste water management systems in the project towns. The project is expected to increase operational efficiency, improve service delivery, and result in a positive impact on health and quality of life for the residents of project towns in the state. With the subproject, Sirohi town population (39,229 - 2011 Census and 58,613 – 2051, projected) will have convenient access to reliable and adequate safe and potable water supply, and safe sewerage. As a result, good hygiene and sanitation practices will be promoted and there will be reduced health and safety risks. Overall, the 'with project alternative' will bring about improved public health and living environment that will contribute to improved quality of life in the municipality. Improved water supply and sanitation will create an enabling environment for local economic development and improved social services that communities within the sphere of influence of the municipality will benefit from; thus, contributing to the overall economic development of the region.
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. Surface water. Combined ground and surface source
Selected Alternative	Selected source: Combined ground and surface source – Existing tube wells and open wells + new tube wells + Kalkaji Dam + Angore Dam
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 pf 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	can only be used for low end usages like flushing and gardening tertiary	can only be used for low end usages like flushing and gardening tertiary	Can be used for low end usages as well as for high end usages without any

	required for high and usages like construction water, industrial usages, cooling water etc.	treatment required for high and usages like construction water, industrial usages, cooling water etc.	treatment required for high and usages like construction water, industrial usages, cooling water etc.	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, thickeners, 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	Highest treatment efficiency with crystal quality power requirement is 50% of conventional technologies land requirement is less than 50% of conventional technologies

<table>
<tr><td></td><td>adopted</td></tr>
<tr><td>Selected Alternative</td><td>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:

<table><tr><th>Parameter</th><th>Standards</th></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><tr><td>Nitrogen-Total, mg/l</td><td>10</td></tr><tr><td>Phosphorus- Total, mg/l</td><td>1</td></tr><tr><td>Fecal Coliform (MPN/ 100 ml)</td><td>100 (permissible 230)</td></tr></table>
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.</td></tr>
<tr><td>4</td><td>Treated wastewater disposal</td></tr>
<tr><td>Type of alternative</td><td>Treated wastewater disposal – reuse applications</td></tr>
<tr><td>Description of alternatives</td><td>(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 also 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.</td></tr>
<tr><td>Selected Alternative</td><td>Reuse in non-potable applications and discharge excess/surplus into local drains/stream</td></tr>
<tr><td>5</td><td>Project Locations</td></tr>
<tr><td>Description of alternatives</td><td>Location of water intake: The location of water intake in Angore and Kalkaji Damsare selected within the dam, close to the bund. Location selection is guided by technical feasibility, and easy approach. The location within the dam will be fine-tuned during the detailed design following the detailed site surveys and investigations. One of the main criteria is to locate intake where there is adequate depth of water and as close as possible to the bund. This will optimize the infrastructure requirement (approach bridge,</td></tr>
</table>

	inlet pipes) and ensures year-round availability of water. Raw water alignment. WTP Location. STP1 location. STP 2 Location. Location of CWRs, Pumping Stations. 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 centre 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

37. ADB SPS 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.

38. **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, orunprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment isrequired.

(ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category Aprojects. 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 isrequired 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.

39. The environmental impacts of Sirohi Town 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 and Sewerage (Appendix1) 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.

40. **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.

41. **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.

42. **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.

43. **Consultation and Participation.**ADB SPS requireborrower to conduct meaningful consultation[11] 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.

[11] 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;1 (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

44. **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.

45. **Monitoring and Reporting.**Borrower shall monitor, measure and document the implementation progress of the EMP. If necessary, the borrowershall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrowershall 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.

46. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requiresthe 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.

47. **Occupational Health and Safety.**ADB SPS requires the borrower[12] to ensure that workers[13] 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.

48. **Community Health and Safety.**ADB SPS 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.

49. **Physical Cultural Resources.** Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS 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

[12] 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

[13] 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.

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.

50. **ADB SPS International Best Practice Requirements.** ADB SPS requires that, 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[14] and Sector Specific (Water and Sanitation) Guidelines).[15] 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.

51. The IEEs shall also reflect meaningful consultation and disclosure process with a provision for grievance redress mechanism.

B. National Laws

52. 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.

53. **Environmental assessment.** The Government of India 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.

54. **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.

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

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

55. **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.

56. None of the components of this water supply and sewerage system subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or EC is not required for the subproject.

57. **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 4.

Table 4: Applicable Environmental Regulations

Law	Description	Requirement	Relevance to Project Phase
National Environment Policy (NEP), 2006.	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by Central, State and Local Government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	RSTDSP should adhere to NEP principle of "enhancing and conservation of environmental resources and abatement of pollution".	All phases of project
• Rajasthan State Environment Policy, 2010 including And Rajasthan Environment Mission and Climate Change Agenda for Rajasthan (2010-14)	• Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental resources; assure 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,	• Project implementation should adhere to the policy aims of: conservation and enhancement of environmental resources, 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 and wastage, declining water availability, pollution. • • Relevant recommendations for the project include control of losses, integrated water resources management, control of raw water pollution[18], reuse and recycling. • • Avoid/minimize use of forest lands. • With reference to climate change adoption and mitigation following should be considered in the project: (i) diminishing	All phases of project

Law	Description	Requirement	Relevance to Project Phase
	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	flows in surface water bodies, and groundwater depletion, and revival traditional water bodies as water sources (lakes/tanks); (ii) equal stress on demand side management in water; and (iii) minimize energy use - design energy efficiency systems.	
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	-
Central Ground Water Authority Public Notice 2/100	Public Notice specifies districts and areas where there are restrictions on the construction and installation of any new structure for extraction of groundwater resources without specific approval from the CGWA	Subprojects belonging to the Notified Areas in the Public Notice and will require new structures on extracting groundwater should seek the permission from the Central Groundwater Authority	
Public Health Engineering Department Office Order P5 (1) PHE-2010 dated July 14 2020	PHED Office Order states that the State Government is instructed that permits for any new tube wells, bore wells or any structures extracting ground water shall be secured from the District Collector	Subprojects with components shall secure permits from the District Collector for components that include any new tube wells, bore wells or structures extracting groundwater	
Air (Prevention and Control of Pollution) Act	This Act was enacted to achieve prevention, control and	The following will require CTE and CTO from RPCB: (i) Diesel generators); (ii) Batching Plant hot mix plants; and (iii)	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
of 1981, Rules of 1982 and amendments.	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.	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) If ready mix concrete and hot mix bitumen is procured from third party, contractor to ensure that the plants, from where material is being purchased is having CTE/CTO and copy should be collected from third party and submitted in 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 protected areas. Nearest protected areas are: Balaram Ambaji Wildlife Sanctuary and Mount Abu Wildlife Sanctuary. The boundary of Balaram Ambaji WLS is about 2.6 km from Bhainsa Singh Dam/ intake. Mount Abu Wildlife Sanctuary is about 5 km from the municipal boundary in the northeast. Proposed Santpur CWR is located about 4.5 km from the sanctuary boundary.	Construction

Law	Description	Requirement	Relevance to Project Phase
		None of the components of the subproject are located within the protected Area. Therefore, this act is not applicable.	
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 & 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 4** provides ambient air quality standards, emission limits and emission stack height requirements for diesel generators **Appendix 5** provides STP discharge standards	Construction and operation
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.	**Appendix6** provides applicable noise standardsand noise limits for DG sets	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
Indian Drinking Water Standards	Gives details of the permissible and desirable limits of various parameters in drinking water as per the Bureau of Indian Standards	**Appendix 2** provides drinking water standards	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	(i) Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities	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.	Construction

Law	Description	Requirement	Relevance to Project Phase
	(ii) Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains (iii) 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, (iv) 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. (v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar, (vi) Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;	Sludge or any material if classified as hazardous waste / material is to be handled and disposed according to this Rules	
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,	Contractor to comply all the requirements of this Act during construction works. There are asbestos cement (AC) in the existing water supply system.	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	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	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". Except over the ground connections near CWRs, almost all the AC pipes were laid underground. In RSTDSP, no AC pipes are proposed, existing AC pipes will be left as it is. However, some pipes may have to removed / handled, and if such waste pipes confirm to the provisions of this act, waste shall be treated as hazardous waste and disposed as per the rules.	

Law	Description	Requirement	Relevance to Project Phase
	consequences on human beings and the environment; and (b) provide persons working in the site with appropriate 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 Abu Road; Nearest protected monuments are Dilwara temple, Achal fort and Toad rock, located at about 30-40 km from Abu Road In case of chance finds, 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	**Employer shall-** • Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point	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	Construction

Law	Description	Requirement	Relevance to Project Phase
Rules 2009	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 • Safety in use of explosives • Safety in operation of transporting equipment and appoint competent person to drive or operate such vehicles and equipment • Safety in lifting appliance, hoist and lifting gears	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 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	

Law	Description	Requirement	Relevance to Project Phase
	• 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 equipment • Provide safety net, safety sheet, safety belts while working at height (more than 1.6 mtrs 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		

Law	Description	Requirement	Relevance to Project Phase
	materials • Provide and maintain medical facilities for workers • Any other matters for the safety and health of workers		
Contract Labor (Regulation and Abolition) Act, 1970; The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	Provides for 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. 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.,	• Applicable to all construction works in the 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 8** provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	Construction and operation
The Child Labour (Prohibition and Regulation) Act, 1986	Prohibits employment of children below 14 years of age in certain occupations and processes	No child labour shall be employed	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	Employment of child labor is prohibited in building and construction Industry.		
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
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.	Not applicable - there are no state protected monuments in the town Chandrawati protected site is located about 5 km from the town boundary. No components are proposed in the protected area. Nearest component is raw water main, which is proposed along a road, which is at about 1.3 km from the protected area boundary. In case of chance finds, the contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP).	Construction

Law	Description	Requirement	Relevance to Project Phase
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
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 work place 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	There are no Ramsar sites in or near Abu Road. Not applicable to Abu Road water supply and sewerage subproject.	-

Law	Description	Requirement	Relevance to Project Phase
	Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.		
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 Hydrochlorofluoro carbons (HCFCs)	Not applicable in this project as no ODS are involved in construction works	-
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 Under this Convention, asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste.	-
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	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

Law	Description	Requirement	Relevance to Project Phase
	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.		

58. **Clearances / permissions to be obtained prior to start of construction.** Table 5 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 5: Clearances and permissions required for Construction activities

S. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Land for project activity	Allotment and approval for specific land use	ULB	PMU
2	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
3	Establishment of construction camps	Allotment and approval for specific land use	Contractor	PIU
4	Construction of new WTP and STP	Consent to establish and consent to operate under Water Act, 1974 from RSPCB	PIU & Contractor	PIU
5	Construction of new Tube Wells	NOC from State Ground Water Board is required before extraction of water from underground source	PIU and contractor	PMU
6	Tree Cutting	State forest department/Revenue (Tehsildar)	PIU	PIU and PMU
7	Hot mix plants, Crushers, Batching plants and DG Set	Consent to establish and consent to operate under Air Act, 1981 from RSPCB	Contractor	PIU
8	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
9	Sand mining, quarries and borrow areas	Permission from District Collector/ State Department of Mines & Geology	Contractor	PIU
10	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU
11	Use of vehicles and equipment	Pollution under control certificate (PUC) form RTO	Contractor	PIU
12	Temporary traffic diversion measures	Temporary traffic diversion measure including use of alternate road from District traffic police	Contractor	PIU
13	Use of Railways ROW for construction area/ crossing	Indian Railways	PIU	PMU
14	Use of highway ROW for construction area/ crossing	National Highway uthority of India	PIU	PMU
15	Pipe laying works	Permission from Nagar Palika and PWD	PIU	PMU

59. 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 and Connectivity

60. Sirohi is a city is located in southern part of Rajasthan state. It is the administrative headquarters of Sirohi District and was formerly the capital of the princely state of Sirohi ruled by Sirohi Rajput rulers. Sirohi District borders Gujarat State in the south. It has an average elevation of 321 m above mean sea level (MSL). and is located at 24.885 Nlatitude and 72.8625 E longitudes. This town is located at 430 km from Jaipur and 242 km from Jodhpur and is connected by National Highway 14. It is well connected with the towns in the region. Mount Abu, the famous and the only Hill station is about80 km from Sirohi town. Total area of the Sirohi Town is 5.179 sq. km comprising of 25 municipal wards, and a population was 39,229 (2011 census).

61. Sirohi is well connected byroads, state highways (SH 10, SH 27, SH 38) and national highways (NH 14, NH 62 and NH 168) to neighboring towns, hinterland, and major towns in the state and other parts of country. The nearest railway station is Sirohi Road. Nearest domestic Airport is in Udaipur, which is 145 km away and nearest International Airport is in Ahmedabad which is about 262 km. There is an Air Strip in the town, which is occasionally used. Project town location is given below.

Figure 13: Location of Project Town in Rajasthan

2. Topography, Soils and Geology

62. Topography of Sirohi had been derived by "Siranwa" hills on the western slope of which it stands. Average elevation is 321metre above the mean sea level. The basement below alluvium consists of rocks belonging to series of carbonaceous phyllite, quartzite, schists, marble.

63. **Physiography.** The Sirohi district is characterized by undulating topography where it can be divided into hills, valleys and plains. The hilly areas are mainly forested and rugged. At places inter-montane valleys are also present. The plain area constitutes pediplain and alluvial plains. According to Geological Survey of India, the Sirohi district has been geomorphologically divided into seven units based on their origin which are as follows: Ridge and valley; Alluvial plain; Zone of obstacle dune; Zone of obstacle dune; Zone of complex/composite dune; Pediment/pediplain; Isolated hill; and, Piedmont zone

64. **Drainage.**The drainage in Sirohi district is controlled by lithologic and physiographic features. The central part of Sirohi district forms NE-SW trending water shed for the stream channels descending towards east and west. These stream channels after descending from high hills attain their flow directions depending on physiography. The channels of north flowing Sukdi nadi originates in Pali district passes through west of Godana to again enter into Pali district to join Jawai river. The north west flowing non-perennial rivers Khari, Khuri, Krishnawati and Kapalganganadi after travelling considerable distances join Bandi nadi. The south-west ward flowing streams Sukali nadioriginates aroundNivaj whereas Sipu nadi originates south of Kishanganj. Another south-west flowing river is Banas which drains entire eastern part of the district. The stream channels of the Banas river originate from the high hills in the central portion

of the district and moves east and south-east wards and finally join south-west flowing Banas river. The Banas river has a long stretch starting from north of Keshavganj, passes through Peshua, Swaroopgang, Kivarli, Morthala, Abu road, Mawal and leaves the district south of Vasra and enters Gujarat. In Gujarat it takes westerly course and ultimately merges in Rann of Kutchh.The Banas river have NE-SW flow direction and divides the buffer zone into almost two halves and drains the entire buffer zone.

65. **Geology.** Geological formations exposed in the district range in age from Proterozoic to Recent. Oldest rocks are Calc. Schist, and Calc. Gneiss belonging to Kumbhalgarh group of Delhi Super Group of Proterozoic age, while the youngest formation is Alluvium belonging to Quaternary age. Rocks of Delhi Supergroup are exposed in the southeastern and central parts of the district. Post Delhi intrusives include Erinpura, Sendra and Ambaji granite/ granitic gneiss, which are exposed in the northeastern, southwestern and southeastern parts of the district. Malani rhyolites are exposed in the southern and northern parts of the district around Abu Road and Sheoganj blocks. Northwestern and southwestern parts of the district are covered by unconsolidated sediments comprising of alluvium and windblown sand.

66. **Soils.** The soil of the district is mainly of sandy loam soils. As per soil classification the district can be divided into five parts. The major soils found in the district and their percentage are shown below:

Table 6: Major Soil Groups in the District-Sirohi, Rajasthan

Major Soil types	Area (ha)	% of Total
Sandy loam Sols	185.038	74.10
Clay Loam	61.557	24.65
Loam Soils	2.758	1.10
Mixed Black and red Clay loam soil	0.372	0.15
Total	249.725	100

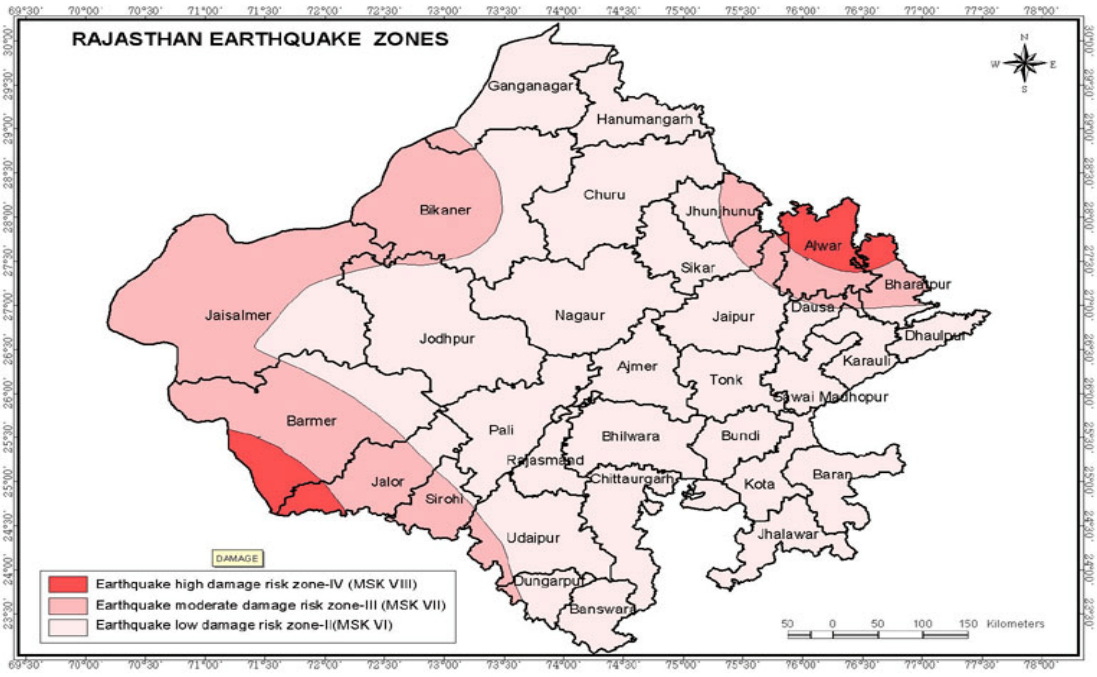
Source: Agriculture Contingency Plan. of Agriculture Cooperation and Farmers welfare,Govt. of India.

67. CGWB has classified the soils of the district under the following broad categories:

(i) Mattiyar (Stiff Clay): Black coloured soil found in Pindwara and parts of Sheoganj blocks. This soil is more suitable for growing Wheat, Barley and Cotton.
(ii) Gorat or Bhuri (Sandy): Light brown coloured soil found in Reodar, some parts of Sirohi and Sheoganj tehsils. It is fertile and suitable for growing Bajra.
(iii) Reti (sand): It occurs in riverbeds and is suitable for growing Tomatoes and watermelon.
(iv) Kankari (hard and stony mixed with sand): It occurs around the base of the hills.
(v) Khari (saline soil): Unsuitable for crops occurring in western parts of the district

68. **Seismology.** As per the seismic zoning map of India, Sirohi falls under the Zone-III, which is the Moderate earthquake risk zone in India. This zone is termed as “Moderate damage risk zone”.

Figure 14: Earthquake Zoning Map of Rajasthan

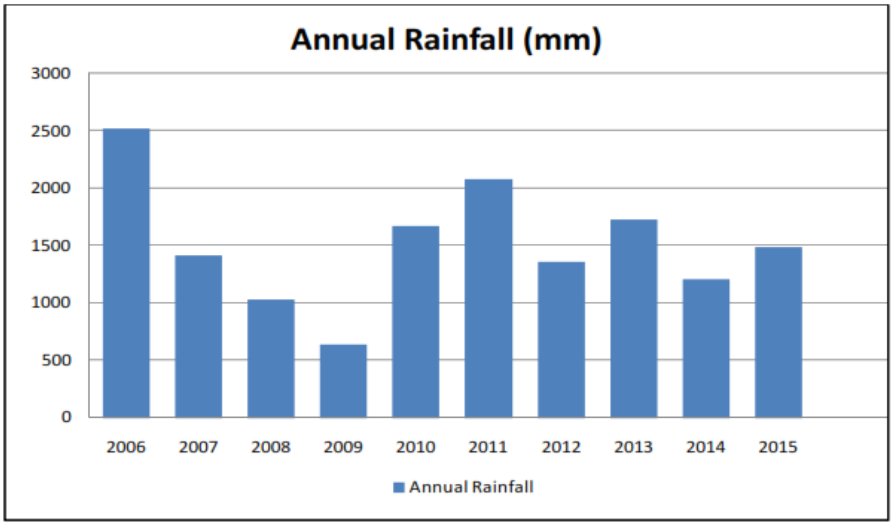


3. Climatic and Rainfall

69. The climatic conditions in Sirohi district is of semi-arid type. The nearest meteorological recording station is at Abu Road. The region falls in the semi-arid zone of India. The year is divided into four seasons. The winter season is from December to February followed by the hot summer season from March to mid-July including the pre-monsoon season from April to June. The period from mid-July to mid-September constitutes the south-west monsoon season and the period from mid- September to end of November is the post-monsoon season.

70. Average annual rainfall (1991-2011) of the district is 760 mm, which is significantly higher than thelong-termnormal rainfall for the period 1901 to 1970, which was 606.3 mm. Rainfall varies widely across the district. It gradually decreases from southern part to northern part. Highest rainfall is received in the Mount Abu hill station in the south (~1488.6 mm) and minimum is in Sheoganj in the north (~542.2 mm). The district experiences either drought once in two years. Severe type of droughts has been recorded very rarely. The most severe type of drought had occurred in the district at Pindwara (2000) and Reodar (1987). The annual rainfall recorded at Abu Road Rain Gauge Station from year 2006 to 2015 is shown below. Highest rainfall was received in 2006 (2,521.7 mm) and lowest in 2009 (642.3 mm).

Figure 15: Annual Rainfall Recorded at Abu Road, in Sirohi District (2006-15)



71. **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 2020s 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. The projections of maximum temperature increase for the project design period i.e., by 2050s is 2.1°C and projections of minimum temperature increase for the project design period i.e., by 2050s is 2.6°C.

72. 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 projections of annual rainfall change for the entire state for the project design period i.e., by 2050s is 3.9 %. 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.

73. By the proposed sewerage project, all the treated water will be used in beneficial purposes such as agricultural activities etc. that is the major component of the economic sector which is largely dependent on rainfall for agricultural activities. Adequate treated water from treatment plant will ensure the sustainability of more crops per drops in the area/regions and to make less dependent on precious groundwater resources in the area/region.

4. Surface Water

74. Sirohi Tehsil falls in parts of Luni (910.9 sq. km), West Banas (141.6sq.km), Sukli (63.8 sq.km) river basins. The drainage system is well developed in the district. Jawai is the main river of north-west part. This river eventually meets Luni river. West Banas is the most important river. Other rivers which flow in the district are Khari, Sukli, Bandi, Kapalganga and Krishnavati. There

are no natural lakes in the district. Artificial Lake named Nakki lake in Mount Abu is picturesque and has become place of pride

75. Angoreand Kalka Ji Dams are proposed as a surface water source of this water supply project. Salient Features of existing water bodies in the Tehsil and district of Sirohi, are given in Table 7. All the dams are earthen dams and constructed for irrigation purpose.

Table 7: Salient Features of Dams in Sirohi Tehsil

S. No.	Name of Dam	Year of Construction	River/Nalla	Gross storage capacity (Mcum)	Live storage Capacity (MCM)	Length of Canal system (Km)	GCA
1	Angore	1988	Krishnawati River	14.019	13.22	40.63	3550.79
2	Dhanta	1962	Local Nalla	7.842	7.65	6.096	1156.62
3	Kameri	1989	Krishnawati River	7.74	4.181	5.400	985.43
4	Poidara	1965	Patganga River	3.974	3.422	5.220	733.31
5	Nimbora	1997-98	Kalpganga River	0.947	1.938	3.900	727
6	Akhelao Manasarowar a	1990	Rajupura River	1.781	1.515	1.8	380.57
7	Varal	2005	Local Nalla	1.6762	1.56	1	409
8	Nawara	2010	Local Nalla	0.515	0.478	1.3	128.45
9	Barloot	2008-09	Moonja Nalla	1.526	1.389	3.25	660.97

Source: Sirohi DPR.

76. **Water Quality.** The chemical analysis results of raw surface water samples from Angore and Kalka Ji dams were carried out by the PHED are given in Table 8 and reports in Appendix 9. The water quality results indicate that the water is potable and suitable for consumption after proper treatment and disinfection.

Table 8: Water Quality of Kalkaji and Angore Dams (April 2018)

Parameters	Kalkaji Dam	Angore Dam	Drinking Water Standards (IS 10500-2012)	
			Desirable	Permissible in absence of alternate source
pH	8.0	7.3	6.5-8.5	No relaxation
Turbidity (NTU)	42	22	1	5
Colour	Slight Yellow	Slight Yellow	5	15
Odour	No Smell	No Smell	5	15
Temperature (°C)	25	25	-	-
Total Alkalinity (As CaCO3)	200	120	200	600
Total Hardness (As CaCO3)	110	110	200	600
Calcium Hardness (As CaCO3)	70	60	-	-
Magnesium Hardness (As CaCO3)	40	50	-	-

Parameters	Kalkaji Dam	Angore Dam	Drinking Water Standards (IS 10500-2012)	
			Desirable	Permissible in absence of alternate source
Chlorides (As Cl-)	140	130	250	1000
Sulphate (As SO42-)	-	-		
Nitrates (As NO3-)	8	8	45	100
Nitrite (As NO2-)	-	-		
Fluoride (As F-)	0.7	0.6	1.0	1.5
Total Dissolved Solids	390	450	500	2000
Iron	-	-	0.3	No relaxation
Residual Chlorine				

Source: PHED Lab, Sirohi

5. Groundwater

77. Ground water occurs under water table conditions both in unconsolidated and consolidated formations. Its occurrence is controlled by topography, physiography and structural features of the geological formations. The movement of ground water in hard rock areas is governed by size, openness, interconnection and continuity of structurally weak planes while in unconsolidated rocks, ground water movement takes place through pore spaces between grains.

78. The basement below alluvium consists of rocks belonging to series of Carbonaceous phyllite, quartzite, schists, marble. Phylites and Schists aquifers occur predominantly in Abu Road, Pindwara and central part of Sirohi tehsil. Ground water is retained in weathered zones, fractures, joints etc. Ground water is retained in weathered zones, fractures, joints etc. Depth of open wells tapping these aquifers ranges from 25 to 40 m. Yield of wells varies from 30 to 250 m3/day. Alluvial area is restricted to riverbeds. The depth to water level in the area tapping these aquifers ranges from 10m to 20m. Depth and diameter of the dug well and bore well depends on formation and geomorphology. However, general depth of dug well and bore well ranges from 9 to 50 m and 100 to 120 m respectively.

79. Groundwater is the main source of irrigation and is utilized through dug wells, and tube wells. The depth to water level varies widely depending upon topography, drainage, bedrock geology etc. in the district. As CGWB Report on Sirohi District Groundwater Scenario, 2013, depth to water in pre monsoon of 2011 varied from 4.13 to 34.1 m below ground level), while post monsoon varied from 0.55 m to 20.97 m below ground level. In Sirohi block, depth to water level ranges between 10 and 20 m below ground level in pre monsoon of 2011 while post monsoon varied from 2 m to 20. m below ground level. In terms of pre and post monsoon fluctuation in groundwater level in 2011, according to CGWB Report, decline in water level recorded in some of the wells in parts of Sirohi block. Analysis of CGWB's long term water level data of Pre-monsoon (2002-2011) indicate declining trend in water level in some parts of Sirohi block.

80. **Groundwater Utilization.** Ground water resources have been jointly estimated by Central Ground Water Board and Ground Water Department, Government of Rajasthan (As on 31.03.2009), excluding saline and hilly areas. Annually replenishable ground water resources of the district have been estimated to be 300.9981 MCM, while the net annual ground water availability is estimated to be 274.224 MCM. Total annual ground water withdrawal for all uses

has been estimated to be 299.9916 MCM. With the stage of development at 109.40 %, district is classified as 'Over Exploited' (OE, > 100%). Of the five Blocks/Tehsils in Sirohi District, 3 are classified as semi critical, and two are classified as over exploited. In Sirohi Block/Tehsil, while the estimated net annual groundwater availability is 65.5769 MCM, the total utilization for all uses is estimated as 65.163 MCM (99.37% utilization). Sirohi Block is classified as "Over Exploited'" (100% utilization with long term decline in groundwater in some parts). CGWB recommend cautious groundwater development in Over Exploited areas, and conjunctive use of surface and groundwater resources.

81. **Groundwater Quality.** Groundwater quality of tube wells and open wells in Sirohi is presented in Table 9 and Table 10. Groundwater is alkaline in nature with pH ranging from 7.0 to 8.0, and within the acceptable range of drinking water quality. Most of the tested parameters are well within the desirable limits of drinking water standards (IS 10500-2012). Fluoride content in most of the samples, exceeding the desirable limit of 1.0 mg/l and also above the permissible limits (1.5 mg/l) in 7 samples. Except two tube well samples the Chloride content in all the open /tube wells are below desirable limit (250 mg/l), TDS content in all the tube wells and open wells monitored is exceeding the desirable limit (500 mg/l), but within the permissible limit (2000 mg/l), except for two tube wells where TDS contents are above the permissible limit. Laboratory test reports are given in Appendix 10.

6. Air Quality

82. Ambient air quality in Rajasthan is monitored by Rajasthan Pollution Control Board. However, at present there is no monitoring station in Sirohi, and therefore no data on ambient air quality available. The roads are not in good condition, traffic on these roads and winds are the main source of dust generation. Due to industries pollutants exist in the air during dry seasons. Air quality monitoring shall be conducted in the pre-construction phase (SIP period) by the contractor and shall be updated in IEE.

Table 9: Groundwater Quality, Sirohi

Source / Location	**Open Well** Ratanvav,	**Open Well** Akbari Campus	**Tube Well** Kalka Tapovan	**Tube Well** Mohanlal Kachhuaji	**Hand Pipe** Near Sariya Devi Mandire	**Open Well** No 4, Angore	**Open Well** No 6, Angore	**Open Well** No 11, Angore	**Tube Well** Ganeshji Mandir	**Drinking Water Standards (IS 10500-2012)**	
Date of Sampling	06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019	27/08/2018	27/08/2018	27/08/2018	27/08/2018	Desirable	Permissible
Parameters											
pH	7.9	7.7	7.9	8.0	8.0	7.6	7.6	7.8	7.0	6.5-8.5	No relaxation
Turbidity (NTU)	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	1	5
Colour	None	None	None	None	None	None	None	None	None	5	15
Odour	None	None	None	None	None	None	None	None	None	5	15

Source / Location	Open Well	Open Well	Tube Well	Tube Well	Hand Pipe	Open Well	Open Well	Open Well	Tube Well	Drinking Water Standards (IS 10500-2012)	
	Ratanvav,	Akbari Campus	Kalka Tapovan	Mohanlal Kachhuaji	Near Sariya Devi Mandire	No 4, Angore	No 6, Angore	No 11, Angore	Ganeshji Mandir		
Temperature (°C)	25	25	25	25	25	25	25	25	25	-	-
Total Hardness (As CaCO3)	500	500	990	960	390	-	-	-	-	200	600
Chlorides (As Cl-)	240	230	2000	1720	100	130	149	130	150	250	1000
Nitrates (As NO3-)	44	12	24	24	20	5	3	2	8	45	-
Fluoride (As F-)	1.3	1	1.6	1.7	0.9	1.6	0.5	1.1	2.0	1.0	1.5
Total Dissolved Solids	1699	1367	6340	6400	1106	752	745	736	736	500	2000

Source: PHED Lab, Abu Road.

Table 10: Groundwater Quality, Sirohi

Source / Location	Tube well	Tube well	Tube well	Tube well	Tube well	Tube well	Tube well	Open well	Open well	Drinking Water Standards (IS 10500-2012)	
	Jogi Vas	Hansaramji	No 1, Angore	Dhanta	Ashapura	Badhnathji	No 3, Angore	Sarja Bavadi	Kanak Vav		
Date of Sampling	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018	Desirable	Permissible
pH	7.3	7.4	7.5	7.7	7.0	7.4	7.7	7.4	7.5	6.5-8.5	No relaxation
Turbidity (NTU)	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	1	5
Colour	None	None	None	None	None	None	None	None	None	5	15
Odour	None	None	None	None	None	None	None	None	None	5	15
Temperature (°C)	25	25	25	25	25	25	25	25	25	-	-
Chlorides (As Cl-)	160	200	250	180	260	400	190	180	450	250	1000
Nitrates (As NO3-)	26	6	11	5	21	9	6	23	89		
Fluoride (As F-)	1.3	1.3	2.0	1.5	1.3	0.8	2.9	0.6	1.2	1.0	1.5
Total	839	1153	1299	887	1437	1644	965	1072	1740	500	2000

Source / Location	Tube well Jogi Vas	Tube well Hans aramji	Tube well No 1, Angore	Tube well Dhanta	Tube well Asha pura	Tube well Badh nathji	Tube well No 3, Angore	Open well Sarja Bavadi	Open well Kanak Vav	Drinking Water Standards (IS 10500-2012)	
Dissolved Solids											

Source: PHED Lab, Abu Road

B. Ecological Resources

83. There are no forest areas or ecologically sensitive areas within or near the municipal boundary of Sirohi town. Project area mostly comprises urban and habitation areas, and agricultural, vacant and barren lands. Nearest protected area is Mount Abu Wildlife Sanctuary, the boundary of which is 20 km south from Sirohi Town. Situated in Aravalli Ranges. Mount Abu is the only hill station in Rajasthan, and is known for its natural and man-made heritage, picturesque landscape, eco sensitive areas and wildlife. Profile of sanctuary is given below, however, as stated, given that is far away (20 km) from project area, project activities do not interfere with sanctuary. Screening of project areas is carried out based on Integrated Biodiversity Assessment Tool (IBAT) and IBAT proximity area report and the detailed biodiversity assessment report show that there is no protected or key biodiversity area within 10 km of Sirohi (Appendix 11)

84. **Flora and Fauna in the study area**. Information on the floristic and faunal diversity of the study area is gathered from the local habitants. Secondary data on flora and fauna, cropping patterns etc. were also collected from available literatures, internet, forest department and revenue department. The species of Herbs, Shrubs, Climbers, Trees and Major agriculture crops, were documented. The dominant plant species growing in this area are:

Table 11: Flora in Sanctuary

S. No	Scientific name	Local name	Family
1	Acacia catechu	Khair	Fabaceae
2	Acacia senegal Kumta Mimosaceae	Kumta	Mimosaceae
3	Aegle marmelos	Bel	Rutaceae
4	Butea monosperma	Palash	Fabaceae
5	Boswellia serrata	Salar	Burseraceae
6	Anogeissus latifolia	White Dhaura	Combretaceae
7	Anogeisus pendula	Black Dhaura	Combretaceae
8	Diospyros melanoxylon	Tendu	Ebenaceae
9	Lannea coromondelica	Mohin	Anacardiaceae
10	Moringa oleifera	Senjana	Moringaceae
11	Cassia fistula	Amaltas	Fabaceae
12	Delonix regia	Gulmohar	Fabaceae
13	Pongamia pinnata	Karanj	Fabaceae
14	Mangifera indica	Aam	Anacardiacae
15	Moringa oleifera	Senjana	Moringaceae
16	Terminalia arjuna	Arjun	Combretaceae
17	Eucalyptus globulus	Safeda	Myrtaceae
18	Azadirachta indica	Neem	Meliaceae
19	Prosopis cineraria	Khejri	Fabaceae

S. No	Scientific name	Local name	Family
20	Prosopis juliflora	Vilayati babool	Fabaceae
21	Lantana camara	Raimunia	Verbenaceae
22	Ipomea carnea	Besharam	Convolvulacae
23	Ziziphus xylopyrus	Jungli Ber	Rhamnaceae
24	Cynodon dactylon	Doob grass	Poaceae
25	Parthenium hysterophorus	Congress grass	Asteraceaea
26	Madhuca indica	Mahua	Sapotaceae

85. Fauna Based on actual sighting, inputs from locals and perused from secondary data it is noted that in faunal composition (i) common species of mammals such as Boselaphus tragocamelus, Funambulus pennant, Eryx johnii, Calotes versicolo, Hemidactylus flaviviridis, (ii) In Butterflies Danaus chrysippus , (iii) Avi faunal species such as Ardeola grayii, Ardea cinerea, Vanellus cinereus, Ploceus philippinus, Upupa epops, Psittacula krameri, Columba livia, Egretta garzetta, Bubulcus ibis, Corvus splendens, Dicrurus macrocercus, Saxicoloides fulicata, Acridotheres tristis, Pycnonotus cafer, Turdoidesstriatus and Passer domesticus etc. found in nearby project area

86. The avifaunal profile recorded in the quadrat studies is dominated by birds associated with open scrub such as Grey Francolin, Laughing Dove, Indian Robin, Common Stonechat, Brahminy Starling, Common Babbler and Yellow-eyed babbler.

87. Some wetland associated species were also recorded on Angore dam. They include resident species such as little grebe, Asian Openbill and Red-wattled Lapwing, and no migratory species were seen during the visit. Birds associated with habitation, cultivation and gardens, including Indian Peafowl, Indian Roller, Common Pigeon, Common Myna, Red-vented Bulbul and Ashy Prinia are also noticed.

88. Migratory Avifauna. The subproject area is part of the massive avian migratory channel called the Central Asian Flyway (CAF), which spans the entire Indian subcontinent. Thus, the subproject area lies in the path of various winter migratory birds entering the Indian subcontinent from the north and headed farther south. With its diversity of habitats, the area in general is likely to be providing seasonal habitats or staging points to many of these visitors. But migratory birds are not reported in the water bodies in and around Sirohi. Local people, public representatives and forest officials were consulted during the site visit confirmed that there are no migratory birds that visit dams. There is no notable wildlife presence / movement indicated during the consultations with locals and forest officials.

89. On the review of available information, no rare or endangered species of flora and fauna prescribed by IUCN or WPC, 1972 are found along the project areas.

90. A detailed biodiversity assessment study for Critical Habitat (Appendix 11) indicates that within the project area of influence (PAI), there are no known species which would qualify the area as Critical Habitat for Criterion 1 - 3. Further, within the PAI there are chances of Wildlife in forest areas next to town limits in East direction on Aravalli Range. The migratory birds (falcon, sarus, vultures and eagle) species may be visiting the wetland and Luni River. The presence of wildlife in hill forest and birds in river wetland need to be confirm by PIU by field visit and consultation with local community and divisional forest & wildlife department. The PAI does not qualify as Critical Habitat under Criteria 4 and 5.

C. Economic Development

91. **Land use.** The geographical area under the Sirohi municipal council was 835 ha, out of which developed area is 575 ha. and the rest is mainly agriculture land.

Table 12: Existing Land Use of Sirohi Town 2011

Sr. No.	Land use	Area	Developed Area	Total
		ha.	%	%
1	Residential	212	36.87	25.39
2	Commercial	11	1.92	1.32
3	Industrial	40	6.96	4.79
4	Govt.	28	4.86	3.35
5	Recreational	14	2.44	1.68
6	Public and semi public	68	11.82	8.14
7	Transport and Communication	202	35.13	24.19
	Sub Total (Developed Area)	575	100.00	-
8	Agriculture and Open Land	248		1.08
9	Water Bodies, River Nalla, Hilly area	9		1.08
10	Plantation, Nursery and Dairy	3		0.36
Total		**835**		**100.00**

Source: Master Plan 2011-2031.

92. **Industry and Agriculture.** Sirohi Town has industries, providing employment to about 9.75% of its workforce. In Sirohi industries are mainly based on agriculture, forest, minerals, engineering and dairy. As per the census 2001, about 4.21% of total workers are engaged in primary agricultural related activities in the town There are two industrial areas as showing as below:

Table 13: Industrial Areas in the Town

S.No.	Name of Industries Area	Land allotment (ha)	Developed Area	
			No.	Area (ha)
1	Sirohi	5.88	17	3.46
2	Saneshwar Ji	56.21	169	24.24

Source: Master Plan 2011-2031.

93. **Water Supply.** The water supply is being made through 11 open wells and 16 tube wells. The well field is in downstream of Angor, Kameri, Danta and Dudiya Talab Dam. At present 3.9 MLD water is being produced from these wells but actually after losses of transmission main and distribution system only 2.6 MLD water is being supplied among the consumer giving a service level of 69 lpcd, which is less than standard of 135 LPCD. This is due to heavy losses in the existing distribution network. Total storage capacity of 2.06 ML exists in Sirohi. For supply purpose town is divided into 8 zones and at present, water is supplied for duration of 60 to 90 minute on alternative days. Distribution network of 58 km with 9552 house service connections exist in the city.

94. **Sewerage.** There is no functional sewerage system in Sirohi city. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. The effluent from the septic tanks is directly let out in the open drains, which pollutes environment.

95. **Solid Waste Management.** There is no proper solid waste management system in Sirohi. The total solid waste generation in the town is about 4-5 tons per day. Presently about 60 % of total wastes generated from the various sources is collected through door-to-door collection system and the rest through street sweeping. Waste collected from various locations across the city is disposed-off at the identified dumping site in Khambal Village which is about 5 km from Sirohi Town. Waste is disposed at the site by crude open dumping method.

96. **Storm Water Drainage.** Storm water from the town is carried out by drains and ultimately disposed off into open fields. The total length of roadside drains in the town is 83 km, which is about 60 % of the length of roads and 13.5 Km wide Sewer drain are there. However, most of the roads have one side drains due to which, during rains, most of the roads get flooded.

97. **Transport.** Sirohi is well connected to all the cities of India through National Highways and State Highways. Rajasthan State Road Transport has daily services to Jaipur, Udaipur, Ajmer, Kota, Barmer, Delhi, Ahmedabad, Surat, Kalyan from Sirohi Central Bus stop. Various private company buses also provide daily services from Sirohi to Bangalore and Pune. Considering the development and increase in population, 3.6 ha. land has been reserved on Mandwa road for new bus stand. In South Eastern part of the city on National highway 14 the Transport Nagar has been proposed under IDSMT Plan, for which 8.65 ha. land has been proposed. Loading and unloading on trucks will be carried out here which will sort out the problem of heavy loaded truck transportation in the city. Nearest Railway Station is Sirohi Road (SOH) i.e. 24.2 KM away from the town. Nearest Domestic Airport is Maharana Pratap Airport, Udaipur).141.2 KM away from the town and nearest international airport is Sardar Vallabh Bhai Patel, Ahmedabad which is 262.2 km away.

D. Socio Cultural Resources

1. Demography

98. According to 2011 census, Sirohi Municipality has population of 39,229 out of which 20,612 are males while 18,617 are females. Literacy rate of Sirohi city is 79.21 % which is higher than the state average of 66.11%. In Sirohi, male literacy is 89.69 % while female literacy rate is 67.73%. Population of Children with age of 0-6 is 4485 which is 11.43 % of total population of Sirohi. In Sirohi Municipality, female Sex Ratio is 903 against state average of 928. Child Sex Ratio in Sirohi is around 831 compared to Rajasthan state average of 888.

2. History, Culture and Tourism

99. The Name Sirohi had been derived from "Siranwa" hills on the western slope of which it stands. Colonel Tod in his book "Travels in Western India" has suggested that the names of the territory might have derived from its position at the head (Sir) of the desert (Rohi), Sirohi also named as "Sword" and this had led some people to believe that this State of brave Deora Chauhans received it present name due to its widespread fame of its Swords i.e. Sirohi means " self-respect is most important even if head may be detached". In 1405, Rao Sobhaji founded the town of Shivpuri on the eastern slope of Siranwa Hill. Shivpuri today lies in ruins. In 1425, his son and successor, Sehastramal founded a fortress on the western slope of the same hill, which became his capital and grew into the present-day town of Sirohi.

100. After Independence an agreement was signed between Central Government and minor ruler of Sirohi State, with this the State Administration of the Sirohi State was taken over by Bombay Government from 5 January 1949 to 25 January 1950. The first administrator

representing a Bombay State was Prema Bhai Patel. After final merger with Rajasthan in 1950, an area of 787 km2 consisting of Abu Road and Delwara tehsils of Sirohi district was renamed with the Bombay State on 1 November 1956, after the recommendation of the State organization Commission, which forms the present position of the district.

101. **Culture.** Folk Songs and Folk dances are the traditional way of amusement and entertainment of the people of Sirohi, which are celebrated on the occasion of fair and festivals. These traditional songs are full of classical melody and are based on Ragas. Some of the major fairs and festivals of the district are:

(i) Gautam Ji -Chautila Hill -This fair is of Mina community. The occasion is celebrated on 13th April of every year
(ii) Vambeshwar Mahadev - Jadoli Veer (Sheoganj) Tehsil
(iii) Jagnath Fair - Organized at Sheoganj town
(iv) Pabuji Fair - On the riverbed of Jawai
(v) Bhuteshwar Fair - At village Bhutgaon
(vi) Sarneshwar Fair - Near Sirohi
(vii) Sheetla Mata Fair - Sirohi Town
(viii) Jiravala Parshavnath Fair - At Jiraval
(ix) Kambeshwar Mahadev - Located on Kanakolar hill (Sheoganj Tehsil)

102. Sirohi fort is situated in the heart of the city, which is famous for its glorious history and royal heritage. Sirohi city is also famous for religious places of Jain community. There are 14 beautiful and well-knownJain temples in and around Sirohi. Jain pilgrims and tourists visit the town. There are however no protected monuments or places.

E. Environmental Settings of Investment Program Component Sites

103. Subproject components are located in Sirohi 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. Proposed STPs (2 nos) and the WTP will be constructed on vacant municipal land. Sites are covered with sparse tree cover, shrubs and bushes, and no notable wildlife at these sites. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations.

104. Proposed STP sites are away from habitations (~350 m) and surrounded by agricultural lands. Treated wastewater will be reused for beneficial purposes (such as agriculture, horticulture, urban forestry, industry etc.,) a reuse plan will be prepared by the DBO contractor following the Sewerage and Wastewater Policy, 2016 and draft Guidelines Reuse of Treated Wastewater, 2019, of Government of Rajasthan. Necessary infrastructure like treated wastewater storage tanks, including an elevated reservoir, and pumping station etc., is already included in the subproject at STP.

105. Surplus / excess / unused treated wastewater will be disposed into drains near the STP sites. Except during rains, these drains mostly dry or carries the untreated wastewater / septic tanks effluent that flows into it from habitations. There is no notable aquatic life. Agricultural activities are noticed in the surrounding areas adjoining the drains.

106. Sewer 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 sewer in those roads. Site environmental features of all subproject sites and photographs are presented in the following Table.

Table 14: Site Environmental Features

S. No	Subproject component	Environmental Features of the Site	Photographs
1	Intake well and pumping station (7.40 MLD) in Angore Dam Lat:24°52'36.00"N Long:72°46'10.06" E	Intake well is proposed in the Angore dam and an approach bridge will be constructed from bund to intake well; site is approachable by a kutcha earthen road. Dam and approach road are under the control of Water Resource Department (WRD). Dam was constructed in 1988, by the Water Resource Department (WRD) mainly to provide irrigation water. It is situated on the Krishnawati river in Luni Basin and about 10 km from Sirohi town in the west direction. Dam is having total gross storage of 14.019 MCUM (495 MCFT) and total live storage of the dam is 13.33 MCUM (466 MCFT). As per State Water Policy 95 MCFT water is reserved for drinking water purposes every year by WRD. There is no notable aquatic life and forestland as per the local information. Dam is surrounded by agricultural lands. Dam and surroundings are mostly converted to human use long ago and there are very few patches natural areas, mostly in the north. it was observed that fishing activities were being undertaken at Angore dam by local villagers on lease basis. On enquiry with the Nagar Parishad, it was revealed as the dead storage capacity is always available it is sufficient for survival of fishes. Water Resource Department issued a NoC in this regard that due to this proposed water supply project there will be no impact on survival of fishes. Approach will be constructed within the existing kutcha road footprint; no tree cuttings are envisaged.	 Angore Dam
2	Intake well and pumping station (3.90 MLD) in Kalka Ji Dam Lat. 24°52'2.61"N Long.72°51'58.27"E	The Water resource department (WRD) has constructed the Kalka Ji dam in the year 1990. It is a masonry dam near Kalka Ji temple in Sirohi town. This dam is situated on the downstream of Akhelao and Mansarovar dam which were on Rajupura river. The dam within the Sirohi town in the east west direction. Dam is having total gross storage of 62 MCFT and total live storage of the dam is 53 MCFT. The dam was constructed for drinking purposes as an additional source for Sirohi Town, as per State Water Policy 50 MCFT water is reserved for PHE department for drinking water purposes every year.	

S. No	Subproject component	Environmental Features of the Site	Photographs
		There is no notable aquatic life and wildlife activities as per the local information. Dam is surrounded by agricultural lands, Dam and surroundings are mostly converted to human use long ago and there are very few patches natural areas, mostly in the west.	Kalka Ji Dam
3	Raw water pipeline alignment	Raw water pipeline from intake in Angore and Kalka Ji dams to WTP at Angor Head works will be laid along the existing roads. Approach will be constructed within the ROW of existing kutcha and bituminous roadsand no tree cuttings are envisaged. The chemical analysis results of raw surface water samples from Angore and Kalka Ji dams carried out by the PHED indicates that the water is potable and suitable for consumption after proper treatment and disinfection	 Raw water pipeline from intake in Angore dam Raw water pipeline from intake in Kalkaji dam

S. No	Subproject component	Environmental Features of the Site	Photographs
4	WTP of 9 MLD capacity at Angore Head Work (Lat 24°53'17.54"N; Long.72°46'33.24"E)	Proposed WTP site is located within the existing PHED Head works campus at Angore. Total area of the site is approx. 10,000 sq. m. After completion assets will be handed over to PHED. Site is predominantly flat, vacant, and sparsely covered with few local trees, shrubs and bushes. There are 6 trees, which needs to be cut for construction of WTP. During detailed design all efforts should be made to reduce numbers of trees to be cut by appropriate layout design else tree plantation shall be carried out as per RUIDP's replacement ratio of 1: 3. There are staff quarters near the proposed site, hence mitigation measures to be adopted during construction as per Construction and Demolition Management Rules, 2016 to minimize impact on habitants.	
5	Transmission and distribution network	The transmission system and distribution networks will traverse through different roads within the existing ROW. Therefore, no impacts shall be envisaged on structures (temporary or permanent) and CPRs. No sensitive areas in or near the alignment in the stretches where Transmission main/feeder main and distribution network lines are proposed. Advance permissions from concerned authorities will be required for road cutting and traffic diversion. No tree cutting will be required as per preliminary design. The existing distribution system is very old and will be completely phased out except DI lines 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	

S. No	Subproject component	Environmental Features of the Site	Photographs
6	Clear Water Reservoirs	Four Clear Water Reservoirs and clear water pump houses shall be constructed at four locations: 1450 KL Capacity at Rampura; 470 KL capacity at Teen batti; 580 KL capacity Kalkaji and 270 KL capacity at Sardulpura Pumping station. CWRs will be constructed in the existing PHED campus. Sufficient vacant land (not under any productive use) is available. There are some abandoned staff quarters which needs to be demolished for site clearance. Measures should be taken for safety during demolition works and safe disposal of demolished materials.	 Rampura Teen Batti

S. No	Subproject component	Environmental Features of the Site	Photographs
			 Kalkaji Sardulpura
7	STP-1 near Nehru nagar (5.0 MLD) Lat. 24°54'4.51"N Long. 72°50'48.39"E	Site is located at Nehru Nagar. Total Area of the site is 32000 Acre of which 5000sq. m. is allotted for construction of STP. Site is owned by the Municipal Board, Sirohi. Site is predominantly flat, vacant, and sparsely covered with few local trees, shrubs and bushes. Site is surrounded by agricultural / barren vacant lands and is away from habitation. Nearest sensitive receptor, a house is located at about 450m from the site.	

S. No	Subproject component	Environmental Features of the Site	Photographs
8	Outfall sewer alignment from STP 1 to discharge point	It is proposed to reuse the treated effluent for beneficial purposes (agriculture, horticulture, urban forestry etc.) and remaining surplus / excess treated effluent is proposed to discharge into dry water channel (drain) or land Treated wastewater will be discharged into a nearby water channel/drain. A pipeline (250m length) will be laid along an existing road from STP site to the drain. The drain remains mostly dry except during rains, and there are no water intake points in the immediate downstream.	 Discharge point of treated effluent of Nehru Nagar Road STP
9	STP 2 at Revdar road (1.70 MLD) Lat.24°51'56.99"N Long.72°50'23.49"E	Proposed STP site is located near Revdar road, Total Area of the site is approx.35000 Acre of which 2000sq. m. is allotted. Land is owned by Municipal Board, Sirohi Site is predominantly flat, vacant, and there is no notable tree cover or vegetation. Site is surrounded by agricultural /vacant lands and is away from habitation. Nearest sensitive receptor, a house is located at about 350m from the site. One air strip which is occasionally used for landing of helicopters, is located at a distance of 500mtr, from the STP site. No Objection Certificate (NOC) already obtained from the concerned authority.	
10	Outfall sewer alignment from STP 2 to discharge point	It is proposed to reuse the treated effluent for beneficial purposes (agriculture, horticulture, urban forestry etc.) and remaining /surplus / excess treated effluent is proposed to be discharged into water channel/drain. A pipeline (300m length) will be laid along the existing road from STP site to a nearby water channel/drain which carries overflow water of Angore dam which mostly remains dry except during rains, thereare no water intake points in the immediate downstream.	 Discharge point of treated effluent of Revedar

S. No	Subproject component	Environmental Features of the Site	Photographs
			Road STP. NOC for the owner of the discharge point is in Appendix 32.
11	Sewer network	The sewage collection networks will traverse through either middle of the city road or within ROW. Laying with Trenchless method for 10 km at critical junctions are proposed. No impacts on structures (temporary nor permanent) and CPRs[16] is envisaged. However, during laying of pipeline, due to loss of access, temporary livelihood loss to roadside vendors, Kiosks, is envisaged. No tree cuttings will be required as per preliminary design.	

[16] Common property resources include public resources, community-owned facilities or cultural property such as temples, shrines, public utility posts, etc, that the landless poor and vulnerable depend on for survival.

Figure 16: Location of STP Site 1 and Discharge Pont

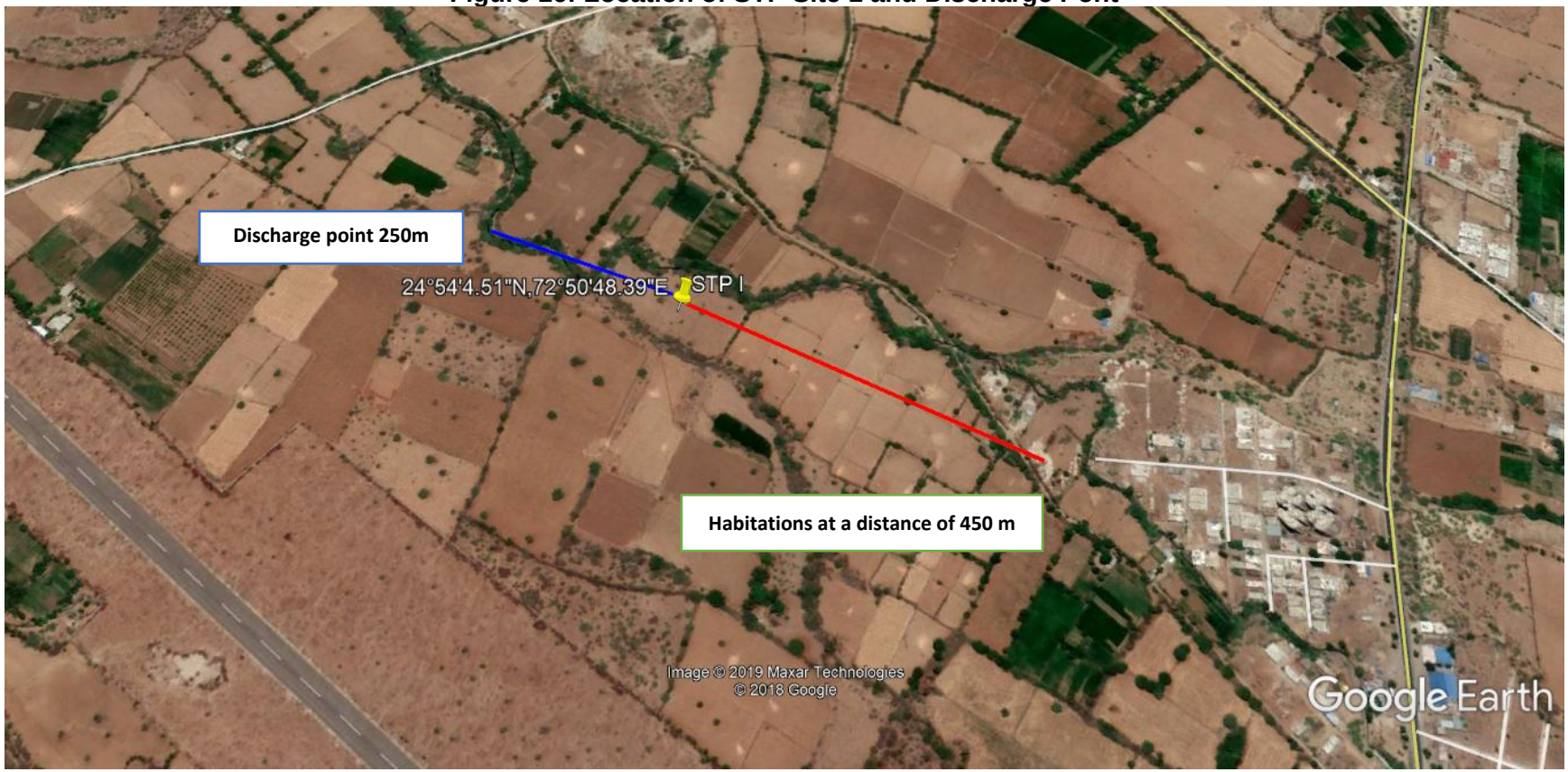
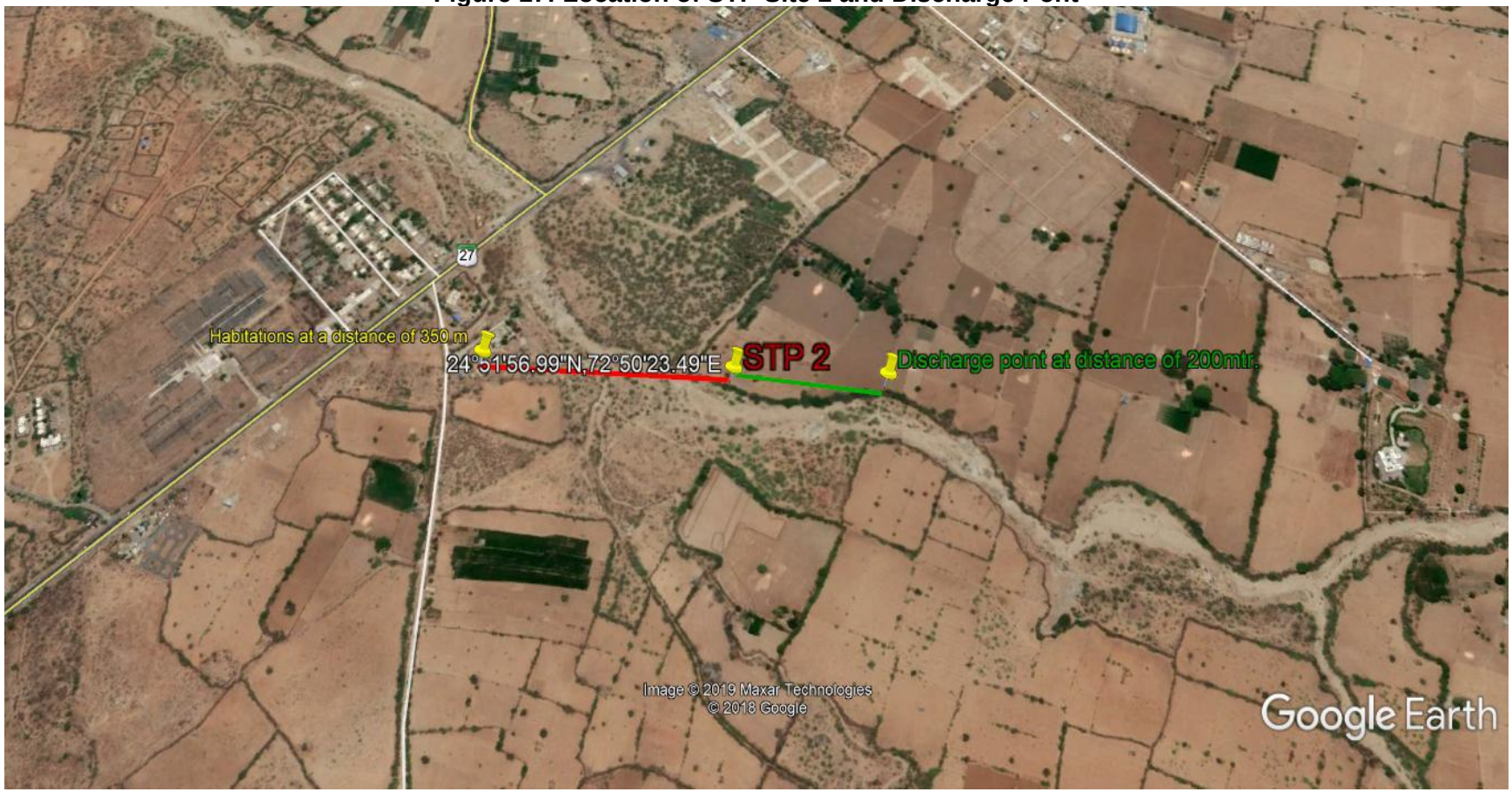


Figure 17: Location of STP Site 2 and Discharge Pont



VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

107. 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.

108. 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,
(iii) including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(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) **Operation and maintenance (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.

109. 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).

110. 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.

111. 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.

112. 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) negative impacts associated with sewage facilities such as odour, treated wastewater discharge are already considered in design / siting of facilities, (iii) 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 (iv) 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

1. Location Impacts

113. **Odour Nuisance from STPs.** As presented in the baseline profile, the two proposed STP sites are identified away from habitation, and sites are currently vacant, and do not have any notable sensitive environmental features with no tree cover / vegetation. As the habitations located away from the sites (~350 m), and, 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 site planning and design:

(i) Provide a green buffer zone of 10-20 m wide all around the STPs with local varieties of trees in multi-rows. 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.
(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.

114. **Social and Cultural Resources.**There are no notable or significant archeological places or protected monuments or areas in Sirohi project area. 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 local Archeological Department / Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ
(iv) Prepare a chance find protocol (sample is provided in Appendix 12).

115. Tree cutting at project sites. At the proposed WTP site, there are medium sized trees of local species. These trees may be required to cut for construction of WTP. There are no notable tree cover or vegetation in STP sites. Water pipelines and sewers will be laid along the road within road right of way. 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 WTP or any other site with trees
(ii) Obtain prior permission for tree cutting at WTP 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 felled.

2. Design Impacts

116. **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 percent of water supply (including 5 percent 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.

117. 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 faecal 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

118. **Water Source Sustainability.** Based on proposed water supply rate of 135 lpcd for Sirohi Town, the total raw water demand is estimated as 7.39 MLD (base year 2021), and 9.77 MLD (ultimate design year 2051). Nearest surface water sources – Angore and Kalka Ji Dams are considered as sources of supply.

119. It is estimated based on the available data that Angore Dam will provide 6.20 MLD of water per day for base year 2021 and 7.15 MLD of water per day during the intermediate /ultimate design year (2036/2051) against present water reservation (7.37 mld) for PHED in Angore Dam. Kalka Ji dam will provide 3.76 MLD of water per day throughout the year upto ultimate design year (2051). Angore Dam is the main water source as Kalkaji is not a reliable source. Water will be available from Angore Dam throughout out the year at 73 % dependability, which will not be sufficient to meet the demand. There is no other feasible and dependable surface water source near Sirohi town. Therefore, it is proposed to adopt conjunctive use approach, utilizing both

surface and groundwater sources to meet the demand. During the high rainfall years, entire water demand may be fulfilled by Angore and Kalkaji dams, while in low rainfall years the deficit will be met by existing groundwater sources. There are existing 11 open wells and 16 tube wells.

120. **Angore Dam.** The Water resource department (WRD) constructed the Angore dam (an earthen dam) across Krishnabati River in the year 1988. The dam is about 10 km from Sirohi town in the west direction. Total catchment area of the dam is 155.39 sq.km, and the length of Dam is 2362.79 m. Gross storage capacity is 14.09 MCM (495 MCFT), with a live storage capacity of 13.33 MCM (466 MCFT). The dam was mainly constructed for irrigation, about 20% of water storage (95 MCFT or 2.71 MCM) r is reserved for PHED for drinking water purposes every year. It is estimated that, at 73 % dependability, the dam will provide 7.15 MLD of water throughout the year. Salient features of the dam are provided in Appendix 13.

121. **Kalka Ji Dam**. The Water resource department (WRD) constructed the Kalka Ji dam in **the** year 1990. It is a masonry dam across Rajupura River, near Kalka Ji temple in Sirohi town. This dam is situated on the downstream of Akhelao and Mansarovar dam which were also on Rajupura River. The dam within Sirohi town in the south direction. Total catchment area of the dam is 20.72 sq.km andthe length of dam is 137.5 m. Gross storage capacity of dam is 62 MCFT (1.78 MCM) and live storage of 53 MCFT (1.51 MCUM). This dam was constructed for drinking purposes and any additional/deficit water from Kalkaji can be utilized for drinking purposes for Sirohi town. Accordingly, Kalka Ji has been considered as additional source for Sirohi Town. As per State Water Policy water is 50 MCFT (1.43 MCUM) water is reserved for PHE department for drinking water purposes every year. Salient features of the dam are provided in Appendix 13.

122. **Surface Water availability.** Angore dam and Kalka Ji dams are proposed as source. Gross storage capacity of the Angor dam is 14.09 MCM and 1.781 MCM for Kalka ji Dam. Only 50 MCFT water would be used presently for the proposed scheme. Allocation of raw water of 95 MCFT (2.71 MCM) from Angore and 50 MCFT (1.43 MCM) from Kalka Ji for water supply in Sirohi town is granted by the Water Resource Directorate Jaipur (Appendix 14) it is estimated that the Angore dam will be able to provide 7.15 MLD of water throughout the year against total demand of 8.55 MLD (2036) and 9.77 MLD (2051). As the dam is of recent origin, there is no long terms flow data to see the long-term sustainability.

123. Given that dams are transferred to PHED for drinking water purposes, and fully allocated to Sirohi Town, no water use conflicts envisaged. Although there is no notable aquatic life or wildlife nearby, the dams will always retain dead storage, which can be utilized. During impact assessment, it was observed that fishing activities were being undertaken at Angore Dam. On enquiry with the concerned department, it was revealed that the water quantities being extracted are so minimal that it cannot have any adverse impact on fish propagation. The dead storage is always available is sufficient for survival of fishes. No objection certificate on fisheries has been obtained from the competent authority (Appendix 15). No notable impacts therefore envisaged.

Table 15: Water Received in Angore and Kalka ji (Akhilao and Mansarover) dam for last 5 years

S.No.	Year	Angore Dam		Akhalao Dam		Manserover Dam		Total
		Gauge in Feet	Capacity in MCFT	Gauge in Feet	Capacity in MCFT	Gauge in Feet	Capacity in MCFT	Ak+Man
1	2013	3.80	56.12	1.00	0.21	-	-	-
2	2014	5.60	73.91	-	-	-	-	-
3	2015	21.40	453.90	12.60	21.47	13.85	18.81	40.28
4	2016	12.30	194.44	13.90	29.39	15.30	22.93	52.32

S.No.	Year	Angore Dam		Akhalao Dam		Manserover Dam		Total
		Gauge in Feet	Capacity in MCFT	Gauge in Feet	Capacity in MCFT	Gauge in Feet	Capacity in MCFT	Ak+Man
5	2017	20.20	408.83	13.65	27.88	15.10	22.36	50.24

Source: Irrigation Department

124. **Dam water quality.** The water quality testing conducted in April 2018 (Table below, Appendix 9) indicated that all the tested parameters are well within the limits. The proposed subproject includes treatment facility and therefore no impacts due to water quality envisaged. Dam water quality testing will be conducted during the design of Water Treatment Plant (WTP) to reconfirm the raw water quality. Water quality of dam will be monitored during construction, and throughout operation phase at regular intervals as per the environmental monitoring plan. Water quality monitoring will be conducted at various places such as at dam, (raw water), at WTP (raw and treated water), CWRs (treated) and consumer end at sample households (supplied treated water) to ensure that water supplied to consumers meet the drinking water standards.

Table 16: Water Quality of Angore and Kalkaji Dams

Source Location	Kalkaji Dam	Angore Dam	Drinking Water Standards (IS 10500-2012)	
	Raw water	Raw water		
Date of Sampling	**11/4/2018**	**11/04/2018**	**Desirable**	**Permissible in absence of alternate source**
Parameters				
pH	8.0	7.3	6.5-8.5	No relaxation
Turbidity (NTU)	42	22	1	5
Colour	Sl. Yellow	Sl. Yellow	5	15
Odour	No Smell	No Smell	5	15
Total Alkalinity (As CaCO3)	200	120	200	600
Total Hardness (As CaCO3)	110	110	200	600
Calcium Hardness (As CaCO3)	70	60	-	-
Magnesium Hardness (As CaCO3)	40	50	-	-
Chlorides (As Cl-)	140	130	250	1000
Nitrates (As NO3-)	8	8	45	100
Fluoride (As F-)	0.7	0.6	1.0	1.5
Total Dissolved Solids	390	450	500	2000

Source: PHED Laboratory Abu road

125. **Groundwater Abstraction and Sustainability**. As stated above the unfulfilled demand from the surface water will be supplemented by the groundwater. As per the CGWB data, in Sirohi Block/Tehsil, the estimated net annual groundwater availability is 65.5769 MCM, the total utilization for all uses is estimated as 65.163 MCM (99.37% utilization). Sirohi Tehsil is classified as “Semi Critical” with significant long-term decline in groundwater. CGWB recommend cautious groundwater development in over exploitedareas, and conjunctive use of surface and groundwater resources. Accordingly, under the project, it is proposed utilize surface water sources to the extent possible, and dependence on groundwater reduced. Ground water resources need to be used judiciously.

126. A feasibility study was conducted by Hydrogeologist, Ground Water Department, Government of Rajasthan (Tube well feasibility report attached at Appendix 16). This study suggested locations for drilling of 7 tube wells for future requirement. The proposed locations are mostly near water bodies (Angore dam, Kameri dam, near Pond etc.,). Hydrogeological formation is mostly Younger Alluvium / Phyllite, and at two places it is Alluvium / Granite. Static water level is 10-15 m below ground level, and proposed depth of tube well is 150-180 m, and expected discharge is 2000-3500 gallons per hour (9000-15,750 liter per hour).

127. Over exploitation of groundwater resources i.e. abstracting more than the net annual ground water available in the area will lead to several environmental and economic issues. Abstracting water from static water resources may lead to contamination due to geo-hydro chemical processes and may also lead to land subsidence. Tube wells will dry up quickly, with falling water table pumping costs will go up, and the effect on competing uses can cause social conflicts.

128. The Tube Well Feasibility report makes it clear that “the aquifer of the area is dynamic in nature and directly responds with the rainfall in the area, so, artificial recharge is a must sustainable yield of groundwater source for a long-time exploitation”. It also provides limitation that the report is based on general hydrological condition of the area, and due to heterogeneity of the aquifer and groundwater discharge from tube wells may vary. It suggests geophysical survey of the area by methods such as vertical electrical sounding (VES) to finalize the location of tube well to ensure appropriate yield and its long-term sustainability.

129. The groundwater development in the area is classified by CGWB as semi-critical, with nearly 99.4% abstraction of available water but with significant long-term decline in groundwater. Given that the feasible surface source (Kalka Ji Dam) is not able to fulfil the demand, it is proposed to continue the groundwater as supplemented source of water supply. CGWB cautions use of groundwater resource over 90% of net available resources and recommends linking water abstraction in these areas to water conservation measures like augmenting groundwater recharge through artificial measures. The Feasibility Report of Tube Wells prepared by State Ground Water Department has also suggested the same. Given the climate change effects, the rainfall is becoming more erratic and unpredictable, combined with increasing frequency of extreme weather events. The project should therefore account for these.

130. To ensure groundwater sustainability, the following measures should therefore be implemented during the implementation:

(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 Sirohi in a phased manner once the project is implemented.

131. **Groundwater Quality.** As presented in the baseline profile, Groundwater quality of tube wells and open wells in Sirohi is presented in Table 9 and 10. Groundwater is alkaline in nature with pH ranging from 7.0 to 8.0, and within the acceptable range of drinking water quality. Most of the tested parameters are well within the desirable limits of drinking water standards (IS 10500-2012). Fluoride content in most of the samples, exceeding the desirable limit of 1.0 mg/l and also

above the permissible limits (1.5 mg/l) in 7 samples. Except two tube well samples the Chloride content in all the open /tube wells are below desirable limit (250 mg/l), TDS content in all the tube wells and open wells monitored is exceeding the desirable limit (500 mg/l), but within the permissible limit (2000 mg/l), except for two tube wells where TDS contents are above the permissible limit. Laboratory test reports are given in Appendix 10.

132. High Fluoride and TDS is only in isolated cases, and the water is mixed with other tube wells and groundwater, the blending effect thus will reduce the concentration to a great extent. In any case, the DBO contractor must ensure that supplied water to the household meets the drinking water standards, and if any additional / specific treatment (such as defluorination or softening) required, it must be included in the treatment process. As there is no sewerage system at present, groundwater is at risk of contamination due to discharge of untreated wastewater. Open defecation is not uncommon, and indiscriminate solid waste disposal is prevalent. The sewerage system being developed under the project will prevent the untreated sewage flow in open drains. A source protection plan shall be prepared to avoid source contamination at tube wells.

(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
(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

133. **Design of Water Treatment Plant.** A 9.0 MLD WTP is proposed to be constructed at the identified site at Angore head works inSirohi Town to treat the raw water abstracted from Angore and Kalka Ji Dams to meet the drinking water standards for potable water supply in the town. Since the package is proposed under Design-Build-Operate contract, the DBO contract will design the WTP during the detailed design phase following the guidelines/requirements/standards prescribed in the bid documents. Water treatment process will generate wastewater from filter backwash activity and sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc., and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. Bid includes various provisions in design of WTP to collect and dispose the wastewater and sludge generated in the treatment process, and the DBO contract will design the WTP accordingly. As it is a DBO contract, the process of wastewater recovery and sludge system given is indicative only at this stage, the actual system will be designed by the DBO contractor during the detailed design with the following bid provisions:

(i) Backwash water reuse system and sludge recovery and disposal system
(ii) Backwash recycling components: Filter backwash holding tank, recovered water storage tank and pumping for recycling
(iii) Sludge management system components: Gravity thickeners for sludge from clarifiers, mechanical sludge dewatering system, storage facility for dewatered sludge
(iv) Disposal of sludge at a landfill or the disposal site provided by the ULB

134. Thus, the WTP will not generate any wastewater as recycling system will recirculate the water from holding tank to inlet to put back into the process, thus saving the water and avoiding the need to discharge into environment, therefore there are no impacts. Similarly, sludge will be collected, and dried safely, any coagulants such as alum that can be recovered from the sludge will be recovered, sludge thickened, and dried and stored in a temporary storage in WTP. Solid waste residuals which may be generated by the WTP include process residuals, used filtration membranes, spent media and miscellaneous wastes. Process residuals primarily consist of settled suspended solids from source water and chemicals added in the treatment process, such as lime and coagulants/ polyelectrolyte. Pre-sedimentation, coagulation (e.g. with aluminum hydroxide [alum] or ferric hydroxide), and iron will produce sludge. Composition of the sludge depends on the treatment process and the characteristics of the source water. Bid requires the disposal to a landfill or disposal site. Disposal site not yet identified at this stage, following measures are suggested:

(i) DBO Contractor should prepare sludge management plan for safe handling and disposal of sludge from WTP
(ii) Estimate the quantity of sludge / solids generated from the WTP during the detailed design phase, and likely composition based on the raw water quality and process chemicals
(iii) Minimize the quantity of solids generated by the water treatment process through optimizing coagulation processes;
(iv) Recover process chemicals to the extent possible to minimize / prevent the disposal
(v) Carryout pretreatment prior to disposal
(vi) Dispose dried sludge / solids from WTP at approved solid waste landfill / disposal site identified by ULB;[17] this should be identified during the detailed design phase
(vii) Evaluate the option of land application during the operation stage; conduct quality tests on the first batch of sludge generated from the WTP, check for physio chemical characteristics including heavy metals
(viii) Manage hazardous/harmful waste if any, as per the Hazardous Waste Management Rules
(ix) Employ safe and beneficial methods for disposal of dried sludge: in building and construction industry, brick / tile manufacturing etc.

135. **Use of Hazardous / Harmful Substances in Water and Wastewater Treatment.** Water and/or wastewater treatment may involve application hazardous / harmful chemicals such as in coagulation, disinfection etc., As the treatment process will be designed by DBO contractor, the use of chemicals in treatment is not available at this stage. Measures are required to reduce the usage as well the handle if any hazardous substances safely following prevailing rules and regulations. For disinfection, the bid specifies, however, the use of Chlorine as disinfectant. In additional to water chlorination at WTP, post chlorination will be conducted at CWRs. It is proposed to establish chlorination system at WTP and at five CWRs. Groundwater from the tube wells/open wells will be directly pumped to CWRs where it will be mixed with the treated surface water from the WTP, and the mixed water will be chlorinated prior to distribution. Disinfection with chlorine is proposed at STP. There is invariably a safety risk when chlorine is handled. Safety precautions are necessary to ensure the safety of workers and citizens. Following measures are suggested:

[17] At present there is no landfill in Sirohi; solid waste collected from the town is disposed by open dumping method at a disposal site identified by ULB; as per the information, a proper solid waste disposal facility including landfill will be developed in the near future. Quantity of sludge/solids of WTP shall be considered in landfill design.

(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; visible and audible alarm facilities to alert chemical/chlorine leak
(v) Facility for isolation in the event of major leakages
(vi) Eye wash and 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

136. **Design of Sewage Treatment Plant.** Two STPs of capacities 5.00 MLD and 1.70 MLD is proposed to be constructed at the identified sites to treat the sewage generated from Sirohi 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 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.[18] 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.

[18] 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".

Table 17: Proposed Raw and Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for Sirohi STPs	MOEFandCC 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 (metro cities)	<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	<1000	<100	-	<1000
9	Oil and grease, mg/l	-	-	-	10	-
10	Nematodes, number of eggs per litre	-	-	-	-	1

MOEFandCC= 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.

137. **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 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.

138. 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 17).

139. **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

140. **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. In case of supply is more than the demand of the town, the treated wastewater can be allocated to users with 25 km of STP by the CLC. It may also be made mandatory to industries to use treated wastewater under certain conditions. Memorandum of understanding between ULB and the users of the treated water (Appendix 32).

141. **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 Sirohi 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 Sirohi, 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). At STP 1 (5 MLD), the capacities of TESR and TEER respectively are 500 KL (10% of STP capacity) and 250 KL (5%), and at STP 2 (1.7 MLD), the capacities are 170 KL (10%) and 85 KL (5%). Thus, total storage capacity that will be available at each STP for treated wastewater will be 15% of respective STP capacity, which will mainly facilitate supply to reuse applications from the TESR.Treated effluent will be chlorinated prior to its entry into TESR/TEER.Following needs to be considered in the preparation of reuse plan:

(i) As part of the plan, identify potential reuse application in Sirohi 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 Sirohi, 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

142. **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 1000 fecal coliforms per 100 milliliters. These shall be considered in the Reuse Plan that will be prepared during the detailed design and complied accordingly.

143. **Disposal of treated wastewater.** Proposed STP sites are located close dry water channels (drains) and the excess / surplus / unused treated wastewater will be discharge into this drain. As the wastewater is treated to stringent disposal standards, no notable impacts envisaged. Both the drains are mostly dry except during monsoon. They carry untreated wastewater from the surrounding areas 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 sites are surrounded mostly 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 at all times meet the stipulated standards prior to its disposal into drains. Any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and may further pollute the water body. 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

144. **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.

145. 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”.

146. 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.

147. Contractor will propose the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 18) 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 18: 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.

148. In order to ensure the safe use of dried sludge, following should be followed:

(i) Prepare a dried Sludge utilization plan for Sirohi 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 Sirohi 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)

149. **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, including marble, granite, cement plant, leather, textile, plastic, synthetic yarns, resins

industries are in Sirohi. 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 RPCB 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

150. **Sewer system – collection and conveyance.** The sewerage system is designed as a separate system of sewage collection (i.e. caters only to domestic 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, SIrohi Municipality should ensure that all existing septic tanks in areas that are being provided by sewers are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system. 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. 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 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.

151. **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 22% 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, eliminate any risks to the workers and the communities by providing proper training and necessary PPEs to workers. Safeguards induction prior to start of works will include detailed instructions handling, managing and protection from diseases and other biological hazards
(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

C. Environmental Audit of Existing Water Supply Infrastructure

152. 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 19. A more detailed environmental audit and risk assessment shall be carried out during detailed design stage and incorporated into the final IEE.

153. All the existing infrastructure facilities are located in Sirohi 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 Asbestos Containing Material (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 AC pipes, and the project, in fact, proposes to discontinue the use of AC pipes. Presence of AC 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 provides component wise compliances and concerns. Corrective actions for the identified environmental concerns are discussed in the following section.

Table 19: Environmental Audit of Existing Facilities

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
Tube wells and open wells	11 open wells and 13 tube wells. Locations: Danta Dam Angor Dam, Kameri Dam Dudhia Talab Aadesh Nagar Mandawa Kalka Ji H.W. Campus	Replacement of pipes, submersible pumps, cables, panels, valves, flow meters and synchronization with SCADA enabled devices Depth of the tube wells will not be increased	No requirements under existing laws	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris There are no asbestos containing material / AC pipes noticed
Clear water reservoirs (CWRs)	5 CWRs (Angor, Rampura, Kalkaji, Teen Batti and Sardulpura)	Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required Cleaning	No requirements under existing laws	Presence of AC pipes in existing connections Occupational health and safety, public safety during the construction works Disposal of

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
				discarded material, debris including AC pipes
OHSRs/GLSRs:	There are 10 Nos of OHSR/GLSR in Sirohi. The following four existing structures are to be repaired / rehabilitated: (GLSR, Tankania, GLSR Bhatekara, OHSR, RHBColony And OHSR Aadresh Nagar)	Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required Cleaning	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
Pluming stations	5 pumping stations (Angore, Rampura, Kalkaji, Teen Battiand Sardulpura Pump Houses)	Replacement of pumps, motors Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required	No requirements under existing laws	Presence of AC pipes in existing connections Spillage of oils, lubricants etc., Occupational health and safety, public safety during the construction works Disposal of discarded material, waste oils, mechanical and electrical parts, debris including AC pipes
Transmission and distribution	Existing Transmission mains: 71.35 km, 80-250 mm diameter pipes and existing distribution: 58.03 km, 80-250 mm diameter pipes	Replacement; new pipes will be laid in the place of existing pipes Pipes will be left as it is in the	No requirements under existing laws	Presence of underground AC pipes (60.7 km transmission mains and 47.73 km distribution lines of 80-250 mm diameter);

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
		ground, no rehabilitation/ removal proposed		exact location and condition not known; no maps available. Accidental disturbance / need to remove in narrow roads Occupational health and safety, public safety during trenching Disposal of AC pipes / debris

154. **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.

155. Presence of asbestos containing material (ACM), mainly AC 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.

156. Nearly 83% of the existing 130 km of underground water transmission and distribution system consists Asbestos Cement (AC) pipes of 80-250 mm diameter (109 km of total 130 km length of pipes). Most of the AC are old. There is no use of new AC pipes but for repairing work in the existing network, and for replace the damaged sections, AC pipes are being used. There will be no use of any AC pipe in the future as under the present project, water supply network is being provided in the entire town with non-AC pipes. It is normal practice in Rajasthan that existing AC pipes are left as it is in the ground and new pipes will be laid in a new alignment. As per the discussion with the local water supply staff in Sirohi, existing AC pipes are laid long back, they are deep in ground, more than 2m at many places, as the road level has raised considerably. In wider roads, there will be adequate space to lay the new pipelines, and therefore there is no need to remove the existing pipelines.

157. However, complete avoidance of handling and disposal of AC pipes may not be possible. There are narrow lanes, where AC pipes may be encountered during the laying of new pipes. Some connections / inlet / outlet pipes at the existing CWRs are also of AC pipes. These will be

removed and replaced with new non-AC pipes. At present no maps available on the exact location / position of AC pipes. The local long serving OandM staff of PHED seem to be well aware of the location of AC pipes in the roads. Consultation with the staff indicates that of the total 106 km of underground AC pipes, about 20% may be required to be removed, especially in the narrow lanes to lay the new lines. This will be about 21 km length of water pipes.

158. 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. 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,[19] asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste.

159. 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 around the work sites. The condition of existing underground AC 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.

160. During the IEE 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 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 AC pipes, work in narrow streets, and interventions in existing AC 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 20. Adhere to the workflow process suggested in Figure 18.
(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

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

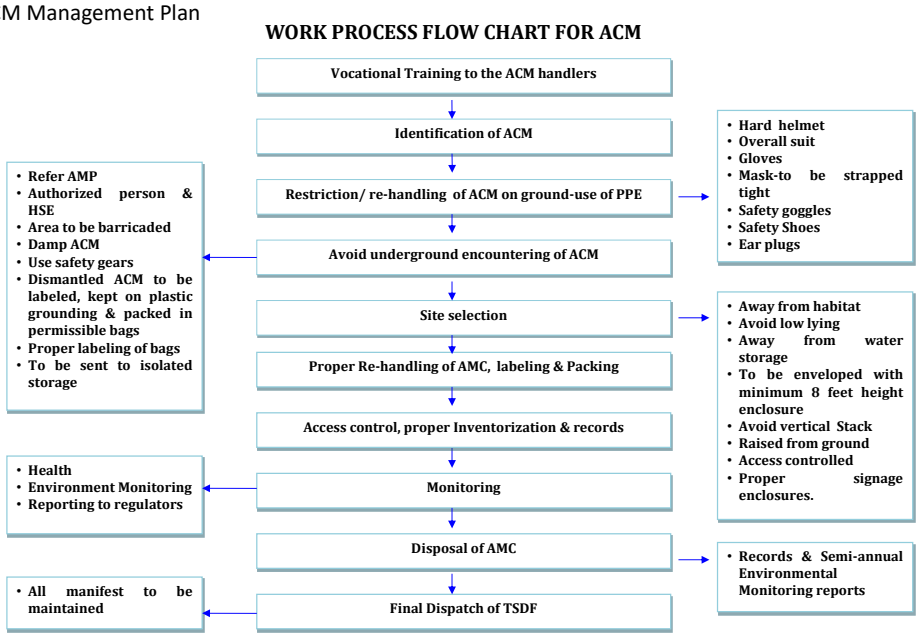
(v) Identify risk of intervention with existing AC pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods.

(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.

Figure 18: ACM Management Plan – Work Process Flow Chart

ANNEX 1 – ACM Management Plan



D. Pre-construction Impacts

161. 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

162. 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.
(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

163. 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 and 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.

E. Construction Impacts

164. The civil works for the subproject includes construction of intake, WTP, STPs and CWRs. 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 (RC), 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 the WTP and 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.

165. Intakes will be constructed in Angore Dam and Kalka JI dam. An enclosed area will be created using a temporary coffer dam at the selected site using barriers /sheet piles and the water will be pumped out to make the area dry for construction. Once this is created, the rest of the construction will follow the general construction procedures to create an intake of required size. Once the work is over and site is cleared, the coffer dam will be removed.

166. Subproject also include linear works (laying of 117.4 km of water pipes, and 93 km of sewers along the roads). This covers almost entire project area of Sirohi 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 1.5-1.8 m. The maximum depth for sewers depends on the design, and in Sirohi 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 8 m. As per the bid conditions, sewers of more than 3.5 m deep should not be laid by open cutting method. As per the bid conditions, “the maximum depth of sewer is 3.5 m for open excavation after 3.5 m sewer shall be laid by the trenchless method only. 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. It is proposed that 10 km length of sewers will be laid by trenchless method; these will include highway /main road crossings. 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. Trenches deeper than 1.5 m will be protected by shoring/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.

167. 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:

168. **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 RSPCB and will collect the copy of these certificates and submit to PIU/consultants.

169. **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 correctly. contractor's vehicles and equipment should compulsorily have PUC and submit PUC to PIU before deployment at site
(vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers etc. if specifically established for this project.
(viii) If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the partier/ suppliers are having CTE/CTO from RSPCB and will collect the copy of these certificates and submit to PIU/consultants; PIU will approve the source only after all the certificates are submitted
(ix) Conduct ambient air quality monitoring periodically as per Environmental Management Plan (EMP)

170. **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 21);
(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 Environmental Management Plan (EMP).

171. **Surface Water Quality - Intake Works in Angore and Kalkaji Dams.** Construction works in the reservoir may lead degradation of water quality due to increase in turbidity and chemical contamination from fuels and lubricant used in construction work. Increase in silt content and water turbidity, chemical quality can affect the aquatic life, silting/chocking of spill ways/ canals etc., Though there are no notable aquatic life, to ensure that any negative impacts are mitigation, the following measures shall be implemented:

(i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon
(ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon;
(iii) Erect temporary barriers to form enclosed construction area with least disturbance
(iv) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond
(v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage
(vi) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers / coffer dam
(vii) Implement work site safety at works in water bodies

172. **Noise and Vibration Levels.** Construction works will be conducted along the roads in Sirohi urban area, where there are houses, schools and hospitals, religious places and small-scale businesses. 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) As far as possible use new construction machineries and keep all the old machineries in good and maintained state.
(iv) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor;
(v) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.
(vi) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
(vii) 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.
(viii) Conduct Noise monitoring according to the Environmental Management Plan (EMP).

173. **Landscape and Aesthetics.** Some trees will be required to cut due to which landscape and aesthetics 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 numbers 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.

174. **Groundwater Quality.** Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater collects in the voids. In Sirohi groundwater is much deeper than the proposed trenching depth, and rains are limited during monsoon season. However, to ensure that water will not pond in pits and voids near project location, the construction contractor will be required to conduct excavation works in non-monsoon season to the maximum extent possible. 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 (Appendix21);
(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) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(vi) Dispose any wastes generated by construction activities in designated sites; and
(vii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

175. **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 22)

(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.

176. Wherever road width is very narrow, there will be temporary loss of access to pedestrians 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.

177. **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 CAPC. 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 Traffic Management Plan (Appendix 22)
(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.
(viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges

178. **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 (Appendix 21);
(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; and
(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.
(viii) Provide alternate sources of clean water until water supply is restored.

179. **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 labour force, to the maximum extent, possible.

180. **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 8);
(ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines,[20] WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID19 virus (Appendix 23), and Sector Specific (Water and Sanitation) Guidelines;[21]
(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[22] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

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

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

[22] 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

(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;

(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:

(ix) Work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM)

(x) Provide appropriate shade near the workplace; allow periodic resting and provide adequate water

(xi) Provide necessary medicine and facilities to take care of dehydration related health issues

(xii) Provide supplies of potable drinking water;

(xiii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;

(xiv) Provide HandS 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;

(xv) 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;

(xvi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;

(xvii) Ensure moving equipment is outfitted with audible back-up alarms;

(xviii) 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; and

(xix) 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.

(xx) Conduct regular health check-ups for workers

(xxi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites

(xxii) 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

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worker.

allowed to dip or bath in water of dam. Suitable working platform should be provided during construction works in water.

181. **Asbestos Containing Materials.** No Asbestos containing material (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.

182. **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.
(iv) Provide road signs and flag persons to warn of on-going trenching activities.

183. 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
(vii) Provide hard 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

184. **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[23] 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 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 24)Prohibit employees from poaching wildlife and cutting of trees for firewood;
(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 following preference hierarchy: reuse, recycling and disposal to designated areas;
(ix) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(x) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

185. **Social and Cultural Resources.** For this project, excavation will occur at locations known not to have archaeological values, so it could be that there is a low risk of such impacts. Nevertheless, the construction contractor will be required to:

(i) 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 Archaeological Department / Museum office if a find is suspected; take any action they require ensuring its removal or protection in situ.

186. **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 during construction and adhering to following criteria:(including but not limited to)

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

(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.[24]
(iii) No residential areas shall be located within 100 m downwind side of the site.
(iv) The site is minimum 250 m. away from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies.
(v) The local governing body and community shall be consulted while selecting the site.

187. **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/Consultants 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 connections are available for running equipment otherwise soundproof/super silent Diesel Generator set should be available
(v) Sound level should not increase as prescribe by CPCB
(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

[24] 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.

(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/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.
(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 labour acts
(xxv) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours
(xxvi) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

F. Operation and Maintenance Impacts

188. Water Supply System. Operation and Maintenance of the water supply system will be carried out by DBO contractor for 10 years and then Sirohi Municipality directly or through an external operator. The water supply system is intended to deliver potable water meeting drinking water standards (Appendix 2) to the consumers at their homes. This must be ensured.

189. 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.

190. 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.

191. Water treatment and disinfection in the WTP and CWRs is one of the main operation activities of the water supply system. This activity produces wastewater, solid waste, and poses safety risk due to handling of chlorine.

192. Since backwash water/wastewater from the process is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc.; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. The management and safe disposal of wastewater and sludge have already been considered in the design phase, and if these activities are implemented as intended will have no negative impacts.

193. 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 WTP. 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.

(i) Chlorinator facility is operated only by trained staff and as per the standard operating procedures
(ii) In case of any accident and/or maintenance activity, the staff should follow documented procedures only
(iii) It is suggested to develop an Emergency Response System (ERS) for the chlorine leakage.

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

(i) Judiciously utilize the available water in dams and groundwater resources by adapting conjunctive use; prepare a water utilization plan every year post monsoon season depending on the water availability to town in Angore and Kalkaji dams
(ii) Prepare and implement Contingency Plan for low rainfall years that will result in low water availability in dams; in such cases revise the water supply rate appropriately to ensure uninterrupted water supply throughout the year; provide prior information to stakeholders
(iii) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative information
(iv) Ensure zero wastewater discharge from the water treatment process via collection and recirculation of process wastewater / backwash water;
(v) Implement sludge management plan; ensure collection, processing, drying, and safe disposal / reuse accordingly
(vi) 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
(vii) Conduct periodic testing of sludge as per the environmental monitoring plan

(viii) Ensure valid consent to operate (CTO) from RPCB for operation of WTP
(ix) Ensure that all conditions/standards prescribed by RPCB are compiled duly
(x) 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
(xi) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 25.

195. **Sewerage System.**Operation and Maintenance of the sewerage system will be carried out by DBO contractor for 10 years and then by Sirohi 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.

196. 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 design-build-operate (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 wastewater, if any, will be discharged into local drains/streams. These run dry except during monsoon. It carries untreated wastewater from habitations along its course. Considering the existing status of streams, and the degree of treatment proposed, no significant impacts envisaged. However, any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and affect the reuse. Mixing of industrial effluents in sewers may affect the inlet quality of sewage. It is therefore critical that STP receives the sewage with intended quality and treats the same to design discharge standards.

197. 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.

198. 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 172 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.

199. 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, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops.
(v) Ensure valid consent to operate (CTO) from RSPCB 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 25
(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 RSPCB:

200. 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:
(ii) 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.
(iii) 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; and
(iv) Monitoring of sewer flow to identify potential inflows and outflows
(v) 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);
(vi) 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;
(vii) 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.
(viii) 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
(ix) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
(x) Provide necessary health and safety training to the staff
(xi) Provide all necessary personnel protection equipment
(xii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works.
(xiii) As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose
(xiv) 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
(xv) Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision.
(xvi) Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process
(xvii) 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.

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

201. 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 COVID19 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 COVID19 virus (see Appendix 23). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

202. **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
(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

203. In Sirohi, at present people depend on septic tanks for discharge of sewage. Once the sewerage system is operational, these septic tanks 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.

G. Cumulative Impacts

204. 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 Sirohi Town, by rehabilitating, augmenting, and creating required new infrastructure.

205. Currently, Sirohi Town water supply is fully groundwater based. The improved water supply system will utilize nearby surface water sources (Angore and Kalkaji dams), and as the water from dams is unlikely to fulfil the entire town demand, it is also proposed to utilize groundwater source to supplement the demand-supply gap.

206. Angore dam and Kalka Ji dams are proposed as surface water sources. Gross storage capacity of the Angor dam is 14.09 MCM and 1.781 MCM for Kalka ji Dam. Only 50 MCFT water would be used presently for the proposed scheme. Allocation of raw water of 95 MCFT (2.71 MCM) from Angore and 50 MCFT (1.43 MCM) from Kalka Ji for water supply in Sirohi town is granted by the Water Resource Directorate Jaipur (Appendix 15) it is estimated that the Angore dam will be able to provide 7.15 MLD of water throughout the year against total demand of 8.55 MLD (2036) and 9.77 MLD (2051). As the dam is of recent origin, there is no long terms flow data to see the long-term sustainability. Given that dams are transferred to PHED for drinking water purposes, and fully allocated to Sirohi Town, no water use conflicts envisaged. Although there is no notable aquatic life or wildlife nearby, the dams will always retain dead storage, which can be utilized. During impact assessment, it was observed that fishing activities were being undertaken at Angor Dam. On enquiry with the concerned department, it was revealed that the water quantities being extracted are so minimal that it cannot have any adverse impact on fish propagation.

207. In view of ground water abstraction and sustainability stated that the unfulfilled demand from the surface water will be supplemented by the groundwater. As per the CGWB data, in Sirohi Block/Tehsil, the estimated net annual groundwater availability is 65.5769 MCM, the total utilization for all uses is estimated as 65.163 MCM (99.37% utilization). Sirohi Tehsil is classified as “Semi Critical” with significant long-term decline in groundwater. CGWB recommend cautious groundwater development in over exploited areas, and conjunctive use of surface and groundwater resources. Accordingly, under the project, it is proposed utilize surface water sources to the extent possible, and dependence on groundwater reduced. Ground water resources need to be used judiciously. The Tube Well Feasibility report makes it clear that “the aquifer of the area is dynamic in nature and directly responds with the rainfall in the area, so, artificial recharge is a must sustainable yield of groundwater source for a long-time exploitation”.

208. Besides the increase in abstraction due to subproject, there is also likelihood of increase in abstraction for other uses, as the groundwater is also the main source of water for irrigation and industrial uses. Strict monitoring of groundwater abstraction, and various measures already suggested to enhance groundwater recharge, will minimize any cumulative impacts.

209. Both water supply and sewerage works are proposed to be taken up simultaneously in Sirohi 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 Sirohi 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 Sirohi, scheduling of works needs to be coordinated with the respective road agency (ULB or Public Works Department) 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.

210. **Project Benefits.** The citizens of the Sirohi will be the major beneficiaries of the improved water supply and sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Sirohi 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.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

211. The active participation of stakeholders including local community, NGOs/CBOs, and the media in all stages of project preparation and implementations essential for successful implementation 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 are a must as per the ADB SPS, 2009.

212. 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, Sirohi Nagar Parishad, 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

213. The public consultation and disclosure program are a continuous process throughout the project implementation, including project planning, design and construction. During project/IEE preparation stage, public consultations were conducted near two proposed STP sites, raw water Intake, WTP 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 4April 2018 and 6th October 2018. The proposed WTP and STP facilities will cover the entire Sirohi townand the people consulted were all residents of Sirohi andare direct beneficiaries. Public

consultations were also done at nearest habitations of WTP and STP locations. Details of public consultations are given in Appendix 26.

1. Consultation during Project Preparation

214. Institutional consultations were conducted with the Governmental Departments such as Local Self Government Department, Public Works Department, Pollution Control Board, Public Health Engineering Department, Sirohi Nagar Parishad, etc. The project proposals are formulated in consultation with PHED and Sirohi Nagar Parishad and the proposals will be finalized only after certification of Commissioner Sirohi NP that the proposals suit the requirements of the ULB.

215. 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 city. 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 Sirohi. They are agreed to take up house service (swear and water) connections. Few environmental issues like availability of access during construction, generation of dust and noise are for short period and not a major concern for residents. Details of public consultations are attached in Appendix 26 with this report. Main points / issues raises / feedback received are listed below:

(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 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 water body
(xviii) Requirement of enhancement of other facilities.

216. It was observed that people are willing to extend their cooperation as the proposed activities are supposed to enhance the infrastructure service levels and the living standard of the public. The proposed project is a need of the town. Locals are very much in favor of the project and they want that this should be completed as early as possible. People are ready to extend all types of support to during execution of the project. Few people 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.

217. City level Stakeholder Committee (CLC) meeting was organized in Udaipur on 25.08.2017 to discuss the matter of proposed sewerage works and water supply in Sirohi under the chairmanship of District Collector, Sirohi in presence of consultants, RUIDP officials, PHED officials and other invitee members. Proposed scope of works and technology was discussed in the meeting and it was decided that treated effluent shall be reused by Municipal Council in beneficial uses. Executive Engineer PIU, RUIDP (Udaipur) has prepared/issued the Minutes of the Meeting and circulated among all concerned officials. and Government departments. Minutes of CLC meeting and photographs are attached in Appendix 27.

2. Consultation during construction

218. Prior to start of construction, Nagar Parishad Sirohi and PIU with the assistance of PMCBC and CSMC/CAPC 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.

219. 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 Parishad Sirohi / PIU with the help of Community Awareness and Participation Consultant (CAPC) 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

220. Executive summary of the IEE will be translated in the local language and made available at the offices of RUIDP, PMU and PIU. Copies of summary will be provided to participants of city level workshop to be organized in Sirohi. 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 ULB/RUIDP/PMU after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

221. 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.

222. 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, etc.

223. 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.

224. 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)
(vi) Semi-annual Environmental Monitoring Reports (English)

225. 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) a new 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

226. 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)[25] the system was effective in timely resolution of grievances in a transparent manner.[26] The multichannel, project-specific, three-tier GRM is functional at RUSDP, hence the design of GRM for RSTDSP takes into account the designed institutional structure for RSTDSP and the positive features and learnings from the previous GRM.[27]

227. **Common GRM**. A common GRM will be in place for social, environmental, or any other grievances related to the project; Implementation of the resettlement plans (RPs)/DDRs/ 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.

228. 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.

229. Affected Persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion boxes that will be installed by project PIUs or by e-mail, by post, or

[25] 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 CAPC/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 CAPC 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.

[26] 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.

[27] 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.

by writing in a complaint register in ULB offices/complaints register at contractor's work site[28] or by sending a Whatsapp message to the PIU[29] or by dialing the phone number of town level PIU/CAPPC or by dialing a toll-free number[30]. 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.[31]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 construction management and supervision consultants (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 (EE)/Assistant Engineer (AE) 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)[32]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 receipt of compliant/grievance in discussion with the ASO, field level PIU, CMSC, CAPPC and the contractor.

(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).

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[28] 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.

[29] 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.

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

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

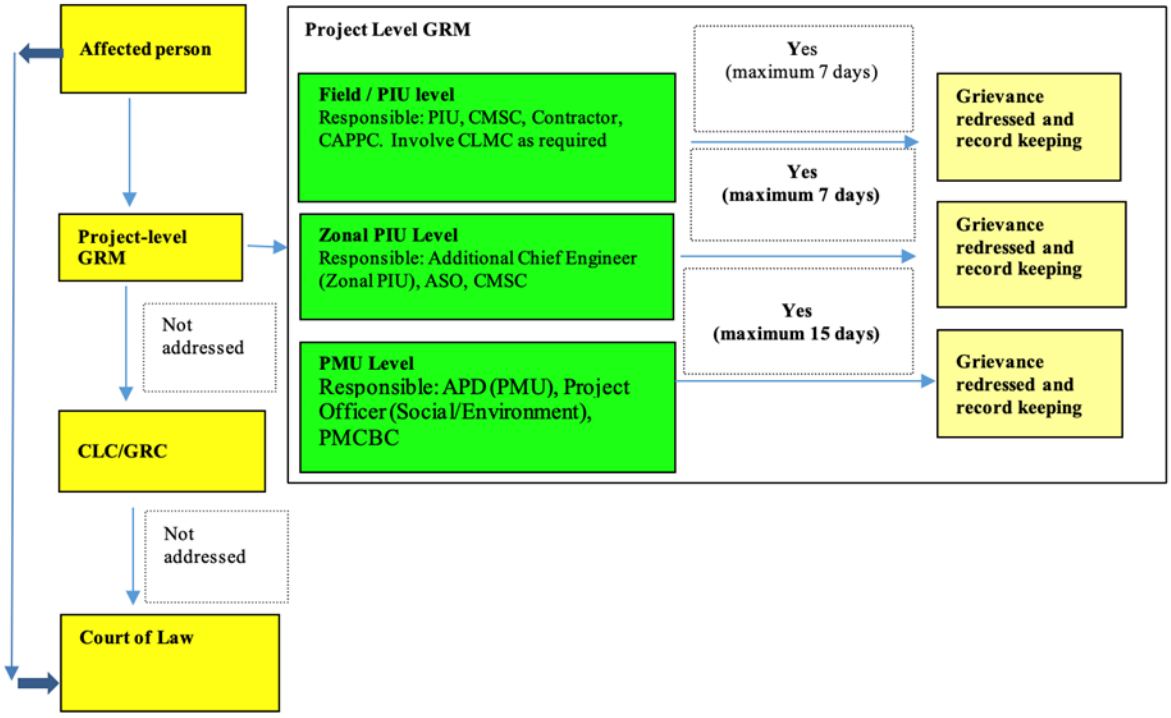
[32] The CLMC has been formed at the town/city level for planning and monitoring of work, resolve issues related to departmental coordination etc. It is headed by Commissioner/Executive Officer ULB (Chairman) and city engineer of public health engineering department (PHED), public works department (PWD)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

(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.[33] 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 19), 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.

[33] 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 19: Grievance Redress Process



Note: 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.

230. 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 designed under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARRA), 2013.[34]

231. 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.[35]

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

232. **Record-keeping.** The PIU of each town and PMU will both keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance, 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.

233. **Periodic review and documentation of lessons learned.** The PMU Project Officer (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.

234. **Costs.**Contractor 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

235. 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.

236. 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.

237. A copy of the EMP must be kept at work sites at all times. 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.

238. 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.

239. 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.

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

Table 20: 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 WTP or any other site with trees (ii) Obtain prior permission for tree cutting at WTP 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
Intake in Angore and Kalkaji Dam	Water quality and ecological impacts	(i) Design inlet of intake pipe in the dam with appropriate screen to avoid entry of aquatic organisms into inlet (ii) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon (iii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon; (iv) Erect temporary barriers to form enclosed construction area with least disturbance (v) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond (vii) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage	DBO Contractor / PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(viii) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers / coffer dam (ix) Implement work site safety at works in water body		
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 (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 faecal 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	DBO Contractor / PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Seismic sensitivity	Damage to infrastructure and potential risks: project area in moderate earthquake risk zone (Zone III)	(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 Abu Road 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 (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	DBO Contractor and ULB/PIU	Project costs and ULB costs
Water Treatment Plant (WTP)	Inefficient treatment, treated water characteristics not satisfying the standards	i) Design treatment process that is suitable for raw water source characteristics duly considering the seasonal variation in quality if any (ii) Duly consider quality of groundwater that will be supplemented for surface water supply variations (iii) Treated water and supplied water at consumer end should meet the drinking water standards all times	DBO Contractor/PIU	Design consultants' cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Water Treatment Plant (WTP)	Design to prevent pollution due to wastewater and sludge	Ensure that the following are included in the WTP design: (i) Backwash water reuse system and sludge recovery and disposal system (ii) Backwash recycling components: Filter backwash holding tank, recovered water storage tank and pumping for recycling (iii) Sludge management system components: Gravity thickeners for sludge from clarifiers, mechanical sludge dewatering system, storage facility for dewatered sludge (iv) Disposal of sludge at a landfill or the disposal site provided by the ULB	DBO Contractor/PIU	Project costs
WTP	Sludge management	(i) Prepare sludge management plan for safe handling and disposal of sludge from WTP (ii) Estimate the quantity of sludge / solids generated from the WTP during the detailed design phase, and likely composition based on the raw water quality and process chemicals (iii) Minimize the quantity of solids generated by the water treatment process through optimizing coagulation processes; (iv) Recover process chemicals to the extent possible to minimize / prevent the disposal (v) Carryout pretreatment prior to disposal (vi) Dispose dried sludge / solids from WTP at approved solid waste landfill / disposal site identified by ULB; this should be identified during the detailed design phase (vii) Evaluate the option of land application during the operation stage; conduct quality tests on the first batch of sludge generated from the WTP, check for physico chemical characteristics including heavy metals (viii) Manage hazardous/harmful waste if any, as per the Hazardous Waste Management Rules (ix) Employ safe and beneficial methods for disposal of dried sludge: in building and construction industry, brick / tile manufacturing etc.,	DBO Contractor/PIU	

<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>WTP, CWRs 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; visible and audible alarm facilities to alert chemical/chlorine leak
(v) Facility for isolation in the event of major leakages
(vi) Eye wash and 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/RPCB 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 RPCB/CPCB or the following bid specified parameters, whichever are stringent:
<table><tr><td>pH</td><td>6.5 – 9.0</td></tr><tr><td>BOD5, mg/l</td><td>≤10</td></tr><tr><td>COD, mg/l</td><td>≤50</td></tr><tr><td>TSS, mg/l</td><td>≤20</td></tr><tr><td>NH4-N, mg/l</td><td><25</td></tr><tr><td>Total nitrogen, mg/l</td><td><10</td></tr><tr><td>Fecal Coliform, MPN/100 ml</td><td><1000</td></tr></table></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
Change in raw sewage quality	Mixing of industrial effluent with sewage	(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 RPCB 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	DBO Contractor and PIU / PMU	Project Costs
STP	Use of treated wastewater for reuse applications	Develop wastewater reuse plan for Sirohi 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 Sirohi, 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 Sirohi, 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	DBO Contractor / PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
STP	Treated effluent discharge into water channel/drains and associated impacts on river water and downstream users	(i) Obtain of consent of RPCB 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 Sirohi 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 Sirohi 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, and creating nuisance, pollution	(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)	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(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 personal protection equipment (vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(viii) Conduct regular health checks (ix) Prepare Health and Safety Plan for FSSM		
Asbestos cement (AC) pipes in existing water supply system: 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) Develop ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 20. Adhere to the workflow process suggested in Figure 18. (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	DBO Contractor/PMU	Project costs
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 PMBSC (for ACM plan)	Approval of plans by PIU

Table 21: Pre-Construction Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Compliance with environmental subproject selection	Environmental impacts due to subproject	Compliance with environmental subproject selection criteria	DBO Contractor, PIU and Sirohi Nagar Parishad	PMU	No costs required

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
criteria					
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 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	PIU/Consultants in coordination of Nagar Parishad	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
		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 21) and traffic management plan (Appendix 22)	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 21), and traffic management plan (Appendix 22)	No cost required. Mitigation measures are part of TOR of PMU, PIU and Consultant
Social and 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 ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved.	DBO Contractor and PIU	Chance Finds Protocol	No cost required. Mitigation measures are part of TOR of PIU and Consultant
Construction work camps, hot mix	Disruption to traffic flow and sensitive	(i) Prioritize areas within or nearest possible	Contractor to finalize locations in consultation	(i) List of selected sites for construction	No cost required.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
plants, stockpile areas, storage areas, and disposal areas.	receptors	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; (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	and approval of PIU	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	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
		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 (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PIU.	DBO 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
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 and WTP from RPCB), 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- RPCB Sand mining, quarries, borrow areas- Department of mines and Geology	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

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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			

Table 22: Construction Stage Environmental Management Plan

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 (OHandS), 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	(i) Plan the work sites	Construction	(i) Location of	Cost for

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	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.	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 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 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	Contractor	stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Certification that vehicles are compliant with Air Act (v) Reports of air quality monitoring	implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 (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 contaminate nearby surface water quality.	(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 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	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; (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	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
		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 Environmental Management Plan (EMP).			
Surface water quality	Degradation of water quality of Angore and Kalka Ji dams due to intake works	(i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon (ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to	Construction Contractor	(i) Construction methodology for intake construction (iii) Records of water quality inspection; (iv) Effectiveness of water management measures; (v) No visible degradation of water quality	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
		onset of monsoon; (iii) Erect temporary barriers to form enclosed construction area with least disturbance (iv) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond (v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage (vi) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers / coffer dam (vii) Implement work site safety at works in water bodies			
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	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 6 of this IEE)	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
		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) Periodical monitoring of noise quality as per EMP			
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, and other similar items.	(i) Prepare and implement spoils management plan (Appendix 21); (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with ULB/PIU for 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: 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.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iii) Worksite clear of any excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers	Cost for implementation of mitigation measures responsibility of contractor.
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.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
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 concerned 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 22) (ii) Duly consider and select sections for trenchless method of 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;	Construction Contractor	(i) Traffic route during construction works including number of permanent signage, barricades and flagmen on worksite; (ii) Complaints from sensitive receptors; (iii) Number of signage placed at project location.	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
		(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.			
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Prepare and implement spoils management plan (Appendix 21). Contractor to Implement RP and to 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	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Spoils management plan (iii) Number of walkways, signage, and metal sheets placed at project location.	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
		(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.			
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force, or to the maximum extent possible (i. (iii) Comply with labor laws	Construction Contractor	(i) Employment records; (ii) Records of sources of materials (iii) Compliance to labor laws (see Appendix 8 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 8 of this IEE); Following best practice health and safety guidelines: IFC's General EHS Guidelines[36] and Sector Specific (Water and Sanitation) Guidelines[37] (ii) Develop and implement site-specific occupational health and safety (OHandS) Plan which will include measures such as: (a) excluding public from the site; (b)	Construction Contractor	(i) Site-specific OHandS Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating	Cost for implementation of mitigation measures responsibility of contractor.

[36] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES
[37] 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
		ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OHandS 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 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		areas where workers are not exposed to hazardous or noxious substances; (vii) record of HandS orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. (xii) Compliance to core labor laws (see Appendix 8 of this IEE)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 HandS 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 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 (xvii) 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. 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		in water of dam. Suitable working platform should be provided during construction works in water. (xviii) Provide proper solid and liquid waste management system in 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 20. Adhere to the workflow process suggested in Figure 18. (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	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
		defined in the Asbestos Management Plan will have to be adhered to (vii) Maintain records of AC pipes as per the AMP			
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	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
		cards/maps. (vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (viii) Provide road signs and flag persons to warn of on-going trenching activities.			
Safety of sensitive groups (children, elders etc.) and other 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 neighbourhood 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	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
		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 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 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			responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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			
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	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
		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 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 24) (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.			
Social and 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	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
		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			
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	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 OandM	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
		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 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.		are removed; and (iv) worksite clean-up is satisfactory.	

Table 23: Operation Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Water supply system operation: water treatment	Supply of water not meeting drinking water standards, health and environment issues due to operation of WTP	(i) Judiciously utilize the available water in two dams water and groundwater resources by adapting conjunctive use; prepare a water utilization plan every year post monsoon season depending on the water availability / allocation for town (ii) Prepare and implement Contingency Plan for low rainfall years that will result in low storage in Angure and Kalkaji Dams; in such cases revise the water supply rate appropriately to ensure uninterrupted water supply throughout the year; provide	OandM contractor for 10 years and then Nagar Parishad	Nagar Parishad, Sirohi	O&M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		prior information to stakeholders (iii) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative information (iv) Ensure zero wastewater discharge from the water treatment process via collection and recirculation of process wastewater / backwash water; (v) Implement sludge management plan; ensure collection, processing, drying, and safe disposal / reuse accordingly (vi) 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 (vii) Conduct periodic testing of sludge as per the environmental monitoring plan (viii) Ensure valid consent to operate (CTO) from RPCB for operation of WTP (ix) Ensure that all conditions/standards prescribed by RPCB are compiled duly (x) 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 (xi) Implement Emergency Response System (ERS) for the chlorine leakage; (ix) Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 25.			

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 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 RPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by RPCB 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	O&M contractor for 10 years and then Nagar Parishad	Nagar Parishad, Sirohi	O&M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 25 (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 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 RPCB: (xv) Conventional and centralized water treatment that use filtration and disinfection that inactivates disease-causing vectors			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(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; 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	OandM contractor for 10 years and then Nagar Parishad	Nagar Parishad, Sirohi	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 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.			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		• 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 30.	OandM contractor for 10 years and then Nagar Parishad, Sirohi	Nagar Parishad, Sirohi	OandM cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of OandM Manual	OandM contractor for 10 years and then Nagar Parishad	Nagar Parishad, Sirohi	OandM cost of contractor

Table 24: Environmental Monitoring Plan for Construction Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, chance find protocol, asbestos pipes management. and safety measures. Site inspection checklist to review implementation is appended at Appendix 30.	Weekly during construction	Supervising staff and safeguards specialist	No costs required
Tree cutting and plantation	STP, SPS, WTP 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	6 locations (STP, WTP, pipe laying, construction camps and workers	PM10, PM2.5, NO2, SO2, CO	Once before start of construction and quarterly (yearly	Contractor	Cost for implementation of monitoring measures

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	camp)		4-times) during construction		responsibility of contractor
Ambient noise	6 locations (STP, WTP, pipe laying, construction camps and workers camp)	Day time and nighttime noise levels	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Soil quality	5 locations (STP, WTP, construction camps, workers camps)	pH, Elect. Conductivity (at 250C), Moisture (at 1050C), 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
Ground Water Quality	03 locations (Tubewell, openwell, Construction camp)	pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Suplhate, Nitrate, Fluiride, Hg, Cadmium, Cr+6, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Surface water quality	02 locations (intake sites)	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	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Table 25: Environmental Monitoring Plan for Operations Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of raw wastewater 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	OandM contractor for 10 years and then Nagar Parishad	Contract OandM cost / Nagar Parishad, Sirohi
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	OandM contractor for 10 years and then Nagar Parishad	Contract OandM cost / Nagar Parishad, Sirohi
Raw water quality	Angore Dam, Kalkaji Dam, WTP and tube wells	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Parishad	Contract OandM cost / Nagar Parishad, Sirohi
Treated water quality	WTP CWRs	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Parishad	Contract OandM cost / Nagar Parishad, Sirohi
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 Parishad	Contract OandM cost / Nagar Parishad, Sirohi
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	OandM contractor for 10 years and then Nagar Parishad	Contract OandM cost / Nagar Parishad, Sirohi

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Consent to operate (CTO) from RPCB	WTP and STPs	CTO should be renewed before expired	As per RPCB	Sirohi Nagar Parishad	Contract O&M cost / Nagar Parishad, Sirohi

B. Institutional Requirements

241. Local Self Government Department (LSGD) is the Executing Agency (EA) 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 designed to monitor the project implementation. The Project Management Unit (PMU) is at state-level and headed by a dedicated Project Director. The Project Implementing Units (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.

242. 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.

243. 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 Construction Management and Supervision Consultants (CMSCs) and PIU.

244. 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 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 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

(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.

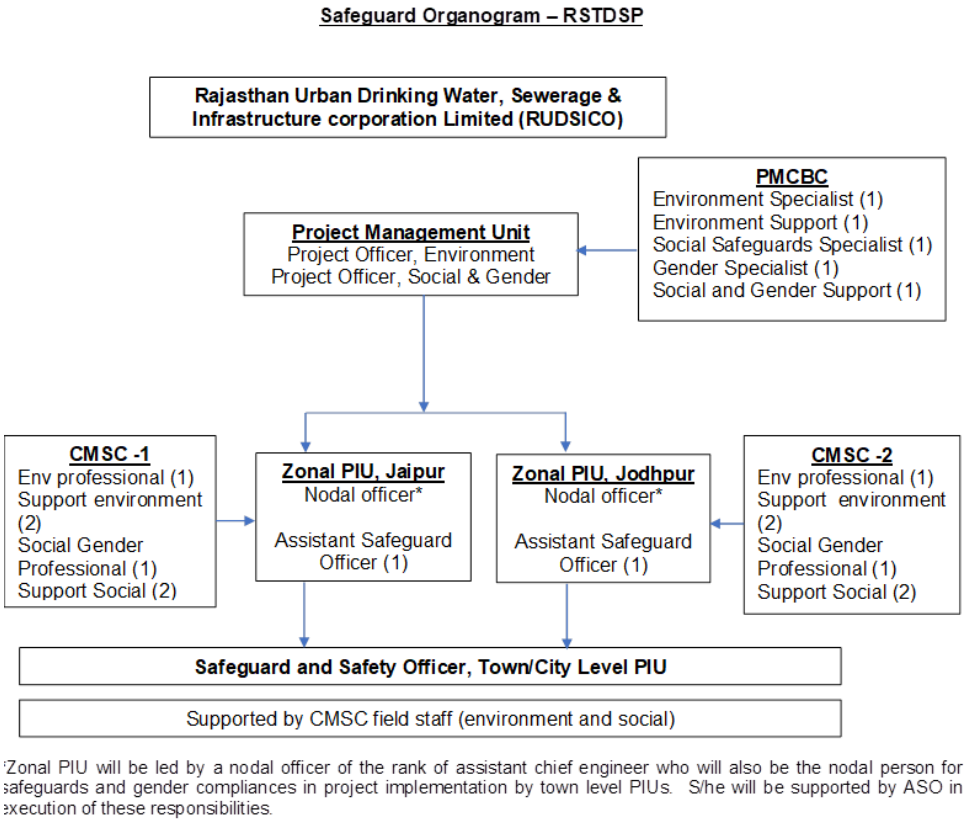
245. There will be two zonal PIUs and a PIU at every town. PIUs at the town-level shall be headed by a Superintending Engineer / Executive Engineer, who shall work as Project Manager and shall sign the contract documents, manage the contract and disburse payments as Drawing and Disbursing Officer.

246. **Construction Management and Supervision Consultants (CMSC)** - 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 design 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;

247. **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 and metering. CAPPC shall also undertake various IEC activities to promote and pursue health and hygiene among the communities.

248. Table 27 Summarize the institutional responsibility of environmental safeguards implementation at all stages of the project.

Figure 20 Safeguard Implementation- RSTDSP



249. **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, two 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, (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.
(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

(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

250. The PMU will be supported by three 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 Construction Management and Supervision Consultants (CMSC) will support the 2 zonal PIUs and town-level PIUs; and (iii) Community Awareness and Public Participation Consultants (CAPPC), will support the zonal PIUs and town-level PIUs.

251. **Zonal Project implementation units (Zonal PIUs).** There will be two 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.

252. The zonal level Assistant Safeguards Officer 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 Assistant Safeguards Officer (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, 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 rights of way 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.

253. **Town/City Level Project Implementation Unit (PIU).** 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 (EE) or Assistant Engineer (AE)] 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 designed 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 rights of way;
(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.

254. **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,43 consultations with interested/affected people, (iv) field-level grievance redress; and (iv) reporting.

255. The Contractor will be required to submit to RUDSICO, for review and approval, a site-specific environmental management plan (SEMP) including (i) designed 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.

256. 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.

257. 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 26: 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.
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	• 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)

Implementation Arrangements	Roles and Responsibilities
• Director, Department of Local Bodies • Executive Director, RUDSICO • Project Director, RUDSICO • Independent Director • Independent Director	
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 <u>PMU Staff</u> • 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, 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:	**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 • 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

Implementation Arrangements	Roles and Responsibilities
• 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	• 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) • <u>PIU Staff</u> • 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 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 –	**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
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 27: Institutional Roles and Responsibilities

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 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	(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 (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	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**
	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.	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 EMP implementation is provided. (iv) Disclose of approved EIAs/IEEs. (v) Obtain all necessary clearances, permits, consents, NOCs, etc.	(i) oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations. .(ii) take necessary action for obtaining rights of way; .(iii) oversee implementation of EMPs, including	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	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.	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	
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 designed project using REA checklists and submit to PIU/PMCBC (ii) Assist in summarizing IEE and translating to language understood by local people.	i. Monitoring of Implementation of EMP at site by contractor ii. Recommend corrective action measures for non-compliance by contractors iii. Assist in the review of monitoring reports submitted 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**
		iv. (iv) Assist in the preparation of monthly monitoring reports v. 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

258. 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.

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

260. 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 28.

261. The following Table 28 presents the outline of capacity building program to ensure EMP implementation. The estimated cost is Rs.275,000 (excluding trainings of contractors which will be part of EMP implementation cost during construction to be covered by the project's capacity building program. The detailed cost and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the ESS of PMCBC.

Table 28: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Rajasthan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHandS, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project at PMU, Jaipur	INR 100,000 (Lump sum)	PMU cost
2. EMP implementation (2 days) - Roles and responsibilities - OHandS planning and implementation - Wastes management (water, hazardous, solid, excess construction	All staff and consultants involved in the Town subproject All contractors prior to award of contract At PIU, Sirohi	INR 50,000 (Lump sum)	PMU cost

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
materials, spoils, etc.) - Working in congested areas, - Public relations - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Post-construction planning			
3. Plans and Protocols (1 day) - Construction site standard operating procedures (SOP) - ACM Management Plan - Site-specific EMP - Traffic management plan - Spoils management plan - Waste management plan - Chance find protocol - OandM plans - Post-construction plan	All staff and consultants involved in the project All contractors prior to award of contract or during mobilization stage. At PIU Sirohi	Lump sum INR 25,000 (Lump sum) Lump sum INR 25,000 (Lump sum)	PMU cost Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)
4. 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	INR 100,000 (Lump sum)	PMU Cost
5. Contractors Orientation to Workers on EMP implementation (OHandS, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the contractor prior to dispatch to worksite	Lump sum INR 25,000 (Lump sum)	Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)

Summary of Capacity Building cost for EMP Implementation

Contractor Cost	- INR 50,000
PMU Cost	- INR 275,000
Total	- INR 325,000

D. Monitoring and Reporting

262. 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 ASO and ESS of consultants will review the report and thereafter PMU will allow commencement of works.

263. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU and Assistant Construction Manager (ACM) of consultants. Monthly report summarizing compliance and corrective measures taken will be prepared by ASO with the assistance of ACM and submitted to PMU.

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

265. Based on monthly and quarterly reports and measurements, PMCBC will draft semi-annual reports and submit to PMU for their review and further submission to ADB (Appendix 31). Once concurrence from the ADB is received the report will be disclosed in the Project website.

266. The PMU will include safeguards implementation status in the quarterly progress report (QPR) using the suggested checklists in Appendix 31 and separate semi-annual environmental and social safeguards monitoring reports to ADB, which will be reviewed and disclosed on ADB's website. The monitoring reports will be prepared by PMU with assistance from the PMU-consultant and inputs from the PIU's safeguard officers, contractors and NGOs, where relevant. The status of safeguard implementation, issues, and corrective actions including associated cost and schedule are to be clearly reported to ADB. The status of safeguards implementation will also be discussed at each ADB review mission and with necessary issues and agreed actions recorded in Aide Memoires. ADB will also carry out annual environmental and/or social (including gender) reviews of the Project. The outline of the semi-annual environmental monitoring report is in Appendix 31. 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.

267. 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

268. Most of the mitigation measures require the contractors to adopt good site practice,which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. There are some of the provisions in bid documents like compliance of the requirements of health and safety during construction works as per applicable labor laws, labor insurance, equipment fitness, provision of labor welfare facilities, healthcare facilities etc. which are unanimously bound to contractor bidding for the project therefore it is understood that costs for such requirements are bound to contractor and no need to consider as cost of EMP implementation. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of PIU/ULB will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacity building program is included as part of the project. Cost of environmental management are given in Table 29.

Table 29: Cost Estimates to Implement the EMP

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	Mitigation Measures						
1	Compensatory plantation measures	Construction	lump sum	-		100,000	Civil works contract

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
	Subtotal (A)					100,000	
B.	Monitoring Measures**						
1	Air quality monitoring	Pre-construction and construction	per sample	78	4920	383,760	Civil works contract
2	Noise levels monitoring	Pre-Construction and construction	Per sample	78	1980	154440	Civil works contract
3	Ground Water Quality	Pre-Construction and construction	Per sample	39	6720	262,080	Civil works contract
4	Surface Water Quality	Pre-Construction and construction	Per sample	26	6720	174,720	Civil works contract
5	Soil Quality	Pre-construction and construction	Per sample	65	5880	382,200	Civil works contract
	Subtotal (B)					1,357,200	
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
4.	Plans and Protocols	Construction	lump sum			25,000	PMU
			lump sum			25,000	Civil works contract
5.	Experiences and best practices sharing	Construction/Post-Construction	lump sum			100,000	PMU
6.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	lump sum			25,000	Civil works contract
	Subtotal (C)					325,000	
D	Civil Works						
1	Water Sprinkling for dust suppression	Construction	KL	15000	111	1,665,000	Civil works contract
2	Rainwater Harvesting for water conservation	Construction	Nos.	3	Lump Sum	3,000,000	Civil works contrac

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
							t
3	Implementation of asbestos (ACM) management plan	Construction	-	-	Lump sum	3,000,000	Civil works contract
4	Barricading						
Water Supply							
	Barricading with wooden ballis	Construction	m	6575	84	552300	
	Barricading with wooden ballis	Construction	m	13150	84	1104600	
Sewerage							
	With wooden ballis	Construction	m	4950	84	415800	
	MS Pipe	Construction	m	4950	38.5	190575	
	MS Pipe with nut and bolt	Construction	m	9950.00	50.0	497500	
	Sub Total (D)					10,425,775	
E	**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
	Sub Total (E)					**7,000,000**	
F	**Grievance Redressal Mechanism**				Lump sum	350,000	Civil works contract under DBO Contractor
	Sub Total (F)					**350,000**	
	Total (A+B+C+D+E+F)				**INR**	**19,557,975**	

* As per preliminary design 8 trees are required to be cut for WTP work, for which 24 trees will required to be planted (as per Compensatorypolicy), being DBO contract, contractor will be required to revise above table. Tree cutting and utility shifting will be minimized through design alternatives for SPS. Contractor will revisit all sites including STP sites and ascertain the tree cutting/ utility shifting required.

X. CONCLUSION AND RECOMMENDATION

269. The process described in this document has assessed the environmental impacts of all elements of the Sirohi 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 construction material to support the sewer in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work.

270. There are no environmentally or archeologically sensitive areas within Sirohi Town. Nearest protected area to Sirohi is Mount Abu Wildlife Sanctuary; the sanctuary boundary is about 20 km from the town. Surface water Intakes are proposed in Angore and Kalkaji Dams. These are mostly surrounded by agricultural areas, and there are no sensitive areas like forests. There is no notable aquatic life in the dams. Various measures are included to avoid any impacts, especially during construction operation. During the operation phase, dead storage will always be available in the dam.

271. Angore and Kalkaji dams are proposed as source. Gross storage capacity of the Angor dam is 14.09 MCM and 1.781 MCM for Kalkaji Dam. Water Resources Department of Government of Rajasthan has allocated 2.71 MCM from Angore and 1.43 MCM from Kalkaji Dam for water supply in Sirohi. it is estimated that Angore dam will be able to provide 7.15 MLD of water throughout the year (at 73% dependability) against total demand of 8.55 MLD (2036) and 9.77 MLD (2051). There is no other feasible and dependable surface water source near Sirohi town. Therefore, it is proposed to adopt conjunctive use approach, utilizing both surface and groundwater sources to meet the demand. During the high rainfall years, entire water demand may be fulfilled by Angore and KalkaJi dams, while in low rainfall years the deficit will be met by existing groundwater sources. There are existing 11 open wells and 16 tube well. Quality of raw water is good and is suitable for drinking water supply after conventional treatment and disinfection.

272. No water use conflicts envisaged as due water allocation is made by Water Resources Department from dam storage. Although there is no notable aquatic life or wildlife nearby, the dams will always retain dead storage, which can be utilized. During impact assessment, it was observed that fishing activities were being undertaken at Angore Dam. On enquiry with the concerned department, it was revealed that the water quantities being extracted are so minimal that it cannot have any adverse impact on fish propagation. The dead storage is always available is sufficient for survival of fishes. No notable impacts therefore envisaged.

273. Given that the feasible surface source (Kalka Ji Dam) is not able to fulfill the demand, it is proposed to continue the groundwater as supplemented source of water supply. 1.43 MLD water will be available with utilizing existing ground water sources through refurbishment of Tube wells (16 Nos.) and Open well (11 Nos.). A feasibility report for 7 new tube wells has been prepared by State Groundwater Department for future requirement. The groundwater development in the area is classified by CGWB as semi-critical, with nearly 99.4% abstraction of available water but with no significant long-term decline in groundwater. CGWB cautions use of groundwater resource over 90% of net available resources and recommends linking water abstraction in these areas to water conservation measures like augmenting groundwater recharge through artificial measures.

The Feasibility Report of Tube Wells prepared by State Ground Water Department has also suggested the same. Various measures are suggested for groundwater sustainability.

274. In water treatment various measures are included to safely collect, reuse / dispose the wastewater and sludge generated in the process. There are 6 trees in proposed WTP site, which needs to be cut for construction of proposed facility. 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.

275. Two STPs of capacities 5 MLD and 1.70 MLD are proposed based on SBR (sequential batch reactor) process, followed by disinfection. 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 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 stringent standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of Rajasthan. The treated wastewater will be reused, and a Reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge.

276. Proposed STP sites are away from habitations and surrounded by agricultural lands. Some trees and shrubs are present at these sites. No habitation exists within 350m. Treated wastewater which is excess / surplus of reuse will be disposed into dry water channels/drains. No impacts envisaged as the water courses are mostly dry and carries untreated wastewater except during monsoon.

277. Except water lines and sewer works, all other construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. Water pipes and sewer line works (117.4 km of water pipes and 93 km of sewers covering almost entire project area of Sirohi town) will be conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method will be adopted for sewers deeper than 3.5 m and also at main road crossings in traffic areas.

278. Subproject includes rehabilitation of existing infrastructure like tube wells, CWRs, pumping stations and OHSRs. Presence of asbestos containing material (ACM), mainly AC 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. Nearly 83% of the existing 130 km of underground water transmission and distribution system consists Asbestos Cement (AC) pipes of 80-250 mm diameter (109 km of total 130 km length of pipes). It is normal practice in Rajasthan that existing AC 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 AC pipes may not be possible. There are narrow lanes, where AC pipes may be encountered during the laying of new pipes. Some connections /

inlet / outlet pipes at the existing CWRs are also of AC pipes. These will be removed and replaced with new non-AC pipes.

279. AC pipe as such in not hazardous as it is in the cement bonded form, however, 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 around the work sites. The condition of existing underground AC pipes is not known, however, as these are old, pipes may be in deteriorated conditions. Various measures are suggested including development and implementation of Comprehensive Asbestos Management Plan (CAMP)

280. 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.

281. 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 WTP and STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

282. Certain new initiatives have been taken in the project viz., promoting wastewater reuse, sludge reuse and contractor to work on private properties to provide sewerage connections. Hence, appropriate guidelines for these measures should be provided for these new initiatives. These could include viz., Guidelines for the ULBs for promoting wastewater reuse; Guidelines for the ULBs for sludge reuse; and Guidelines for the Contractors to work within the private properties. 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

283. 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.

284. The EMP will be included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit to PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. 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. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times.

285. The citizens of the Sirohi will be the major beneficiaries of the improved water supply and sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Sirohi 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.

286. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines WTP and STPs requires consent to establishment (CTE) and consent to operate (CTO) from Rajasthan Pollution Control Board. CTE will be obtained prior to construction, as the detailed designs will be undertaken by contractor.

287. 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 biodiversity assessment report;
(v) Secure permits for the abstraction of groundwater from additional wells;
(vi) Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
(vii) Conduct safeguards induction to the contractor upon award of contract;
(viii) Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules, 2000 and amendment) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
(ix) Strictly supervise EMP implementation;
(x) Ensure contractor appointed qualified EHS officers prior to start of works;
(xi) Documentation and reporting on a regular basis as indicated in the IEE;
(xii) Continuous consultations with stakeholders;
(xiii) Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
(xiv) Involvement of contractors, including subcontractors, in firstlevel GRM; and
(xv) Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

288. 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: Rapid Environmental Assessment (REA) Checklist

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: IND: Rajasthan Secondary Towns Development Sector Project-Water Supply and Sewerage Subproject in Sirohi Town, District-Sirohi, 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 disturbance to, houses, and commercial establishments. STP site is sufficient away from habitations.
Heavy with development activities?	√		Sirohi is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas?		√	There are no environmentally sensitive areas within or near to any proposed site
Cultural heritage site		√	
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	

SCREENING QUESTIONS	Yes	No	REMARKS
Bay		√	
Potential Environmental Impacts Will the Project cause…			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not applicable.**
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.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	**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.
Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		√	**Not anticipated.** Treated effluents from the STP will be utilized in agriculture or similar uses and comply with the State's Reuse policy.
Overflows and flooding of neighboring properties with raw sewage?		√	**Not anticipated.** Risks, climate change factors and forecasted demands are considered in the design and capacity of the sewerage systems.

SCREENING QUESTIONS	Yes	No	REMARKS
Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	√		**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.
Noise and vibration due to blasting and other civil works?		√	**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.
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.** 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.
Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	**Not anticipated.** Sewerage system only caters to domestic waters, no industrial wastewater is allowed into the system.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	√		**Not anticipated.** STPs will be isolated through boundary walls and dense plantations to avoid/minimize nuisance.
Road blocking and temporary flooding due to land excavation during the rainy season?	√		**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
Noise and dust from construction activities?	√		**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.
Traffic disturbances due to construction material transport and wastes?	√		**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.
Temporary silt runoff due to construction?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirement for contractors to provide silt control measures.

SCREENING QUESTIONS	Yes	No	REMARKS
Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		**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.
deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		**Not anticipated.** STP designs include sludge handling and treatment facilities to state policy standards.
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. O&M manual includes testing procedures and acceptable parameters for disposal on land.
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?	√		**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.
large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		√	**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.

SCREENING QUESTIONS	Yes	No	REMARKS
Social conflicts between construction workers from other areas and community workers?		√	**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.
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?		√	**Anticipated but temporary, site-specific and can be mitigated.** Construction will not involve use of explosives and chemicals. During operations, chemicals such as pH adjusters, flocculants, or coagulants may be used. The complete list of chemicals, quantities, and requirements for safe use and storage will be included in the final IEE for the STPs (these are design-build-operate packages). The EMPs in the current IEEs already include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals.
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?	√		**Anticipated but temporary, site-specific and can be mitigated.** Work area will be clearly demarcated with security access for the workers and project-concerned members only. Community health and safety risks are present during construction such as risks from excavations for pipe laying, equipment and vehicle operations which should be identified and implemented in the site-specific EMPs.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: IND: Rajasthan Secondary Towns Development Sector Project-Water Supply and Sewerage Subproject in Sirohi Town, District-Sirohi, Rajasthan
Sector: Urban Development
Subsector: Wastewater
Division/Department: SARD/SAUW

Screening Questions		**Score**	**Remarks**[38]
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?	1	Sirohi received huge rains during rainy season, which may impact project execution during construction
	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

[38] 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

Other Comments: None

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-Water Supply and Sewerage Subproject in Sirohi Town, District-Sirohi, 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. WTP site is sufficient away from habitations.
Heavy with development activities?	√		Sirohi 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		√	
Protected area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer Zone of Protected Area		√	
Special area for Protecting Biodiversity		√	

Screening Questions	Yes	No	Remarks
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 ?		√	There is no waste water discharge in upstream of water source; i.e. Angiore and Kalka Ji dam
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not anticipated.** Project will have no any effect on historical/cultural monuments as there are no such monuments within influence of proposed works
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, 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.

Screening Questions	Yes	No	Remarks
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. 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

Screening Questions	Yes	No	Remarks
			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 (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	√		**Not anticipated.** Water treatment plans are designed with on-site and timely 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

Screening Questions	Yes	No	Remarks
			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 the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	√		**Anticipated but temporary, site-specific and can be mitigated.** Construction does not involve use of explosives. EMPs include measures and monitoring requirements on occupational health and safety for chemical hazards.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: IND: Rajasthan Secondary Towns Development Sector Project-Water Supply and Sewerage Subproject in Sirohi Town, District-Sirohi, Rajasthan
Sector : Urban Development
Subsector: Water Supply
Division/Department: SARD/SAUW

Screening Questions		**Score**	**Remarks**[39]
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?	1	Sirohi receives a large amount of rains and construction woks may be impacted during rainy season
	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

[39] 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): Medium risk
Other Comments: None

Appendix 2:
Drinking Water Standards

Applicable Drinking Water Quality Standards for ADB funded projects in India

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			

[a] Bureau of India Standard 10500: 2012.

[b] Health-based guideline values.

[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.

[d] Figures in parenthesis are maximum limits allowed in the absence of alternate source. IS10500:2012 indicates these values in parenthesis may still be tolerated only if there are no other sources that could meet the base acceptable limit.

Appendix 3:
Environmental Guidelines for Subproject Selection

Components	Criteria	Design Considerations (if criterion is not met)	Compliance check – Abu Road Subproject
All subprojects			
	Subproject will avoid potentially significant adverse impacts that are diverse, irreversible or unprecedented (ADB SPS Category A for environment).		Complied
	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 / will be complied
	Does not include and/or involve any activities listed in ADB's Prohibited Investment Activities List[40]		Complied
	Reflect inputs from public consultations	Refer to ADB SPS requirements on meaning consultations[41]	Being complied

[40] ADB SPS Appendix 5.

[41] 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".

Location	Avoid involuntary resettlement by prioritizing rehabilitation over new construction using vacant government land where possible, and taking all possible measures in design and selection of site or alignment to avoid resettlement impacts	If cannot be avoided, prepare Resettlement Plan.	Being complied
	Avoid or minimize the cutting of trees	If tree is to be cut, consider 1:10 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.		Not relevant to this subproject

Physical Cultural Resources	Should not result in the destruction/damage of or encroachment onto physical cultural resources (PCR)[42] such as 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.	If location is within 300 m of notified protected monuments/ sites and there is no alternative, permissions from the ASI or State Department of 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. Appendix 3 provides a sample Heritage Impact Assessment prepared for a sample subproject (Khetri water and sewerage subproject).	Complied
Existing Facilities to be rehabilitated or expanded	Conduct environmental audit of existing facilities[43] 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.	Complied
Associated Facilities[44]	Analyse environmental impacts and risks to be included in the IEE		Complied
Asbestos-containing materials (ACM) including, but not limited to, pipes, roofing, ceilings, insulation materials, excess pipes stored in	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	Being complied

[42] 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 be above or below ground or underwater. Their cultural interest may be at the local, provincial, national, or international level.”

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

[44] 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”

PHED campuses, walls, etc.		(Sardarshahar water and sewerage subproject). RUIDP shall include AMP in all contracts. Contractor should be certified to handle ACM.	
	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.		Will be complied
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.		Will be 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 – Water Treatment Plants (WTP), Tube Wells (TW), etc. within 100m 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 for WTP; exact tube well locations will be finalized during the detailed design
	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
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 locate new Sewage Treatment Plants (STP) should be at least 500m 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 500 m 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	Being complied

		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	
	As far as possible Sewage Pumping Stations (SPS) and wet wells should be located at least 100m 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 100 m 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 pumping station	Not relevant – no SPS proposed

		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 / will be complied
Design	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
	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 require land acquisition from individual farmers that is a significant proportion of their total land holding (10%)		Being compiied

Appendix 4: Ambient Air Quality, Vehicle, Diesel Generator Emissions Standards

Table 1: Ambient Air Quality Standards

Parameter	Location[a]	India Ambient Air Quality Standard (µg/m^3) [b]	WHO Air Quality Guidelines (µg/m^3)		Applicable Per ADB SPS[e] (µg/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)

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	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)
	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)

[a] 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: Vehicle Exhaust Emission Norms

1. Passenger Cars

Norms	CO (g/km)	HC+ NOx (g/km)
1991Norms	14.3-27.1	2.0 (Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	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)

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

Source: Central Pollution Control Board

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

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.

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]

Appendix 5:
Effluent Discharge Standards for STPs as per 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- Less than 100 MPN/100ml Permissible- 230 MPN/100ml

Appendix 6:

Applicable Ambient Noise Level Standards for ADB funded projects in India

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.

Noise Limits for DG Set

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.

2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

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 7: Extract from Construction and Demolition Management Rules, 2016

[Published In the Gazette of India, Part-II, Section-3, Sub-section (ii)]
Ministry of Environment, Forest and Climate Change

NOTIFICATION

New Delhi, the 29th March, 2016

G.S.R. 317(E).-Whereas the Municipal Solid Wastes (Management and Handling) Rules, 2000 published vide notification number S.O. 908(E), dated the 25th September, 2000 by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of Municipal Solid Waste generated in the urban area of the country;

And whereas, to make these rules more effective and to improve the collection, segregation, recycling, treatment and disposal of solid waste in an environmentally sound manner, the Central Government reviewed the existing rules and it was considered necessary to revise the existing rules with a emphasis on the roles and accountability of waste generators and various stakeholders, give thrust to segregation, recovery, reuse, recycle at source, address in detail the management of construction and demolition waste.

And whereas, the draft rules, namely, the Solid Waste Management Rules, 2015 with a separate chapter on construction and demolition waste were published by the Central Government in the Ministry of Environment, Forest and Climate Change vide G.S.R. 451 (E), datedthe 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date of publication of the said notification;

And Whereas, the objections or suggestions received within the stipulated period were duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sections 6, 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Municipal Solid Wastes (Management and Handling) Rules, 2000, except as respect things done or omitted to be done before such supersession, the Central Government hereby notifies the following rules for Management of Construction and Demolition Waste –

1. Short title and commencement.-(1) These rules shall be called the Construction and Demolition Waste Management Rules, 2016.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Application.-The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organisation or authority who generates construction and demolition waste such as building materials, debris, rubble.

3. Definitions –(1) In these rules, unless the context otherwise requires,-

(a) " ACT' means the Environment (Protection) Act, 1986 (29 of 1986);

(b) "**construction**" means the process of erecting of building or built facility or other structure, or

building of infrastructure including alteration in these entities,;

(c) "**construction and demolition waste**" means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure;

(d) **"de-construction"** means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;

(e) **"demolition"** means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.

(f) **"form" means a Form annexed to these rules;**

(g) **"local authority"** means an urban local authority with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee and not limited to or any other local authority constituted under the relevant statutes such as gram panchayat, where the management of construction and demolition waste is entrusted to such agency;

(h) **" schedule"** means a schedule annexed to these rules;

(i) **"service provider'** means authorities who provide services like water, sewerage, electricity, telephone, roads, drainage etc. often generate construction and demolition waste during their activities, which includes excavation, demolition and civil work;

(j) **"waste generator" means any person or association of persons** or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.

(2) Words and expressions used but not defined herein shall have the same meaning defined in the ACT.

(4) Duties of the waste generator -

(1) Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.

(2) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.

(3) Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned

authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.

(4) Every waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection centre so made by the local body or handover it to the authorised processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.

(5) Every waste generator shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities; Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall have to pay for the processing and disposal of construction and demolition waste generated by them, apart from the payment for storage, collection and transportation. The rate shall be fixed by the concerned local authority or any other authority designated by the State Government.

(5) Duties of service provider and their contractors -

(1) The service providers shall prepare within six months from the date of notification of these rules, a comprehensive waste management plan covering segregation, storage, collection, reuse, recycling, transportation and disposal of construction and demolition waste generated within their jurisdiction.

(2) The service providers shall remove all construction and demolition waste and clean the area every day, if possible, or depending upon the duration of the work, the quantity and type of waste generated, appropriate storage and collection, a reasonable timeframe shall be worked out in consultation with the concerned local authority.

(3) In case of the service providers have no logistics support to carry out the work specified in sub-rules (1) and (2) , they shall tie up with the authorised agencies for removal of construction and demolition waste and pay the relevant charges as notified by the local authority.

(6) Duties of local authority-The local authority shall,-

(1) issue detailed directions with regard to proper management of construction and demolition waste within its jurisdiction in accordance with the provisions of these rules and the local authority shall seek detailed plan or undertaking as applicable, from generator of construction and demolition waste;

(2) chalk out stages, methodology and equipment, material involved in the overall activity and final clean up after completion of the construction and demolition ;

(3c) seek assistance from concerned authorities for safe disposal of construction and demolition waste contaminated with industrial hazardous or toxic material or nuclear waste if any;

(4) shall make arrangements and place appropriate containers for collection of waste and shall remove at regular intervals or when they are filled, either through own resources or by appointing private operators;

(5) shall get the collected waste transported to appropriate sites for processing and disposal either through own resources or by appointing private operators;

(6) shall give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ;

(7) shall examine and sanction the waste management plan of the generators within a period of one month or from the date of approval of building plan, whichever is earlier from the date of its submission;

(8) shall keep track of the generation of construction and demolition waste within its jurisdiction and establish a data base and update once in a year;

(9) shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;

(10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;

(11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

(7) Criteria for storage, processing or recycling facilities for construction and demolition waste and application of construction and demolition waste and its products-

(1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;

(2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.

(3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II.**

(3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II.**

(8) Duties of State Pollution Control Board or Pollution Control Committee-

(1) State Pollution Control Board or Pollution Control Committee shall monitor the implementation of these rules by the concerned local bodies and the competent authorities and the annual report shall be sent to the Central Pollution Control Board and the State Government or Union Territory or any other State level nodal agency identified by the State Government or Union Territory administration for generating State level comprehensive data. Such reports shall also contain the comments and suggestions of the State Pollution Control Board or Pollution Control Committee with respect to any comments or changes required;

(2) State Pollution Control Board or Pollution Control Committee shall grant authorization to construction and demolition waste processing facility in **Form-III** as specified under these rules after examining the application received in **Form I**;

(3) State Pollution Control Board or Pollution Control Committee shall prepare annual report in **Form IV** with special emphasis on the implementation status of compliance of these rules and forward report to Central Pollution Control Board before the 31st July for each financial year.

(9) Duties of State Government or Union Territory Administration-

(1) The Secretary in-charge of development in the State Government or Union territory administration shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

(2) The concerned department in the State Government dealing with land shall be responsible for providing suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.

(3) The Town and Country planning Department shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on a long term basis.

(4) Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.

(10) Duties of the Central Pollution Control Board - (1) The Central Pollution Control Board shall,-

(a) prepare operational guidelines related to environmental management of construction and demolition waste management;

(b) analyze and collate the data received from the State Pollution Control Boards or Pollution Control Committee to review these rules from time to time;

(c) coordinate with all the State Pollution Control Board and Pollution Control Committees for any matter related to development of environmental standards;

(d) forward annual compliance report to Central Government before the 30th August for each financial year based on reports given by State Pollution Control Boards of Pollution Control Committees.

(11) Duties of Bureau of Indian Standards and Indian Roads Congress -The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

Schedule III
Timeframe for Planning and Implementation
[See Rule 13]

Sl. No.	Compliance Criteria	Cities with population of 01 million and above	Cities with population of 0.5-01 million	Cities with population of less than 0.5 million
1	Formulation of policy by State Government	12 months	12 months	12 months
2	Identification of sites for collection and processing facility	18 months	18 months	18 months
3	Commissioning and implementation of the facility	18 months	24 months	36 months
4	Monitoring by SPCBs	3 times a year – once in 4 months	2 times a year – once in 6 months	2 times a year – once in 6 months

The time Schedule is effective from the date of notification of these rules.

FORM – I
See [Rule 7 (2)]
Application for obtaining authorisation

To,
The Member Secretary

_____Name of the local authority or Name of the agency appointed by the municipal authority :

Correspondence address Telephone No. Fax No.	
Nodal Officer and designation (Officer authorized by the competent authority or agency responsible for operation of processing or recycling or disposal facility)	
Authorisation applied for (Please tick mark)	Setting up of processing or recycling facility of construction and demolition waste
Detailed proposal of construction and demolition waste processing or recycling facility to include the following Location of site approved and allotted by the Competent Authority. Average quantity (in tons per day) and composition of construction and demolition waste to be handled	

Appendix 8: Salient Features of Major 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 and 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 remodeling 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, 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; 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 workplace
- 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 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 than1.6 mtrs 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 9:

Surface Water (Angore Dam & Kalkaji Dam) Analysis Report

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab/Tech(Chem)/2016-2017/ 17 Dated : 12.4.2018

To,
Assistant Engineer
P.H.E.D.Sub Divison
0 Sirohi

District: Sirohi
Block: Sirohi

Reference :Your Letter No. 013 Dated: 11/04/2018 Name of Sample Taker: A.En staff
Date of Receipt :11/04/2018 Ref. ID: 7

Source	Raw water	Raw water			
Source Location	Kalkaji Dame	Angore Dame			
Village/Town	Sirohi (Urban)	Sirohi (Urban)			
Habitation	Sirohi (Urban)	Sirohi (Urban)			
Village Code No.	0	0			
Date of Collection	11/04/2018	11/04/2018			
Date of Examination	12/04/2018	12/04/2018			
Lab. Sample No.	29	30			
Note :- All results Except pH are in mg/L					
1 pH	8	7.3			
2 Turbidity(NTU)	42	22			
3 Colour	Sl.yellow	Sl.yellow			
4 Odour	no smell	no smell			
5 Temperature (°C)	25	25			
6 Total Alkalinity (as $CaCO_3$)	200	120			
7 Total Hardness (as $CaCO_3$)	110	110			
8 Calcium Hardness (as CaCO3)	70	60			
9 Magnesium Hardness (as CaCO3)	40	50			
10 Chloride (as Cl)	140	130			
11 Sulphate (as SO_4^{-2})	-	-			
12 Nitrite (as NO_2)	-	-			
13 Nitrates (as NO_3)	8	8			
14 Fluoride (as F)	0.7	0.6			
15 Total Dissolved Solids	390	450			
16 Iron	-	-			
17 Residual Chlorine					

Junior Chemist
PHED Lab Abu Road
Dated:

No. Lab/Tech(Chem)/2016-2017/
Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3

Junior Chemist

Appendix 10:

Groundwater QualityTest Reports

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab/Tech(Chem)/~~2016-2017~~ 35 Dated: 8-4-2019

To.
Assistant Engineer
P.H.E.D.Sub Division
Sirohi

District: Sirohi
Block: Sirohi

Reference :Your Letter No. 06 Dated: 06/04/2019 Name of Sample Taker: J.En.
Date of Receipt 08/04/2019 Ref_ID: 12

Source		OW	OW	TW	TW	HP
Source Location		Ratan vav,Nr.Sarnesh wer Funeral	Abkari campus	Pawan Devi Maganlal,Nr.Kal ka Tapowan	Mohanlal Kachhuaji	Nr.Sariya Devi Mandire
Village/Town		Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
Habitation		Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
Village Code No.		0	0	0	0	0
Date of Collection		06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019
Date of Examination		08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019
Lab. Sample No.		80	81	82	83	84
Note :- All results Except pH are in mg/L						
1	pH	7.9	7.7	7.9	8	8
2	Turbidity(NTU)	Clear	Clear	Clear	Clear	Clear
3	Colour	Non	Non	Non	Non	Non
4	Odour	Non	Non	Non	Non	Non
5	Temperature (°C)	25	25	25	25	25
6	Total Alkalinity (as $CaCO_3$)	570	530	190	330	360
7	Total Hardness (as $CaCO_3$)	500	500	990	960	390
8	Calcium Hardness (as CaCO3)	0	0	0	0	0
9	Magnesium Hardness (as CaCO3)					
10	Chloride (as Cl^-)	240	230	2000	1720	100
11	Sulphate (as SO_4^{-2})	-	-	-	-	-
12	Nitrite (as NO_2^-)	0	0	0	0	0
13	Nitrates (as NO_3^-)	44	12	24	24	20
14	Fluoride (as F^-)	1.3	1	1.6	1.7	0.9
15	Total Dissolved Solids	1699	1367	6340	6400	1106
16	Iron	-	-	-	-	-
17	Residual Chlorine					

Junior Chemist
PHED Lab Abu Road

No. Lab/Tech(Chem)/2016-2017/ Dated:

Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

Dated :

No. Lab/Tech(Chem)/2016-2017/

District: Sirohi
Block: Sirohi

To,
Assistant Engineer
P.H.E.D.Sub Divison
Sirohi

Reference Your Letter No. J.En.Sirohi/13 Dated: 27/08/2018 Name of Sample Taker: J.En.staff
Date of Receipt 27/08/2018 Ref. ID: 117

	Source	OW	OW	OW	Raw Water	CWR
	Source Location	no.4 Angore	no.6 Angore	no.11 Angore	Angore Dame	Angore Dame
	Village/Town	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
	Habitation	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
	Village Code No.	0	0	0	0	0
	Date of Collection	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
	Date of Examination	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
	Lab. Sample No.	**1515**	**1516**	**1517**	**1518**	**1519**
	Note :- All results Except pH are in mg/L					
1	pH	7.6	7.6	7.8	7.8	7.9
2	Turbidity(NTU)	Clear	Clear	Clear	Clear	Clear
3	Colour	None	None	None	None	None
4	Odour	None	None	None	None	None
5	Temperature (°C)	25	25	25	25	25
6	Total Alkalinity (as $CaCO_3$)	-	-	-	-	-
7	Total Hardness (as $CaCO_3$)	-	-	-	-	-
8	Calcium Hardness (as CaCO3)	-	-	-	-	-
9	Magnesium Hardness (as CaCO3)	-	-	-	-	-
10	Chloride (as Cl^-)	130	140	130	140	160
11	Sulphate (as SO_4^{-2})	-	-	-	-	-
12	Nitrite (as NO_2^-)	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
13	Nitrates (as NO_3^-)	5	3	2	6	5
14	Fluoride (as F^-)	1.1	0.5	1.1	0.9	1.6
15	Total Dissolved Solids	752	745	736	760	899
16	Iron	-	-	-	-	-
17	Residual Chlorine					

Junior Chemist
PHED Lab Abu Road
Dated:

Lab/Tech(Chem)/2016-2017/
by to:
The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
The Executive Engineer, PHED Division Sirohi/Abu Road

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

Dated :

No. Lab/Tech(Chem)/2016-2017/

To,
Assistant Engineer
P.H.E.D.Sub Divison
Sirohi

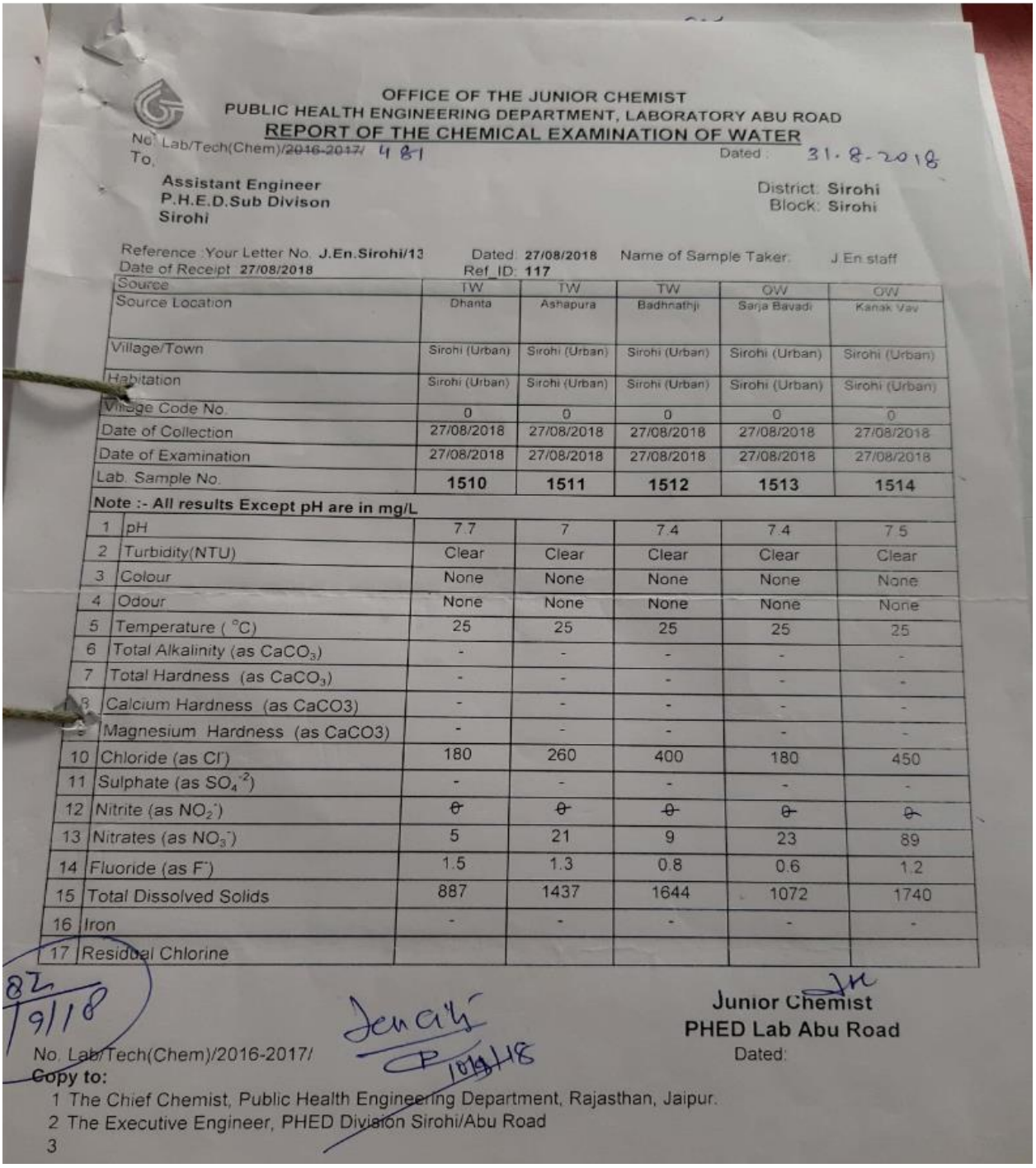
District: **Sirohi**
Block: **Sirohi**

Reference :Your Letter No. **J.En.Sirohi/13** Dated: **27/08/2018** Name of Sample Taker: J.En.staff
Date of Receipt **27/08/2018** Ref_ID: **117**

Source	CWR	TW	TW	TW	TW
Source Location	Tankariya	Ganesh ji Mandire	Jogi vas	Hansaramji	no.1 Angore
Village/Town	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
Habitation	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
Village Code No.	0	0	0	0	0
Date of Collection	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
Date of Examination	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
Lab. Sample No.	**1525**	**1526**	**1527**	**1528**	**1529**
Note :- All results Except pH are in mg/L					
1 pH	7.8	7	7.3	7.4	7.5
2 Turbidity(NTU)	Clear	Clear	Clear	Clear	Clear
3 Colour	None	None	None	None	None
4 Odour	None	None	None	None	None
5 Temperature (°C)	25	25	25	25	25
6 Total Alkalinity (as $CaCO_3$)	-	-	-	-	-
7 Total Hardness (as $CaCO_3$)	-	-	-	-	-
8 Calcium Hardness (as CaCO3)	-	-	-	-	-
9 Magnesium Hardness (as CaCO3)	-	-	-	-	-
10 Chloride (as Cl^-)	170	150	160	200	250
11 Sulphate (as SO_4^{-2})	-	-	-	-	-
12 Nitrite (as NO_2^-)	0	0	0	0	0
13 Nitrates (as NO_3^-)	5	8	26	6	11
14 Fluoride (as F^-)	1.6	2	1.3	1.3	2
15 Total Dissolved Solids	896	736	839	1153	1299
16 Iron	-	-	-	-	-
17 Residual Chlorine					

Junior Chemist
PHED Lab Abu Road
Dated:

No. Lab/Tech(Chem)/2016-2017/
Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3



OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab/Tech(Chem)/~~2016-2017/~~ 481 Dated: 31-8-2018

To,
Assistant Engineer
P.H.E.D.Sub Divison
Sirohi

District: Sirohi
Block: Sirohi

Reference :Your Letter No. J.En.Sirohi/13 Dated: 27/08/2018 Name of Sample Taker: J.En staff
Date of Receipt :27/08/2018 Ref_ID: 117

	Source	TW	TW	TW	OW	OW
	Source Location	Dhanta	Ashapura	Badhnathji	Sarja Bavadi	Kanak Vav
	Village/Town	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
	Habitation	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)	Sirohi (Urban)
	Village Code No.	0	0	0	0	0
	Date of Collection	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
	Date of Examination	27/08/2018	27/08/2018	27/08/2018	27/08/2018	27/08/2018
	Lab. Sample No.	**1510**	**1511**	**1512**	**1513**	**1514**
	Note :- All results Except pH are in mg/L					
1	pH	7.7	7	7.4	7.4	7.5
2	Turbidity(NTU)	Clear	Clear	Clear	Clear	Clear
3	Colour	None	None	None	None	None
4	Odour	None	None	None	None	None
5	Temperature (°C)	25	25	25	25	25
6	Total Alkalinity (as $CaCO_3$)	-	-	-	-	-
7	Total Hardness (as $CaCO_3$)	-	-	-	-	-
8	Calcium Hardness (as CaCO3)	-	-	-	-	-
9	Magnesium Hardness (as CaCO3)	-	-	-	-	-
10	Chloride (as Cl^-)	180	260	400	180	450
11	Sulphate (as SO_4^{-2})	-	-	-	-	-
12	Nitrite (as NO_2^-)	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
13	Nitrates (as NO_3^-)	5	21	9	23	89
14	Fluoride (as F^-)	1.5	1.3	0.8	0.6	1.2
15	Total Dissolved Solids	887	1437	1644	1072	1740
16	Iron	-	-	-	-	-
17	Residual Chlorine					

Junior Chemist
PHED Lab Abu Road

No. Lab/Tech(Chem)/2016-2017/ Dated:

Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3

OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab/Tech(Chem)/2016-2017/ Dated :

To,
Assistant Engineer
P.H.E.D.Sub Divison
Sirohi

District: **Sirohi**
Block: **Sirohi**

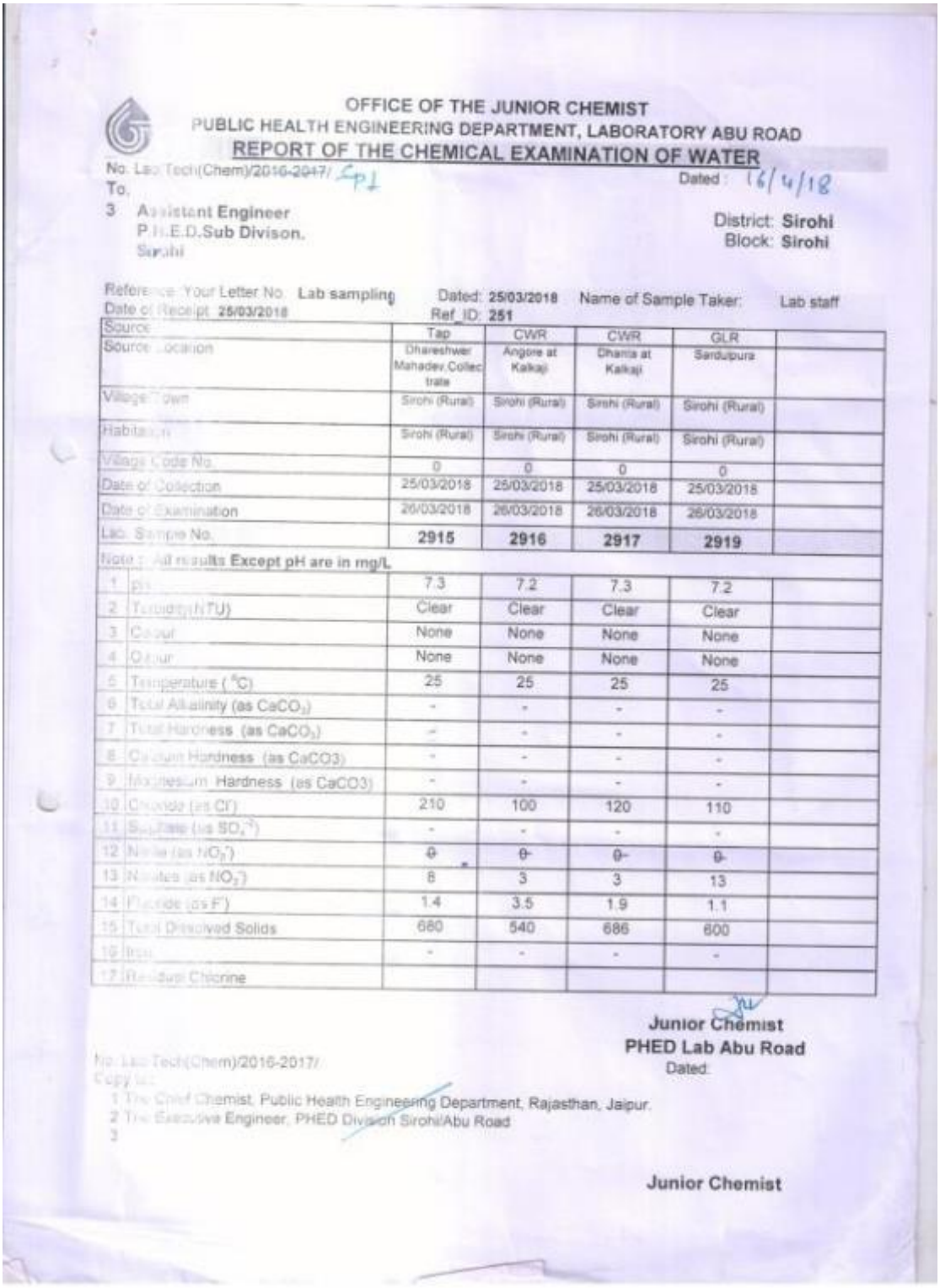
Reference Your Letter No. **J.En.Sirohi/13** Dated: **27/08/2018** Name of Sample Taker: J.En.staff
Date of Receipt **27/08/2018** Ref_ID: **117**

		TW				
Source						
Source Location		no.3.Angore				
Village/Town		Sirohi (Urban)				
Habitation		Sirohi (Urban)				
Village Code No.		0				
Date of Collection		27/08/2018				
Date of Examination		27/08/2018				
Lab. Sample No.		**1530**				
Note :- All results Except pH are in mg/L						
1	pH	7.7				
2	Turbidity(NTU)	Clear				
3	Colour	None				
4	Odour	None				
5	Temperature (^{o}C)	25				
6	Total Alkalinity (as $CaCO_3$)	-				
7	Total Hardness (as $CaCO_3$)	-				
8	Calcium Hardness (as CaCO3)	-				
9	Magnesium Hardness (as CaCO3)	-				
10	Chloride (as Cl^-)	190				
11	Sulphate (as SO_4^{-2})	-				
12	Nitrite (as NO_2^-)	0				
13	Nitrates (as NO_3^-)	6				
14	Fluoride (as F^-)	2.9				
15	Total Dissolved Solids	965				
16	Iron	-				
17	Residual Chlorine					

Junior Chemist
PHED Lab Abu Road
Dated:

No. Lab/Tech(Chem)/2016-2017/
Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3

Surface Water Analysis report of Various location including Tap, CWR & GLR



OFFICE OF THE JUNIOR CHEMIST
PUBLIC HEALTH ENGINEERING DEPARTMENT, LABORATORY ABU ROAD
REPORT OF THE CHEMICAL EXAMINATION OF WATER

No. Lab Tech(Chem)/2016-2017/ 591 Dated: 16/4/18

To,
3 Assistant Engineer
P.H.E.D.Sub Divison,
Sirohi

District: Sirohi
Block: Sirohi

Reference Your Letter No. Lab sampling Dated: 25/03/2018 Name of Sample Taker: Lab staff
Date of Receipt 25/03/2018 Ref. ID: 251

Source	Tap	CWR	CWR	GLR	
Source Location	Dhareshwer Mahadev.Collectrate	Angore at Kalkaji	Dhanla at Kalkaji	Sardulpura	
Village/Town	Sirohi (Rural)	Sirohi (Rural)	Sirohi (Rural)	Sirohi (Rural)	
Habitation	Sirohi (Rural)	Sirohi (Rural)	Sirohi (Rural)	Sirohi (Rural)	
Village Code No.	0	0	0	0	
Date of Collection	25/03/2018	25/03/2018	25/03/2018	25/03/2018	
Date of Examination	26/03/2018	26/03/2018	26/03/2018	26/03/2018	
Lab. Sample No.	**2915**	**2916**	**2917**	**2919**	
Note : All results **Except pH are in mg/L**					
1 pH	7.3	7.2	7.3	7.2	
2 Turbidity(NTU)	Clear	Clear	Clear	Clear	
3 Colour	None	None	None	None	
4 Odour	None	None	None	None	
5 Temperature (^{0}C)	25	25	25	25	
6 Total Alkalinity (as $CaCO_3$)	-	-	-	-	
7 Total Hardness (as $CaCO_3$)	-	-	-	-	
8 Calcium Hardness (as CaCO3)	-	-	-	-	
9 Magnesium Hardness (as CaCO3)	-	-	-	-	
10 Chloride (as Cl)	210	100	120	110	
11 Sulphate (as SO_4^{-2})	-	-	-	-	
12 Nitrite (as NO_2)	0	0	0	0	
13 Nitrate (as NO_3)	8	3	3	13	
14 Fluoride (as F)	1.4	3.5	1.9	1.1	
15 Total Dissolved Solids	660	540	686	600	
16 Iron	-	-	-	-	
17 Residual Chlorine					

Junior Chemist
PHED Lab Abu Road
Dated:

No. Lab Tech(Chem)/2016-2017/
Copy to:
1 The Chief Chemist, Public Health Engineering Department, Rajasthan, Jaipur.
2 The Executive Engineer, PHED Division Sirohi/Abu Road
3

Junior Chemist

Appendix 11
Biodiversity Assessment Report - Sirohi

Biodiversity Assessment –Sirohi Water Supply and Sewerage Subproject

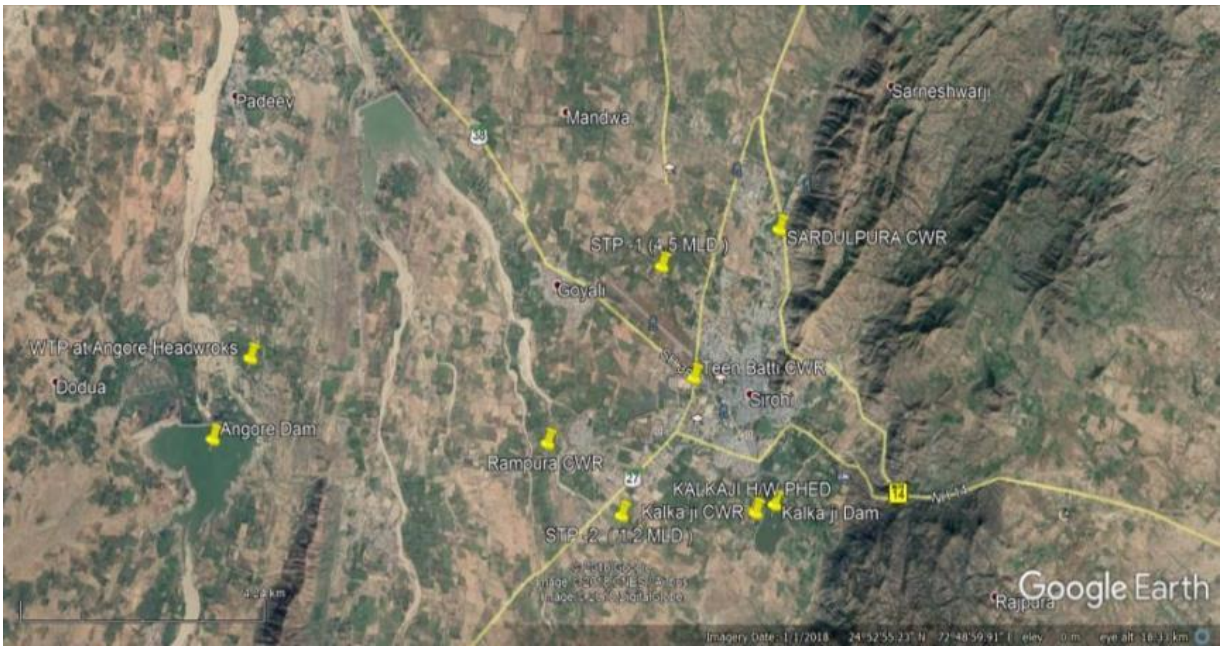
A. Introduction

This detailed biodiversity assessment is carried out for the proposed Sirohi Water Supply and Sewerage Subproject located in Sirohi City 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 detailed field assessments and consultations with key stakeholders involving forest and wildlife officials from the state before project implementation.

B. Project Description

The project is located in Sirohi city of Sirohi District of Rajasthan State. Most of the project components are planned and will be located inside the municipality limits on land owned by the local government. The existing water supply system is proposed to improve with new water treatment plant of 9 MLD capacity at location within campus of existing Angore headworks and 4 nos. of clear water pump houses and 5 nos. of clear water reservoirs at Rampura, Teen Batti, Kakaji headworks and Sardulpura on vacant land owned by PHED. A length of 35.59 km transmission mains of DI pipes of 100-400 mm diameter and 117.4 km length distribution network to cover 100 % Municipal area for treated water supply. For collection and treatment of sewage of the city a collection network of 93 km length including house connections with pumping stations. There are 2 nos. of STP based on SBR technology 5.0MLD and 1.7MLD are proposed at Nehru Nagar and Revdar Road; respectively on land owned by Sirohi Municipal Council. The location of project component on town map is given in Figure-1.

Figure 20: Project area on Town Map



C. Establishing project area of influence (PAI)

The project area of influence (PAI) for study is established on basis of locations on project components of proposed project. The scope of work covering all components and associated facilities under the water supply and sewage treatment project in Sirohi 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 roads, railway line, hills or seasonal streams. The established PAI for subproject in Sirohi Town is given in Figure -2.

Figure 21: Map showing boundary of PAI Sirohi subproject

The boundaries of PAI for subproject has been established on the basis of physical/topographical features surrounding the Town area. There is Aravalli Hills running on east direction of the town all across north to south of the habitation area. The hill range has also acting as barrier for further development in east direction. In the south of the city Luni river tributary exists and follow along the west direction of city. This season river is taken for establishing boundary for PAI on south and west directions. The north direction Sirohi-Sheoganj road end on National Highway 62 is considered a limit for study area. The Aravalli hills next to bypass NH-62 has hill forest. While on North direction of Town defense area on NH-62 cut off further development, hence boundary is considered accordingly.

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).[45] As per the Proximity report generated by IBAT, provided as Appendix 11 of the IEE Report, there are three protected area and five key biodiversity areas within the buffer of10km and 50km radius of the subproject components. The approx. aerial distance from subproject location to protected areas and key biodiversity area is mentioned below:

National protected areas

1) Jessore Sloth Bear Sanctuary (50km)
2) Balaram Ambaji Wildlife Sanctuary (55km)
3) Mount Abu Wildlife Sanctuary (20km)

Key Biodiversity Areas

1) Kumbalgarh Wildlife Sanctuary (40km)
2) Mount Abu Wildlife Sanctuary (20km)
3) Phulwari Wildlife Sanctuary (40km)
4) Jawai Dam Leopard Conservation Reserve (30km)
5) Sei Dam reservoir and surrounding environs (25km)

The nearest protected area to subproject location is Mount Abu Wildlife Sanctuary approx. 20km; which is also a key biodiversity area. The protected area has a rich flora with sub-tropical thorn scrub and forest. There are 35 International Union for the Conservation of Nature (IUCN) Red List threatened species, one key biodiversity area reported within the 50km radius of the subproject components. The key findings of the IBAT report are presented in the subsequent sections.

D.2 Protected Areas

Jessore Sloth Bear Sanctuary: The sanctuary is in Jessore hills of Aravalli ranges and was declared as a wildlife sanctuary in May 1978. The protected area is located in North Gujaratbordering area of Rajasthan. The forests are of southern dry mixed deciduous and desert thorn type forest. Jessore Sloth Bear Sanctuary has many rare species of flora and fauna. It is a home to the endangered sloth bear.

The Sanctuary is home to 12 species of amphibians, 45species of reptiles, 212 species ofbirds, and 30 species of mammals. As mentioned, sloth bear is the flagship species of theSanctuary and the leopard is one of the toppredators inhabiting the sanctuary.Other major vertebrate species of the area include the striped hyenas, jungle cat, jackal, Indian fox, common Langur, Nilgai, rats, hedgehog, Indian pangolin, bats, porcupine etc.

[45] 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 recognized biodiversity information drawn from a number of IUCN'sKnowledge 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 recognized sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

The area has a great ecological significance as it acts as a buffer between the desert eco-system and the dry deciduous type of forest ecosystem. The area covered under Wildlife Sanctuary is 180.66 sq.km. having a boundary of eco-sensitive zone extended from zero on North and East direction due to Rajasthan state boundary and 3.2 km maximum in Gujarat state.

Balaram Ambaji Wildlife Sanctuary: The Balaram Ambaji Wildlife Sanctuary is situated in the northern part of Gujarat in theAravalli hills. The Balaram-Ambaji Wildlife Sanctuary is spread over 542.08 sq. km. of forest and is home to species such as leopards and sloth bear. The sanctuary was notified on 7th August 1989. The entire sanctuary area falls in three tahsils of Palanpur district, i.e., Palanpur tahsil, Danta tahsil and Wadagaon tahsil.

The rare animals include sloth bear, striped hyena, leopard, bluebull, porcupine, fox, small Indian civet, Indian pangolin and a number of reptiles including venomous and non-venomous snakes, monitor lizards, star tortoise etc. The rare birds of this area are adjutant Stork, spoonbill, osprey, white backed Vulture and black vultures.The unique ecosystem harbours 483 species of plants including 107 of trees, 58 of shrubs, 219 of herbs, 49 of climbers, 40 of grass and 10 species of lower plants.

The dry deciduous forests of the Balaram Ambaji Wildlife Sanctuary not only conserve the depletion of the Aravalli eco-system but also control the southward expansion of the Thar Desert.

Mount Abu Wildlife Sanctuary: The sanctuary comprises the oldest mountain ranges “The Aravalli” in Rajasthan State. The protected area was notified on 11th August 1960 as Wildlife Sanctuary under Wildlife Protection Act 1972. The sanctuary area is long and narrow and spreads out into a picturesque plateau of about 19 km. in length and 5-8 km. in breadth. The attitudewithin the Sanctuary area varies from 300m. at the foot Mil to 1722m. at Gurashikar.

Mount Abu has a very rich floral biodiversity including xenomorphic subtropical thorn forest at the foot hills and subtropical evergreen forest along water courses and valleys at higher altitudes. A variety of fauna Including highly rare, threatened and endangered species are found in this sanctuary. It is home for Panther, the apex predator and other animals found are Sambhar, Jungle Cat, Small Indian Civet, Wolf, Hyaena, Jackal, Indian Fox, Common Langoor, Wild Boar, Pangolin, Rate, Common Mongoose, Indian Hare, Porcupine, Hedgehog, etc. The sanctuary provides an ideal habitat for Sloth Bear.

Kumbalgarh Wildlife Sanctuary: The wildlife sanctuary was notified in July 1971. Kumbhalgarh Wildlife Sanctuary spreads over an area of 610.528 sq.kms. This includes224.890 sq.km core zone and 385.638 sq.km area as buffer zone. KWLS makes an ecotone between the hilly forests of Aravallis andthe Thar Desert. Kumbhalgarh hills act like a barrier, checking the eastward extension ofdesert.

In KWLS, the forest typeis mostly edaphic-climate climax type. As per the Champion & Seth's (1968) classification the forests of this sanctuary fall under the II category of Tropical Dry Deciduous forests, which can be sub-classified as Group 5 Tropical Dry Deciduous forests, Group 5 B-Northern Tropical Dry deciduous forest.The Anogeissus pendula is the main dominant tree of the sanctuary, particularly between base of hills to middle.

The leopard is the top carnivore in KWLS. This sanctuary is also famous for frequent wolf sightings (Singh, 2002). Other fauna include jackal, fox, wildboar, bear, neelgai, hare,

mangoose. Theavifauna sighted are, the Jungle Babbler, Green Bee Eater, Blue Jay, Greater Coucal or Crow Pheasant, Jungle Fowl, Hoopoe, Grey Hornbill, Scarlet Minivet, Golden Oriole, Grey and painted Partridges. Raptors include the Serpent Eagle, Tawny Eagle, White-eyed Buzzard, Shikra, King and White-backed vultures. About 240 avian species have been recorded (Singh, 2002).

Phulwari Wildlife Sanctuary: The forest areas of Aravalli hills in Kotra and Jhadol tehsils of Udaipur districtnear Gujarat border was declared as Wildlife Sanctuary in 1983. The total area of the Sanctuary is511.41 Sqkm. It is being managed by the Wildlife Wing since August, 1988.

The area of wild life sanctuary Phulwari provides an ideal habitat to Herbivores, Carnivores & variety of terrestrial, arboreal & water birds. The important animalsare Leopard, Sloth Bear, Striped Hyaena, Jackal, Four-horned Antelope, Fox,Porcupine, Civet, Jungle Cat, Grey Jungle Fowl, Langur, Mongoose, Indian Hare,Crocodile, Balloon frog, Flying Squirrel, White-napped Tit, Pangolin, RedSpurfowl, Giant Wood Spider etc.

The floral constituents of the Phulwari Wildlife Sanctuary are mostly edaphoclimate climax typeforests. As per the Champion & Seth's classification the forests of this sanctuary fall under theII category of Tropical Dry Deciduous forests. The main species dominating are Wrightia tinctoria, Boswellia serrata, Lanneagrandis, Madhuca indica, Pongamia pinnata. Dendrocalamus strictus, Sterculiaurens, Butea monosperma, Erythrina suberosa, Anogeissus latifolia, Syzygiumheynaianum, Adina cardifolia, Diospyros melanoxylon, Chlorophytumborivillanum, Centela asiatica, Orchids, Tuberous plants etc.

Jawai Dam Leopard Conservation Reserve: The conservation reserve forest is the area located in Jawai and Bera. There are 55 leopards counted in April 2017 along with cubs. It has been notified in June 2018 covering a total area of 61.98 sq.km. in Pali district of Rajasthan.

Apart from leopards, the forest area is also home to Sloth bears, Wolf, Chinkara,Bluebull, Hyena, Jungle cat and Indian grey mongoose.Among reptiles Python, Cobra, Rat Snake, Russel's Viper, Indian Krait, etc. are found whileCrocodiles, Starred Tortoise, Indian Mud or Flap- shelled Turtle, Brooks Gecko, Rock Gecko,Common Garden Lizard, Monitor Lizard and Chameleon are also reported from the area.As per available data, study area is rich in avifaunal diversity. This dam attracts humanbeings as well as birds also. Babblers, Barbets, Bee eaters, Cuckoos, Bulbuls, Buntings, Cormorants, Flowerpeckers, Woodpeckers, Kingfishers, Kites, Lapwings, Minivets, NightJars, Owlets, Parakeets, Pigeons, Quails, Flycatchers, Rollers, Tits and Heron are common inthe area. Saras Crane, Storks (Painted and Blacknecked), Darter, Black-Headed Ibis are alsoreported from wetland sites.

Sei Dam reservoir and surrounding environs: Sei Dam, on the River Sei, forms a large water reservoir used mainly for irrigation by the local tribal population. The reservoir serves as an important wintering ground for migratory birds. At the peak period of migration, congregations of more than 10,000 birds can be seen at the site. Moreover, the site falls in the belt of Gogunda-Pindwara Forests, which were once considered important breeding ground for the avifauna (Satish K. Sharma pers. comm. 2003).

Important flora around the Sei waterbody consists of Anogeissus latifolia, Boswellia serrata, Phoenix sylvestris, Sterculia urens, Mangifera indica, Syzygium heynianum, Butea monosperma, Ficus bengalensis and Vitex negundo. The forest area surrounding the site harbours Leopard *Panthera pardus*, Hyena *Hyaena hyaena*, Golden Jackal *Canis aureus*,

Sloth Bear *Melursus ursinus*, Four-horned Antelope, Indian Pangolin *Manis crassicaudata*, Porcupine *Hystrix indica* and Langur *Semnopithecus entellus*.

The protected area of Mount Abu WLS; Balaram Ambaji Wildlife Sanctuary, Kumbalgarh Wildlife Sanctuary, Phulwari Wildlife Sanctuary, Jawai Dam Leopard Conservation Reserve and Sei Dam reservoir and surrounding environs are important area for birds and host wide range of Aves species in the area. The areas area listed as International Birds Area and important for conservation and protection of birds at the global, regional or sub-regional level. There are four criterion set out to qualify for IBA sites based on threshold of species, the criteria are:

A1) Globally threatened species: The site qualifies if it is known, estimated or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered, Endangered or Vulnerable

A2) Restricted-range species: The site forms one of a set selected to ensure that all restricted-range species of an Endemic Bird Area (EBA) or a Secondary Area (SA) are present in significant numbers in at least one site and preferably more.

A3) Biome-restricted species: The site forms one of a set selected to ensure adequate representation of all species restricted to a given biome, both across the biome as a whole and for all of its species in each range state.

A4) Congregations

(i) This applies to 'waterbird' species as defined by Delaney and Scott[46] and is modelled on criterion 6 of the Ramsar Convention for identifying wetlands of international importance. Depending upon how species are distributed, the 1% thresholds for the biogeographic populations may be taken directly from Delaney & Scott, they may be generated by combining flyway populations within a biogeographic region or, for those for which no quantitative thresholds are given, they are determined regionally or inter-regionally, as appropriate, using the best available information.

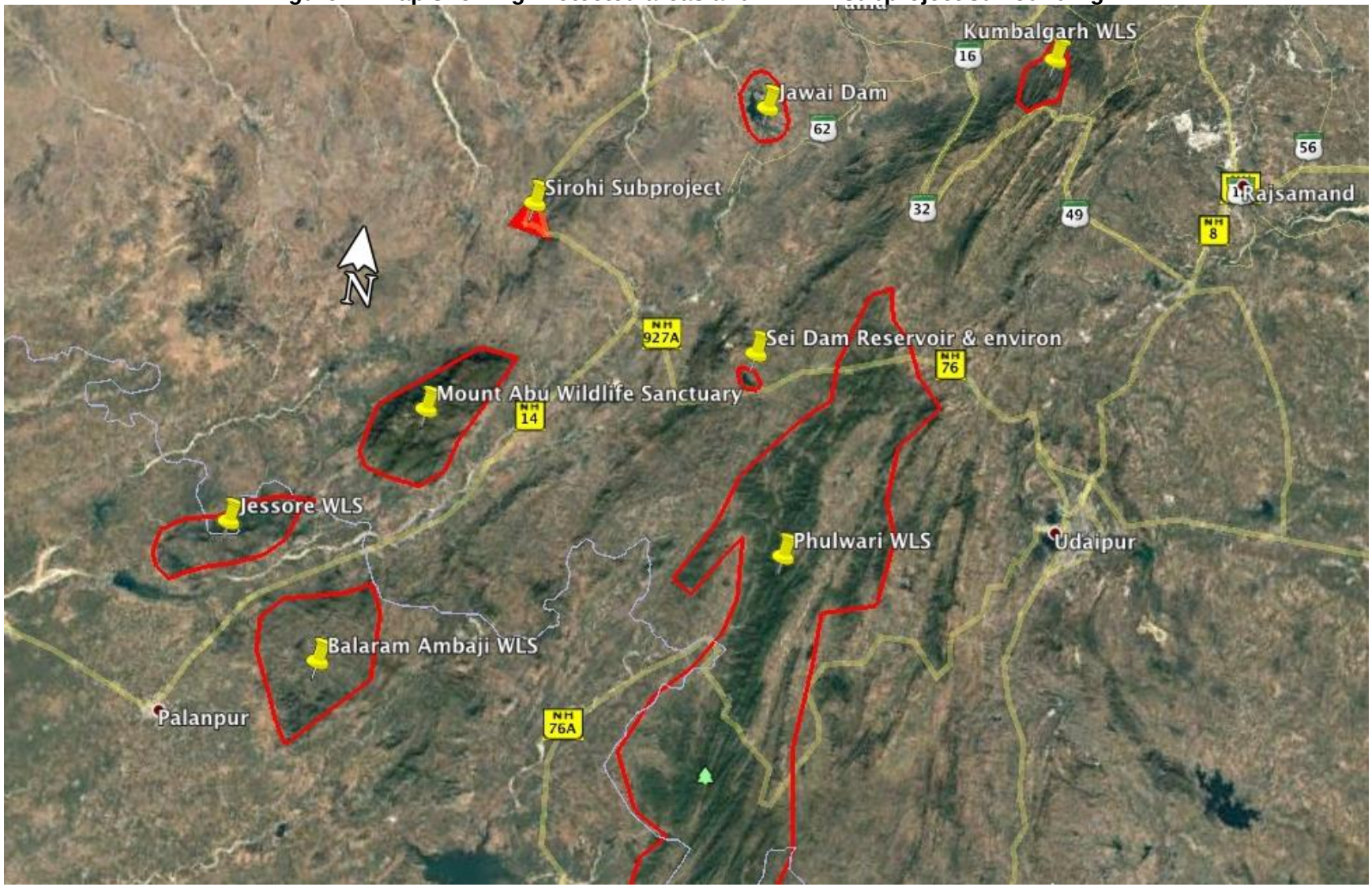
(ii) This includes those seabird species not covered by Delaney and Scott (2002). Quantitative data are taken from a variety of published and unpublished sources.

(iii) This is modelled on criterion 5 of the Ramsar Convention for identifying wetlands of international importance. The use of this criterion is discouraged where quantitative data are good enough to permit the application of A4i and A4ii.

(iv) The site is known or thought to exceed thresholds set for migratory species at bottleneck sites.

[46] Delaney and Scott (2002) Waterbird Population Estimates Third Edition, Wetlands International, Wagenigen, The Netherlands.

Figure 22:Map showing Protected areas and KBA in subproject surrounding



D.3 Critically Endangered / Endangered Species

A total of 35 IUCN red list (CR, EN & VU) species reported within 50km radius. Out of these 35 IUCN red list species, 13 species are classified as Critically Endangered (CR) and Endangered (EN). Birds are common species which includes 25 species (CR-5, EN-7& VU-13), 6 mammals (EN-1, VU-5), 2 reptiles (VU-2), 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 16: 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	*Neophron percnopterus*	Egyptian Vulture	EN
7	*Aquila nipalensis*	Steppe Eagle	EN
8	*Falco cherrug*	Saker Falcon	EN
9	*Haliaeetus leucoryphus*	Pallas's fish-eagle	EN
10	*Leptoptilos dubius*	Greater Adjutant	EN
11	*Sterna acuticauda*	Black-bellied tern	EN
12	*Sypheotides indicus*	Lesser Florican	EN
13	*Amandava formosa*	Green avadavat	VU
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	*Marmaronetta angustirostris*	Marbled teal	VU
23	*Machlolophus nuchalis*	White-naped tit	VU
24	*Rynchops albicollis*	Indian skimmer	VU
25	*Saxicola macrorhynchus*	White-browed bushchat	VU
	Mammals		
26	*Manis crassicaudata*	Indian Pangolin	EN
27	*Lutrogale perspicillata*	Smooth-coated otter	VU
28	*Melursus ursinus*	Sloth bear	VU
29	*Panthera pardus*	Leopard	VU
30	*Tetracerus quadricornis*	Four-horned antelope	VU
31	*Rusa unicolor*	Sambar	VU
	Reptile		
32	*Crocodylus palustris*	Mugger	VU

S.No.	Scientific Name	Common Name	IUCN Red List category
33	*Geochelone elegans*	Indian star tortoise	VU
	Plant		
34	*Anacyclus pyrethrum*	Atlas daisy	VU
35	*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 redlist 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 Redlist 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 reported in the project area of influence (50km) shows that it is likely that the 35 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 17: Habitat Analysis in PAI – Sirohi 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	Egyptian Vulture	EN	Rocky areas (eg. inland cliffs, mountain peaks), Wetlands (inland),	Yes; extend of migratory bird species breeding habitat during winter in India including Rajasthan state. https://www.iucnredlist.org/species/22695180/154895845

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
	(*Neophron percnopterus)*		Grassland, Shrubland, Savanna, Artificial/Terrestrial	
7	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
8	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
9	Pallas's Fish-eagle (*Haliaeetus leucoryphus)*	EN	Wetlands (inland)	None: species breed only in northern India with strongholds in Assam and Uttarakhand only. https://www.iucnredlist.org/species/22695130/131934599
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; the extend of species habitat is throughout India except the dry part of Rajasthan State where inland wetlands are absent. 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

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
13	Green avadavat*(Amandava Formosa)*	VU	Forest, Shrubland, Grassland, Artificial/Terrestrial	None; The species habitat endemic to central India, in Rajasthan state found in southern parts with sugarcane fields as reported by Sharma et al. 2012. https://www.iucnredlist.org/species/22719618/131995719
14	Sarus crane (Antigone antigone)	VU	Grassland, Artificial/Terrestrial, Wetlands (inland), Artificial/Aquatic & Marine	Yes; 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

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
19	Asian woollyneck*(Ciconia episcopus)*	VU	Marine Intertidal, Forest, Artificial/Terrestrial, Artificial/Aquatic & Marine, Grassland, Wetlands (inland), Marine Neritic	None; the species is found patchily across South Asia and South East Asia, range extends throughout India https://www.iucnredlist.org/species/22727255/110064997
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	Marbled teal*(Marmaronetta angustirostris)*	VU	Wetlands (inland), Marine Coastal/Supratidal, Artificial/Aquatic & Marine	None; the species has a fragmented distribution in north-west parts of Gujarat and Rajasthan. https://www.iucnredlist.org/species/22680339/110054350
23	White-naped tit *(Machlolophus nuchalis)*	VU	Forest, Shrubland, Artificial/Terrestrial	None; species is endemic to India it occurs in isolated patches in central and southern Rajasthan state https://www.iucnredlist.org/species/22711924/110264998
24	Indian skimmer *(Rynchops albicollis)*	VU	Wetlands (inland)	None; the species is found patchily across India; range extends throughout Rajasthan State. https://www.iucnredlist.org/species/22694268/110600990
25	White-browed bushchat *(Saxicola*	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. Recent records are from parts of the Thar Desert in Rajasthan and neighbor Gujarat State.

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
	macrorhynchus)			https://www.iucnredlist.org/species/22710160/110578039
Mammals				
26	Indian Pangolin (*Manis crassicaudata)*	EN	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
27	Smooth-coated otter (*Lutrogale perspicillata)*	VU	Artificial/Aquatic & Marine, Wetlands (inland), Forest, Grassland, Marine Coastal/Supratidal, Marine Neritic, Marine Intertidal, Shrubland	Yes; species is distributed in South Asia through much of India including Rajasthan https://www.iucnredlist.org/species/12427/21934884
28	*Sloth bear (Melursus ursinus)*	VU	Forest, Savanna, Shrubland, Grassland, Artificial/Terrestrial	None; the species habitat is limited between Alwar and Jaipur stretch as per IUCN species distribution map. https://www.iucnredlist.org/species/13143/166519315
29	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
30	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
31	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

S. No.	Common Name (*Species Name*)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
Reptile				
32	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
33	Indian star tortoise*(Geochelone elegans)*	VU	Forest, Shrubland, Grassland, Artificial/Terrestrial	None; as per study by Gaur during 2006 the species habitat is found in three broadly disjunct areas of geographic occurrence: northwestern India (Gujarat, Rajasthan) and adjoining southeastern Pakistan; eastern and southern areas from Tamil Nadu, Andhra Pradesh and eastern Karnataka to Odisha (Orissa). https://www.iucnredlist.org/species/39430/115173155
Plant				
34	Atlas daisy *(Anacyclus pyrethrum)*	VU	Rocky areas (eg. inland cliffs, mountain peaks), Forest, Grassland, Shrubland	None; the plant species is native to India and extend of occurrence in Rajasthan State. https://www.iucnredlist.org/species/202924/121743450
35	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 in urban or agricultural in the surrounding locality. Further, there is no key evolutionary processes[47] within the PAI, as 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[48] or proposed protected areas at national and international level should be considered as Critical Habitat. In the PAI for subproject in Sirohi Town there is no national protected area and no international designated site or proposed and notified protected area. The nearest national protected area and Key Biodiversity Area is Mount Abu Wildlife Sanctuary and environ, which is approx. 20 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 Sirohi Town and on land under municipal limits. The project area is approx. 20km away from the boundary of nearest protected area of Mount Abu Wildlife Sanctuary.The sanctuary area is on plateau having forest area with variety of fauna including Panther and other animals.The nearest Key Biodiversity Areas and national protected areas are located more than 30km aerial distance from the project town. There is Aravalli Hill range with forest on East direction of Sirohi town and Luni River on west direction. The forest area and water body near to city may attract migratory birds and other wildlife in the area.

The species of vulture and eagle reported in the project area of influence or passing by may visit the project area 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 and collection network for the town will result in reduce in wastewater 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

[47] The evolutionary processes often occur in an isolated habitat and ecosystem due to physical or biological barriers, for example habitat on islands or valley.

[48] As per ADB's SPS the sites which are of international designation, such as Ramsar and UNESCO sites should be considered as Critical Habitat.

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.

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 18: 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 rthe forest stretches	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
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	(i) Impact due to noise generated from project activities (ii) Contamination of water and soil due to construction waste disposal in forest area	(i) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers to reduce impact to surrounding sensitive receptor; and (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 Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor
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	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
		participate in such activities. (iv) Strict anti-poaching surveillance measures need to be implemented, especially during project construction phase			
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 inadequately treated wastewater	(i) Regular monitoring of treated effluent quality before discharge or reuse for plantation and irrigation purposes (ii) Tree plantation and landscaping in the project area as per approved plan with preference to local species	O&M Contractor	Sirohi Nagar Parishad	Contractor' s O&M cost

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 chances of Wildlife in forest areas next to town limits in East direction on Aravalli Range.The migratory birds (falcon, sarus, vultures and eagle) species may be visiting the wetland and Luni River. The presence of wildlife in hill forest and birds in river wetland need to be confirm by PIU by field visit and consultation with local community and divisional forest & wildlife department. 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 confirm the presence of Wildlife in the hill forest on east direction of Sirohi Town (Aravalli Range) and migratory birds in Wetland around the town area as mentioned in Table -2, 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 12: Sample chance find protocol

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.

1.1 ***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.

1.2 ***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.

1.3 ***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)

1.4 ***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.

1.5 ***Reporting finds -*** When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

1.6 ***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).

1.7 ***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 13 – Salient Features of the Angore and Kalka ji Dam

Angore Dam

Sr.No.	Particular	Details
1	Name of Dam	Angore
2	Year of Const.	1988
3	River/ Nalla	Krishnawati River
4	Nearest City	Sirohi
5	Latitude	248812
6	Longitude	727692
7	Catchment Area of Sq.km.	155.39
8	Yield In Mcft	473.16
9	FTL	512.5
10	MWL	516.5
11	TBL	525.5 Ft.
12	Ht. Above Lowest Foundation (M)	19.81
13	Length Of Dam (M)	2362.79
14	Gross Storage Capacity (M.Cum)	14.019
15	Live Storage Capacity M.Cum	13.22
16	Reservoir Area At Frl 103 M3	4.048
17	Design Spillway Capacity Cumecs	611.71
18	Length Of Canal System In K.M.	40.630
19	Type of Dam	Earthern
20	Design Purpose (Irrigation Water Supply, Power Generation Etc.)	Irrigation

Source : Water Resources Department, Jaipur

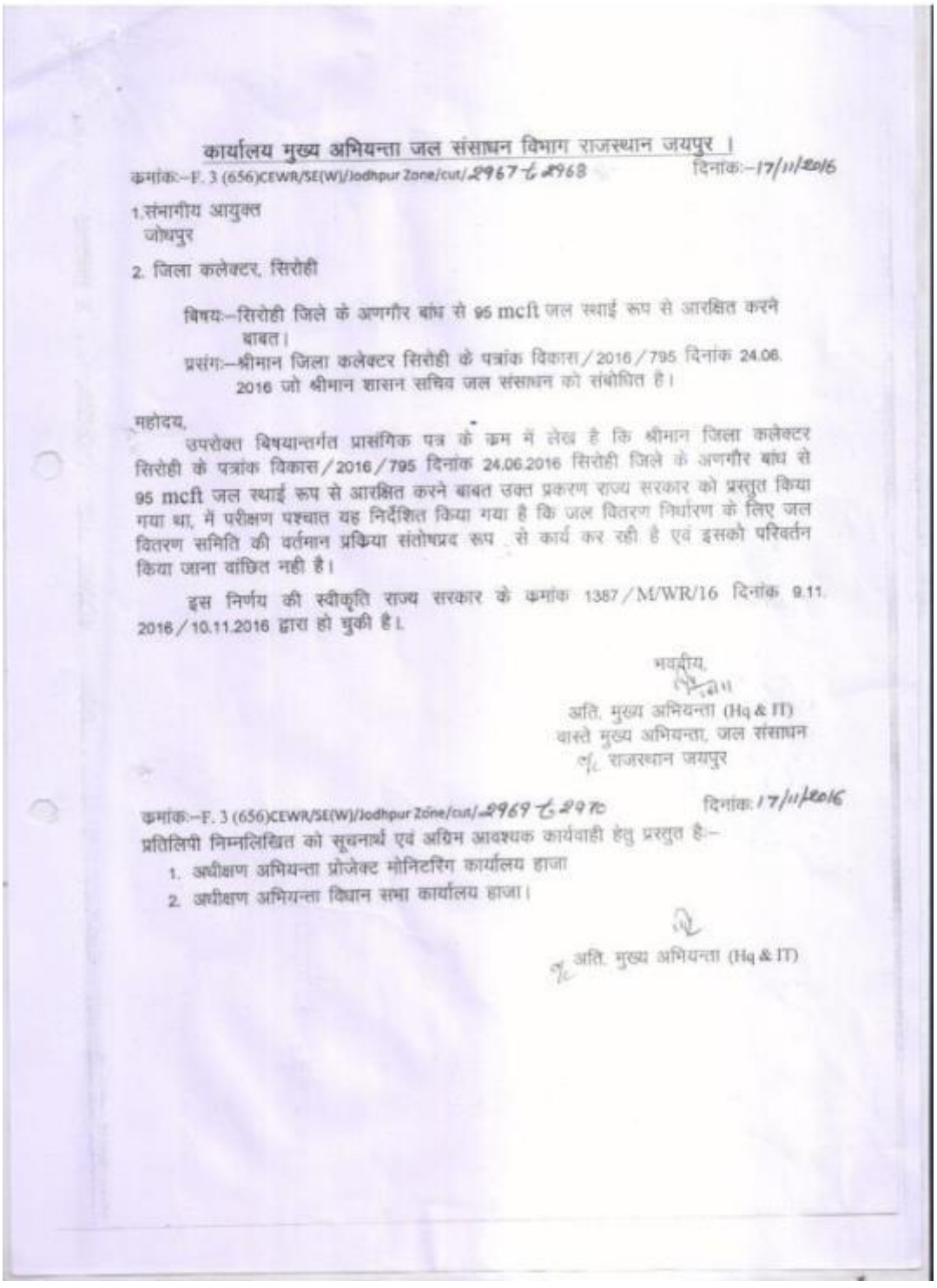
Akhelao Mansarowara (Kalkaji) Dam

Sr. No.	Particular	Details
1	Name of Dam	Akhelao Mansarowara (Kalka Ji)
2	Year of Const.	1990
3	River/Nalla	Rajupura River
4	Nearest City	Sirohi
5	Latitude	248723
6	Longitude	728644
7	Catchment Area of Sq.km.	20.72
8	Yield In Mcft	74.64
9	FTL	100
10	MWL	103
11	TBL	107
12	Ht. Above Lowest Foundation (M)	7.62
13	Length of Dam (M)	137.5
14	Gross Storage Capacity (Mcum)	1.781

Sr. No.	Particular	Details
15	Live Storage Capacity Mcum	1.515
16	Reservoir Area At Frl 103 M3	1.269
17	Design Spillway Capacity Cumecs	202.09
18	Length Of Canal System In K.M.	1.800
19	Type Of Dam	Earthern
20	Design Purpose (Irrigation Water Supply, Power Generation etc.)	Irrigation

Source: Water Resources Department, Jaipur

Appendix- 14:
Letter of WRD Jaipur for water reservation in Angore Dam, Dated: 17.11.2016



कार्यालय मुख्य अभियन्ता जल संसाधन विभाग राजस्थान जयपुर ।

क्रमांकः–F. 3 (656)CEWR/SE(W)/Jodhpur Zone/cut/2967 to 2968 दिनांकः–17/11/2016

1.संभागीय आयुक्त
जोधपुर

2. जिला कलेक्टर, सिरोही

विषयः–सिरोही जिले के अणगौर बांध से 95 mcft जल स्थाई रूप से आरक्षित करने बाबत।

प्रसंगः–श्रीमान जिला कलेक्टर सिरोही के पत्रांक विकास/2016/795 दिनांक 24.06.2016 जो श्रीमान शासन सचिव जल संसाधन को संबोधित है।

महोदय,

उपरोक्त विषयान्तर्गत प्रासंगिक पत्र के क्रम में लेख है कि श्रीमान जिला कलेक्टर सिरोही के पत्रांक विकास/2016/795 दिनांक 24.06.2016 सिरोही जिले के अणगौर बांध से 95 mcft जल स्थाई रूप से आरक्षित करने बाबत उक्त प्रकरण राज्य सरकार को प्रस्तुत किया गया था, में परीक्षण पश्चात यह निर्देशित किया गया है कि जल वितरण निर्धारण के लिए जल वितरण समिति की वर्तमान प्रक्रिया संतोषप्रद रूप से कार्य कर रही है एवं इसको परिवर्तन किया जाना वांछित नही है।

इस निर्णय की स्वीकृति राज्य सरकार के क्रमांक 1387/M/WR/16 दिनांक 9.11.2016/10.11.2016 द्वारा हो चुकी है।

भवदीय,

अति. मुख्य अभियन्ता (Hq & IT)
वास्ते मुख्य अभियन्ता, जल संसाधन
वि. राजस्थान जयपुर

क्रमांकः–F. 3 (656)CEWR/SE(W)/Jodhpur Zone/cut/2969 to 2970 दिनांकः 17/11/2016

प्रतिलिपी निम्नलिखित को सूचनार्थ एवं अग्रिम आवश्यक कार्यवाही हेतु प्रस्तुत है:–

1. अधीक्षण अभियन्ता प्रोजेक्ट मोनिटरिंग कार्यालय हाजा
2. अधीक्षण अभियन्ता विधान सभा कार्यालय हाजा।

अति. मुख्य अभियन्ता (Hq & IT)

Appendix- 15:
NOC of Fisheries from WRD, Sirohi Dated: 30 July 2018

कार्यालय सहायक अभियंता, जल संसाधन उपखण्ड, सिरोही

क्रमांक/ 2018/ दिनांक :–

प्रमाण–पत्र

प्रमाणित किया जाता हैं कि अणगौर बांध तहसील एवं जिला सिरोही में से पेयजल हेतु पानी के आहरण हेतु बनायी गयी संरचना से मत्स्य के जीवन पर कोई भी प्रतिकूल प्रभाव नही हैं/पडेगा।

भवदीय

सहायक अभियन्ता
जल संसाधन उपखण्ड, सिरोही

क्रमांक/ 2018/ 588 दिनांक :– 30.7.2018

प्रतिलिपि निम्न को सूचनार्थ प्रस्तुत हैं :–

1. श्रीमान अधिशाषी अभियन्ता, जल संसाधन खण्ड, सिरोही।
2. निदेशक केडकोन कन्सलटैन्ट प्राईवेट लिमिटेड डी–224, बनी पार्क, जयपुर।

सहायक अभियन्ता
जल संसाधन उपखण्ड, सिरोही

Transcript

OFFICE OF THE ASSISTANT ENGINEER, WATER RESOURCE DIVISON, SIROHI

S.No./ 2018/ Date:-

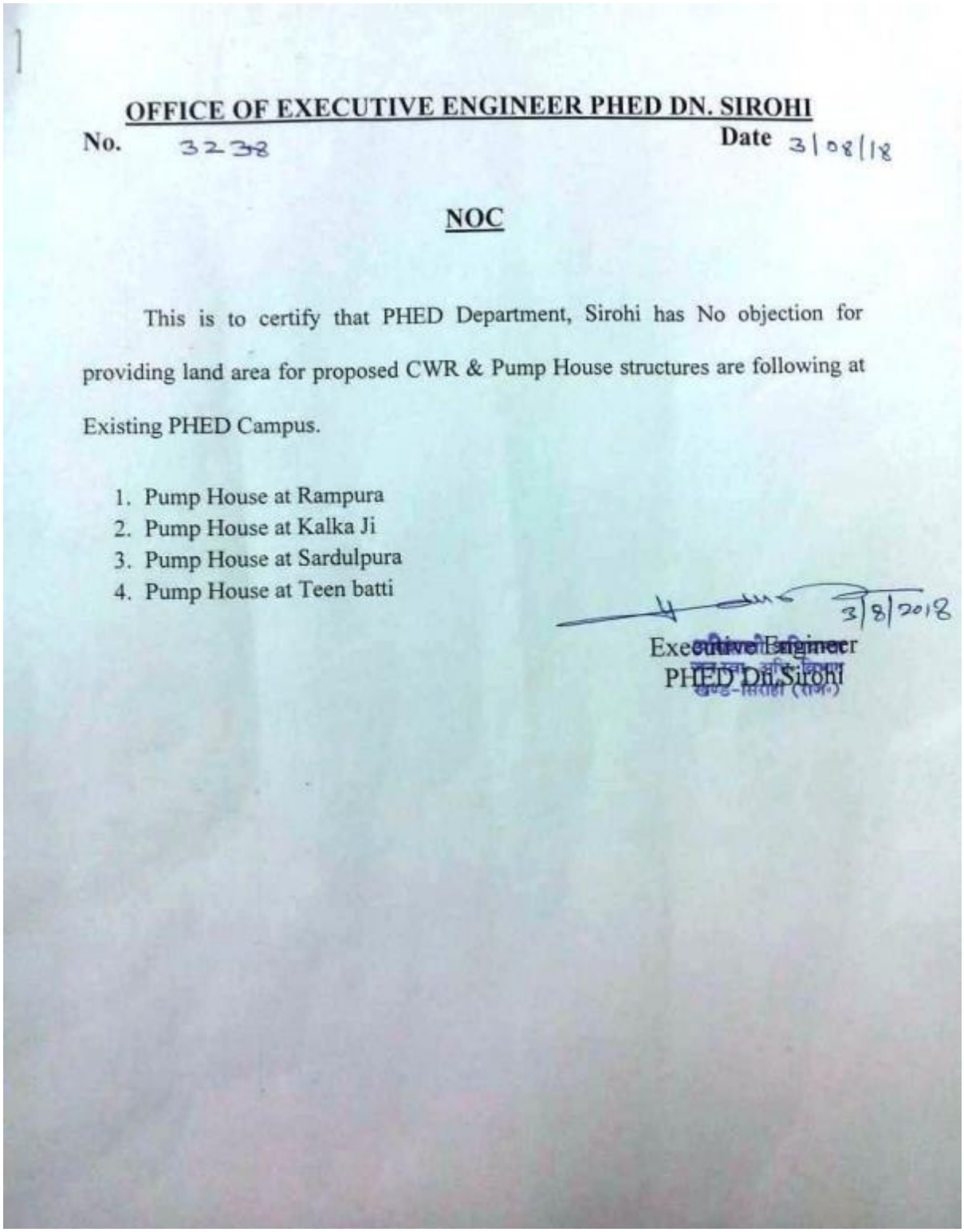
CERTIFICATE

This is to certify that the structure for water withdrawal in water supply purpose from Angore Dam tehsil and district-Sirohi is/ will not have any adverse effect on fisheries life.

Yours Faithfully

Assistant Engineer
Water Resource Division, Sirohi

NOC obtained from PHED, Sirohi regarding providing Land area for Proposed CWR & Pump House at different locations



OFFICE OF EXECUTIVE ENGINEER PHED DN. SIROHI

No. 3238 Date 31/08/18

NOC

This is to certify that PHED Department, Sirohi has No objection for providing land area for proposed CWR & Pump House structures are following at Existing PHED Campus.

1. Pump House at Rampura
2. Pump House at Kalka Ji
3. Pump House at Sardulpura
4. Pump House at Teen batti

3/8/2018

Executive Engineer
PHED Dn. Sirohi

Appendix 16:
Feasibility Report of Tube Wells

S.No. 104

The Commissioner
Nagar Parishad
Sirohi

OFFICE OF THE INCHARGE HYDROGEOLOGIST G.W.D. SIROHI

DATE 17/5/2017

Sub : feasibility for Tube well construction under RUIDP(ABD) phase IV
Ref: your office letter no. 1117.date 12.05.2017

FEASIBILITY FOR TUBE WELL

S.No.	Name of village	Proposed Location	Block	Hydro geological fomation	static water level(m)	Proposed total depth of HP(m)	Proposed casing (m) Dia (200mm)	Anticipted discharge (GPH)	Type of Rig	Quality	Remark
1	2	3	4	5	7	8	9	10	11	12	13
1	Source (5Nos. T/W) at Angore Dam Area for Sirohi City	Near by area of Angore Dam Village-Angore	Sirohi	Alluvium/ Granite /Conglomerate Arkose/Tuff.	10-12	150-180	25-40	2500-3500	HD .DTH	Potable	
2	Source (2Nos.T/W) at Kameri Dam Padiv Area for Sirohi City	Near by area of Kameri Dam Village - Padiv	Sirohi	Alluvium/ Granite	12-15	150-180	30-40	2500-3500	HD .DTH	Potable	
3	Source(3Nos.T/W) at Dudhiya Talab Area Sharneshwar ji for Sirohi City	Near by area of Dudhiya Talab Sharneshwar ji Road -Sirohi	Sirohi	Alluvium/Phyllite/ Granite	12-15	150-180	25-35	2500-3000	HD .DTH	Potable	
4	Sirohi City	Near by area of Tankariya Nala, Nr. Puliya Area- Sirohi	Sirohi	Alluvium/Phyllite/ Schist/Granite	12-15	150-180	20-35	2000-2500	HD .DTH	Potable	
5	Sirohi City	In Front of Nehru Gardan-Sirohi	Sirohi	Alluvium/Phyllite/ Schist/Granite	12-15	150-180	20-35	2000-2500	HD .DTH	Potable	
6	Sirohi City	Near by area of Kalka Tapovan-Sirohi	Sirohi	Alluvium/Phyllite/ Schist/Granite	12-15	150-180	20-35	2000-2500	HD .DTH	Potable	
7	Sirohi City	Near by Dhandela Talab- Sirohi	Sirohi	Alluvium/Phyllite/ Schist/Granite	12-15	150-180	20-35	2000-2500	HD .DTH	Potable	

REMARK: 1.The all information based on general Hydro-Geological condition of the area and due to Heterogenity of aquifer and ground water flow control through under ground Fissure,fracture,joint structure discharge may be low/dry No responsibility of undersigned /department in such case .Above parametere may be vary according to local strata particularly casing may be less or more.

2.Slotted casing pipe must be lowered at contact of soft and hard formation and water bearing zone in loose formation

3. Final Pin pointing will be done at time of drilling.

अधी भू-जल वैज्ञानिक
(सर्वेक्षण एवं अनुसंधान)
भू-जल विभाग, सिरोही

Appendix 17: Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy

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.

Appendix 18: Guidelines for Sewerage System Operations, 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 19:
Preliminary audit note on existing facilities

Introduction

The objectives of this environmental audit of existing facilities of water supply sub-project are to (i) assess the compliance of the existing OHSRs/GLSRs and TWs to be rehabilitated/augmented during the implementation of RSTDSP with environmental legislation; (ii) improve environmental performance through monitoring the effectiveness of the management system; and (iii) increase the Executing agencies knowledge of itself and its activities, thus increasing its ability to continually improve and minimize future potential liabilities.

The environmental audit was carried out for the existing facilities. The methodology adopted for this audit was to initially review existing plans and technical information and list various activities being carried out in the water supply system. Due diligence was carried out to physically check whether environmental performance, health and safety, etc. were in compliance with national and state prescribed standards and guidelines. Team visited the locations of existing facilities and observed operations. Meetings and discussions with key personnel were held in the various stages of the audit. Various documentations regarding the operational aspects were also checked.

<table>
<tr>
<td>Rehabilitation of existing Tube Wells</td>
<td>Presently the water supply in Sirohi is being made through 11 open wells and 16 tube wells. The well fields are in the downstream of Angor and Kameri dams about 9 kms. west of the town. The water level varies from 15 to 20 meters below ground level. The average depletion in water level is 0.70 meters per year. The alluvium thickness is 2 to 3 meters only. The Yield of tube wells/open wells varies from 5000-15000 LPH.
The total production from above tube wells and open wells are 3624 KLD (3.52 MLD) in summer and 4180 KLD (4.18 MLD) in winter respectively. At present the total per day supply is 3020 KLD (3.02 MLD) in summer and 3483 KLD (3.48 MLD) in winter. The present service level in Sirohi town is only 70-75 lpcd which is less than the CPHEEO norms.. The water is supplied for one and half hour in duration of 48 Hrs.The details of tube well and open well are as under:-
<table>
<tr><th>Sr. No.</th><th>Location</th><th>Open Well</th><th>Tube Well</th></tr>
<tr><td>1</td><td>Danta Dam</td><td>3</td><td>0</td></tr>
<tr><td>2</td><td>Angor Dam</td><td>6</td><td>6</td></tr>
<tr><td>3</td><td>Kameri Dam</td><td>1</td><td>2</td></tr>
<tr><td>4</td><td>DudhiaTalab</td><td>4</td><td>1</td></tr>
<tr><td>5</td><td>Aadesh Nagar</td><td>1</td><td>0</td></tr>
<tr><td>6</td><td>Mandawa</td><td>0</td><td>1</td></tr>
<tr><td>7</td><td>Kalka Ji H.W. Campus</td><td>1</td><td>1</td></tr>
<tr><td></td><td>Total</td><td>16</td><td>11</td></tr>
</table>
Rehabilitation of existing tube wells and open wells are proposed to meet the functional parameters as per the hydrologists report for sustainability, including but not limited to replacemnt of pipes, subbmersible pumps, cables, panels, vavles, flow meters and synchronization with SCADA</td>
</tr>
</table>

<table>
<tr><td></td><td>enabled devices after assessment by audit of the existing TW condition and expected design life as per technical specification. Activities are to be executed in these works
All the existing faulty/old cables shall be replaced with the appropriate rating new cable.
All the existing leaked/worn out riser pipe of existing tube wells shall be replaced with GI pipe of appreciate size.
All the existing old and damaged panel board shall be replaced with new panel board having all the necessary protection against motor burning.
Depth of the tube wells will not be increased son no impact on groundwater withdrawal.
Flow meter shall be installed at each existing tube well for recording of tube wells discharge for calculation of NRW including non-return valve.
PHED should collate all available information on the borehole and maintain a copy on site and in the office for future reference and management of the source. Information should include the hydrogeological report, borehole logs and construction details.</td></tr>
<tr><td>OHSRs/GLSRs:
.</td><td>There are 10 Nos of OHSR/GLSR in Sirohi. Details given below:
<table>
<tr><th>Sr. No.</th><th>Location</th><th>Capacity</th><th>Staging</th><th>Year of Construction</th></tr>
<tr><td>1</td><td>GLSR Tankania</td><td>567 KL</td><td>Hillock</td><td>1973</td></tr>
<tr><td>2</td><td>GLSR Bhatekara</td><td>400 KL + 200 KL</td><td>Hillock</td><td>2003</td></tr>
<tr><td>3</td><td>OHSR RHB Colony</td><td>150 KL</td><td>18 Mt.</td><td>2002</td></tr>
<tr><td>4</td><td>OHSR Aadresh Nagar</td><td>150 KL</td><td>18 Mt.</td><td>2002</td></tr>
<tr><td>5</td><td>OHSR Kanakwas</td><td>100 KL</td><td>15 Mt.</td><td>1990</td></tr>
<tr><td>6</td><td>OHSR Hospital</td><td>200 KL</td><td>18 Mt.</td><td>1995</td></tr>
<tr><td>7</td><td>OHSR GAD Colony</td><td>60 KL</td><td>15 Mt.</td><td>1999</td></tr>
<tr><td>8</td><td>OHSR Police Line</td><td>60 KL + 40 KL</td><td>20 Mt. , 10 Mt.</td><td>Dec. 2012</td></tr>
<tr><td>9</td><td>OHSR Bhandrlar Nagar</td><td>60 KL</td><td>18 Mt.</td><td>July 2012</td></tr>
<tr><td>10</td><td>OHSR Circle house</td><td>20 KL</td><td>10 Mt.</td><td>Jan 2008</td></tr>
</table>
The following four existing structures are to be repaired / rehabilitated:
GLSR Tankania
GLSR Bhatekara
OHSR RHB Colony
OHSR Aadresh Nagar
Debris and corrosion causing contaminants can create a sludge like material at the bottoms or on the sides of unclean tanks. Often resulting in oxidation, this can hinder storage tank efficiency. Worse yet, dirty and contaminated tanks can pose increased safety risks to the environment and employees.
All concrete and plastering works will be done using mix in higher proportion than the existing, to ensure proper adhesion and strength. It has to be ensured that the new material sticks to existing by using cement slurry and</td></tr>
</table>

<table>
<tr><td></td><td>or epoxy/adhesive wherever required. All concrete cracks will be repaired by using pressure grouting as per specifications.
Wherever concrete cover has peeled off from concrete (Water retaining) structure, structure needs to be repaired with epoxy mortar with primer. All corroded reinforcement bar shall be replaced with new iron bars.
All repairable concrete cracks to be made good by pressure grouting
Removal of bushes and planting of trees in the vicinity of existing building/ structure with half brick circular tree guard (distance to be maintained from building/ structures).
Subproject components are located away from settlements .Significant amount of demolition waste will be generated due to demolition of old buildings , excavation of existing road, which will be reused in construction and the remaining waste will be used for filling of low lying lands.</td></tr>
<tr><td>CWR</td><td>Five RCC CWRs already exist under the scheme, constructed by PHED. The capacity of CWRs are given below:
<table>
<tr><th>Sr. No.</th><th>Location</th><th>Capacity</th><th>Year of Construction</th></tr>
<tr><td>1</td><td>Angor</td><td>792 KL</td><td>1973</td></tr>
<tr><td>2</td><td>Rampura</td><td>400 KL</td><td>1990</td></tr>
<tr><td>3</td><td>Kalkaji</td><td>567 KL</td><td>1973</td></tr>
<tr><td>4</td><td>Teen Batti</td><td>200 KL</td><td>1995</td></tr>
<tr><td>5</td><td>Sardulpura</td><td>100 KL</td><td>2010</td></tr>
</table>
CWRs are in function along with pump houses. This is used to pump the water to related ESRs; from there water is distributed among the consumers through distribution pipe. Wherever concrete cover has peeled off from concrete (water retaining) structure, structure needs to be repaired with epoxy mortar with primer. All repairable concrete cracks to be made good by pressure grouting
Removal of bushes and planting of trees in the vicinity of existing building/ structure with half brick circular tree guard (distance to be maintained from building/ structures). Subproject components are located away from settlements .Significant amount of demolition waste will be generated due to demolition of old buildings , excavation of existing road, which will be reused in construction and the remaining waste will be used for filling of low lying lands.
Contractor has to take precautions in handling and usage of chlorine to avoid any health hazard to workers from handling and management of chlorine used for disinfection No other hazardous chemicals are expected to be used during construction works</td></tr>
<tr><td>Present Condition of Existing Machinery:.</td><td>The pump sets installed at pump house have served their useful lives. These sets work at very low efficiency and design data’s do not match with these pumps, therefore, proposed to be replaced
<table>
<tr><th rowspan="2">Sr. No.</th><th rowspan="2">Name of the Pump House</th><th colspan="5">Details of Pumping Machineries</th></tr>
<tr><th>Type</th><th>HP</th><th>Head</th><th>Discharge</th><th>Nos.</th></tr>
<tr><td>1</td><td>Angor Pump House</td><td>C/F
P/Set</td><td>25
15</td><td>60 M
70 M</td><td>35 LPS
26 LPS</td><td>2 Nos.
1 Nos.</td></tr>
</table></td></tr>
</table>

2	Rampura Pump House	C/F P/Set	15	50 M	17 LPS	1 Nos.
3	Kalkaji Pump House	C/F P/Set	20 10	70 M 70 M	41 LPS 26 LPS	2 Nos. 1 Nos.
4	Teen Batti Pump House	C/F P/Set	15	70 M	26 LPS	2 Nos.
5	Sardulpura Pump House	C/F P/Set	15	70 M	10 LPS	1 Nos.

Electricity will be used for running equipment otherwise sound proof/super silent diesel Generator set should be used. It will be ensured that no leakage of discharge of fuels like diesel, petrol, and Oil & Grease can effect human health and environment.
Short term accidental spills are possible. To avoid contamination from fuel/lubricants, all equipment to be maintained and examined regularly. Required precautions will be taken in storage and handling of hazardous materials, as per the Hazardous Waste (Management and Handling) Rules, 1989

Transmission main & Distribution system (Type/size/length of pipe

Details of existing transmission mains are given below:

Sr. No.	Size of pipe line	Length of pipe line (Mt.)
1	80 mm AC-10 to 250 AC-10	60700 mt.
2	150 mm CI & 250 CI	7550 mt.
3	140mm Upvc	3100 mt.
	Total	71350 mt.

Cast Iron (CI) pipe line is about 30 years old and due to fluoride deposit in the pipe line the diameter of pipe has reduced and pipe erodes. Therefore the condition of CI/AC pipe line is not satisfactory due to leakage and breakage. Hence proposed replacement by Ductile Iron (DI K-9) pipe.
The old pipe lines for rising mains are at present of Asbestos Cement (AC) material, which leak frequently result the pressure drop in the lines, therefore as per policy, the provision for replacement of these existing AC lines by new Ductile Iron (DI K-9) pipelines have been taken as per design requirement.
There are 18 water supply zones in Town Sirohi. Sirohi is provided with distribution system by gravity fed from respective OHSRs. The total length of existing distribution system is reported as below:-

Sr. No.	Size of pipe line	Length of pipe line (Mt.)
1	80 mm AC-10 to 250 AC-10	46730mt.
2	90mm UPVC	9200 Mt.

3	110 mm UPVC	2100 Mt.
	Total	58030 mt.

The existing distribution lines of AC/CI and uPVC pipes are very old with heavy leakages due to repeatedly breakages and joints leakages resulting heavy losses of clear water, therefore, need to be replaced by HDPE((high-density polyethylene) pipes.After laying the lines, the provision of road repairs has also been proposed in the project.

The World Health Organisation considered asbestos in drinking water arising from asbestos cement pipe in their 1993 edition of the Guidelines for Drinking Water Quality and it is no longer being used and because of the health risks these will be left in situ and replaced by new pipes. Given the dangerous nature of this material for both workers and citizens, additional measure should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. This should be done prior to the start of construction works of water supply system, PIU will develop a protocol to be applied in any instance that AC pipes are encountered, to ensure that appropriate action is taken. This should be based on the approach recommended by the United States Environmental Protection Agency (USEPA).

Ductile iron pipe is a pipe made of ductile cast iron commonly used for potable water transmission and distribution. This type of pipe is a direct development of earlier cast iron pipe, which it has superseded. Ductile iron pipe in the developed world is normally manufactured exclusively from recycled material including scrap steel and recycled iron. The pipe can be recycled after use. In November 2012, ductile iron pipe manufactured in the United States received certification as a sustainable product from the Institute for Market Transformation to Sustainability.

The environmental benefits that accompany the use of HDPE in water and wastewater systems begin with its manufacturing. Pipe produced from HDP E resin uses significantly less energy to manufacture when compared to oth er materials such as iron and concrete. Transporting HDPE piping to munici pal water and wastewater jobsites requires far less fuel than competing mat erials which are much heavier. HDPE is lightweight yet extremely durable. The flexible and lightweight makeup of HDPE bring more environmental ben efits through lowimpact installation practices such as horizontal directional d rilling (HDD) and other trenchless operations. HDD is minimally intrusive an dwell suited for use in highly congested municipalities as well as crossings o f environmentally sensitive areas.

Subproject Sites Photographs

Angor head worksangori dam

Kalka ji pump house

Rampura pump house (rampura paldi)

Sardulpura pump house(sadulpura)

Teen batti pump house (teen batti) WTP Sirohi + Angur pumphouse

Appendix 20:
Asbestos 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

Government of India Laws, Regulations and standards on Asbestos Applicable to the projects	Requirements for the project
	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 in India as applicable, namely:

a. The Supreme Court of India – Banned ACM use in 21 January 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 ASSESMENT:

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 DBO Contactor. 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 inventorization has to be kept by theDBO Contractor. The same shall be cross verified by RUDSICO-EAP.

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-DBO Contractor/ 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 equipment (PPE), 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

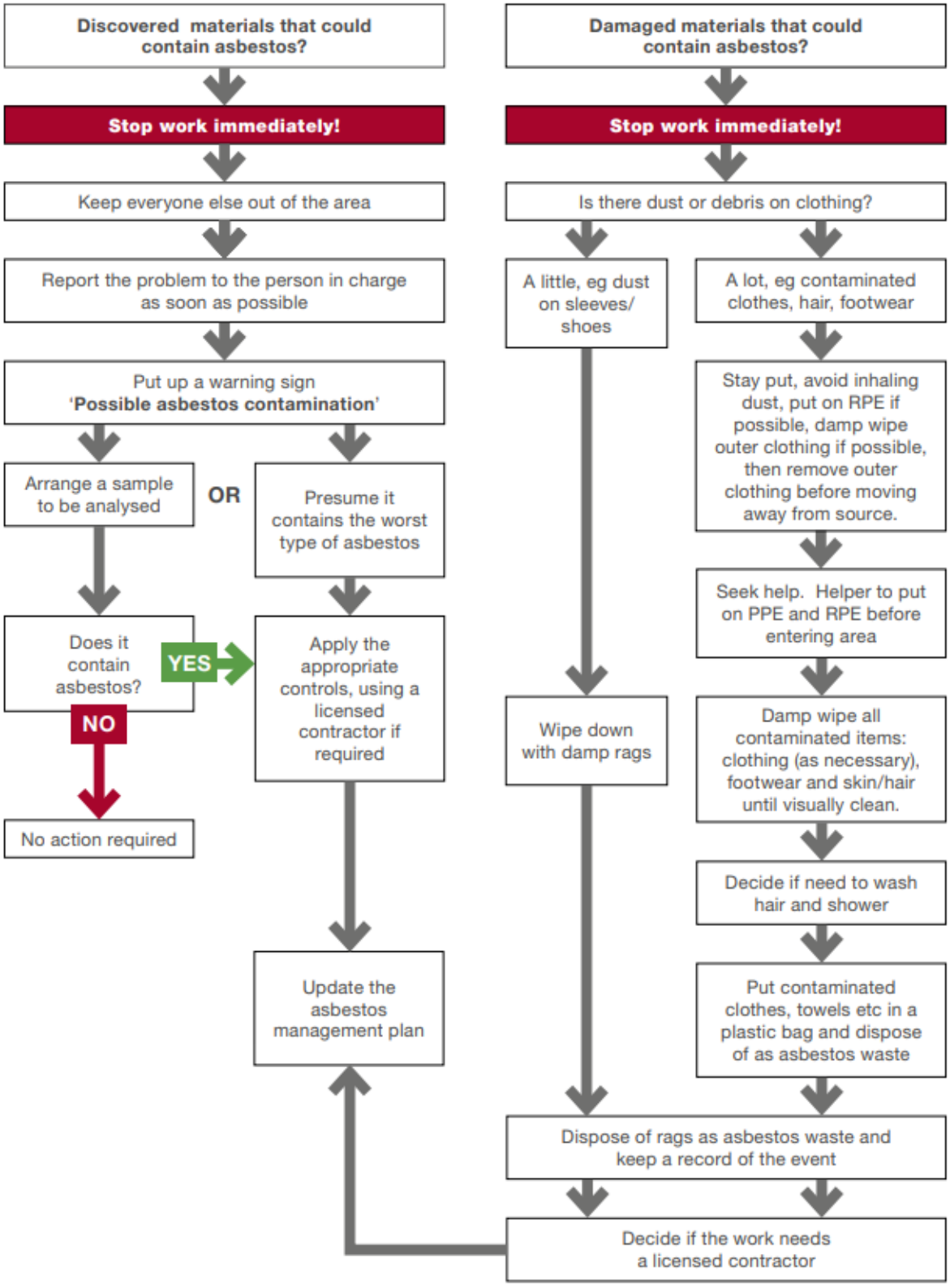


Figure 1: Showing Flow chart of ERP

Table 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	**RUDSICO-EAP&DBO Contractor**	Form-I	Rs.100/km	The onus of the minimal encounter of ACM is vested upon the RUDSICO-EAP and inventory will be with the DBO Contractor and has to be annually verified by RUDSICO-EAP.
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	**RUDSICO-EAP/DBO Contractor**	None	Nil	As per ADB Format
Collection of Health records in compliance to the local laws	**DBO Contractor/RUDSICO-EAP/PHED/LSG**	Form-IV	Nil	For regular evaluation & identification of any abnormality.
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 indentified TSDF 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 PHED etc 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), RUDSICO-EAP 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	DBO Contractor	SOP-2	Rs.40,000/sample	The Asbestos Fiber count monitoring has to be conducted prior to ACM handling operation and after

Periodic Work zone monitoring(Asbestos fiber count) records to be maintained				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

10. 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

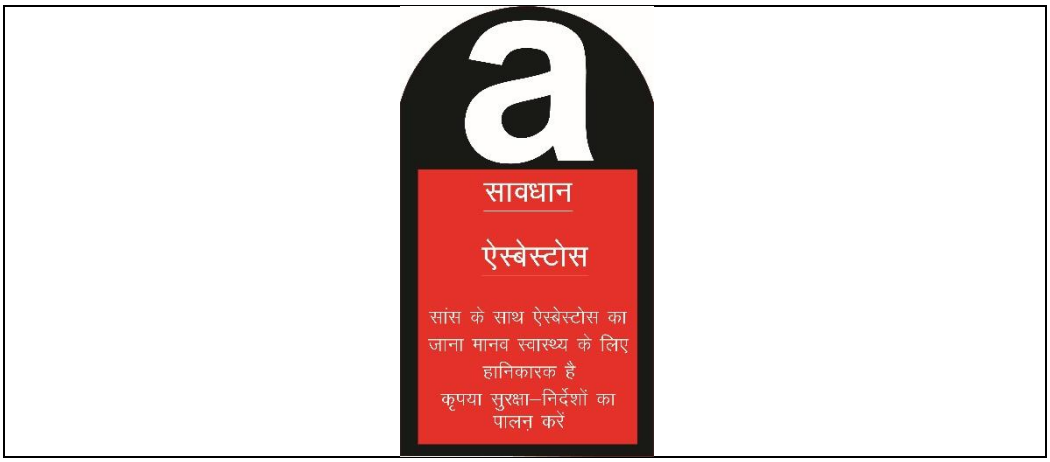


Figure 2: Asbestos warning signage

- 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

11. 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 permissible 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 bag 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:

a. Waste Type:
b. Date of packing:
c. Qty/Numbers:
d. Packed by:
e. Warning Signage:
f. Disposal

Figure 3: ACM: In-situ storage warning

13. The AMP procedures-**Standard Operating Procedure-01-** are as follows and are summarized as above

(i) Objectives – to keep the work zone safe and secured.
(ii) Requirements – identify all the requirements needed for handling AC in the specific site and project
(iii) Conduct and ensure awareness and vocational training to ACM handlers
(iv) Conduct a comprehensive identification and risk assessment of ACMs
(v) Apply restriction / re-handling of ACM on ground-use of PPE. Ensure that workers handling ACM have the right PPEs as follows:

a. Hard helmet
b. Overall suit
c. Gloves
d. Mask to be strapped tight
e. Safety goggles
f. Safety shoes
g. Ear plugs

(vi) Avoid underground encountering of ACM

a. Ensure that an authorized person (HSE) are supervising the work
b. Barricade the area with signage
c. Damp ACM
d. Use safety gears
e. Dismantle ACM to be labeled, kept on plastic grounding and packed in permissible bags
f. Label the bags properly
g. Ensure shipping to proper disposal sites

(vii) 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:

a. Away from habitation
b. Avoid low lying areas
c. Away from water storage
d. To be enveloped with minimum of 8-feet height enclosure
e. Avoid high vertical stacks
f. Access controlled
g. Proper signage enclosure

(viii) Proper re-handling of AMC, labeling and packing

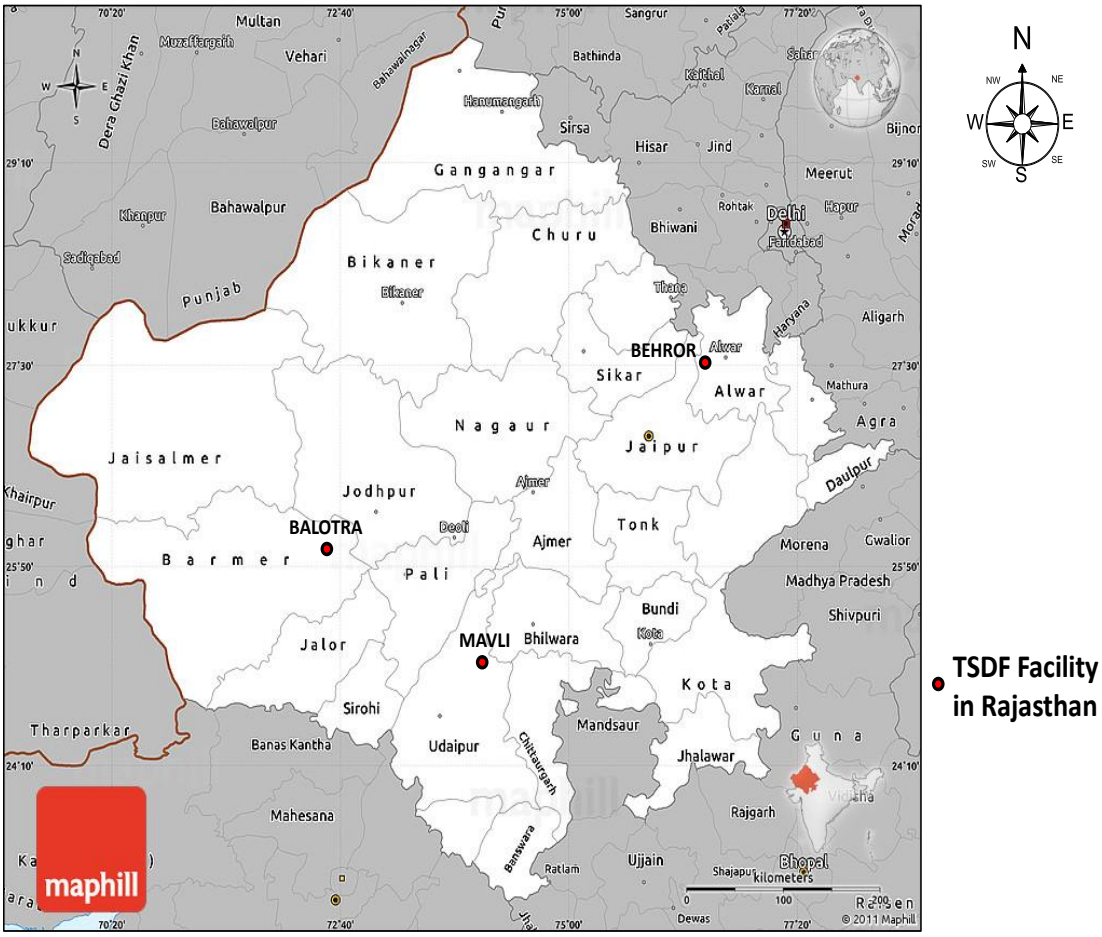
(ix) Control access and ensure proper monitoring of records, specifically:
   i. Environment
   ii. Health
   iii. Reporting to regulators

(x) 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	Ramky BWMP 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

(xi) 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.

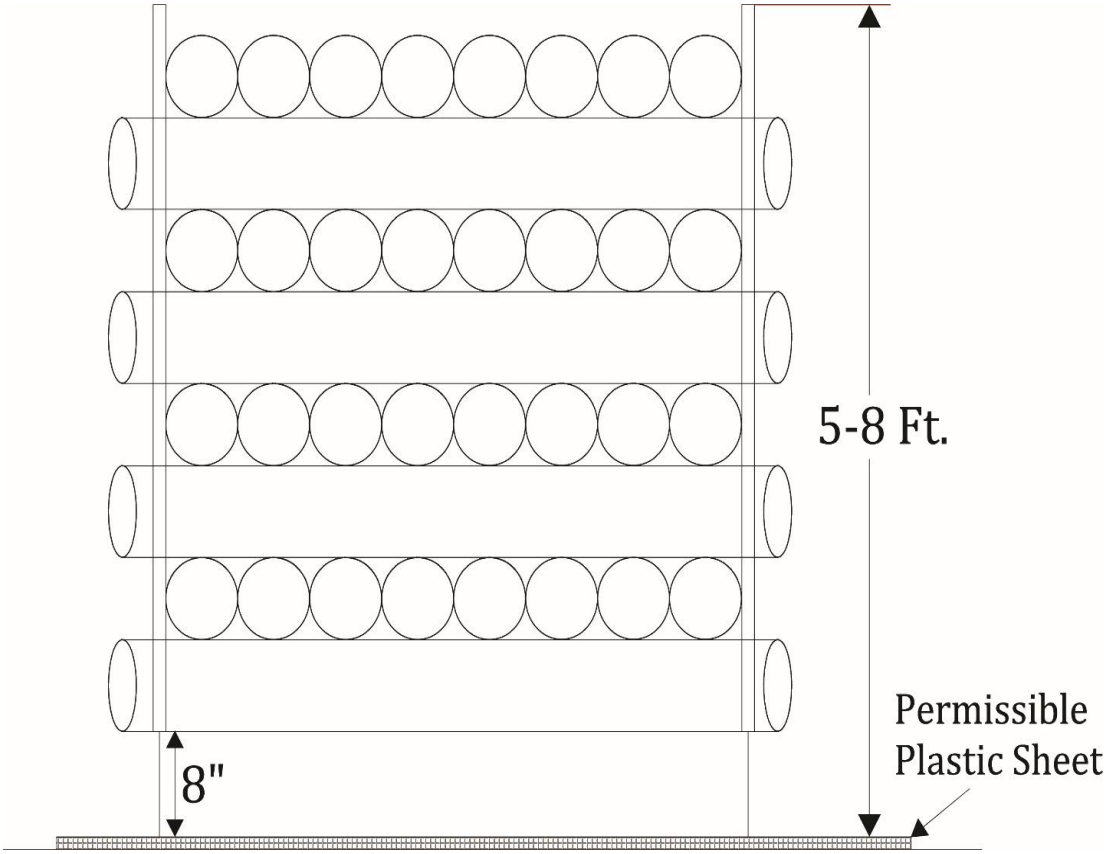


Figure 5: Schematic diagram showing ACM Pipes stacking

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.

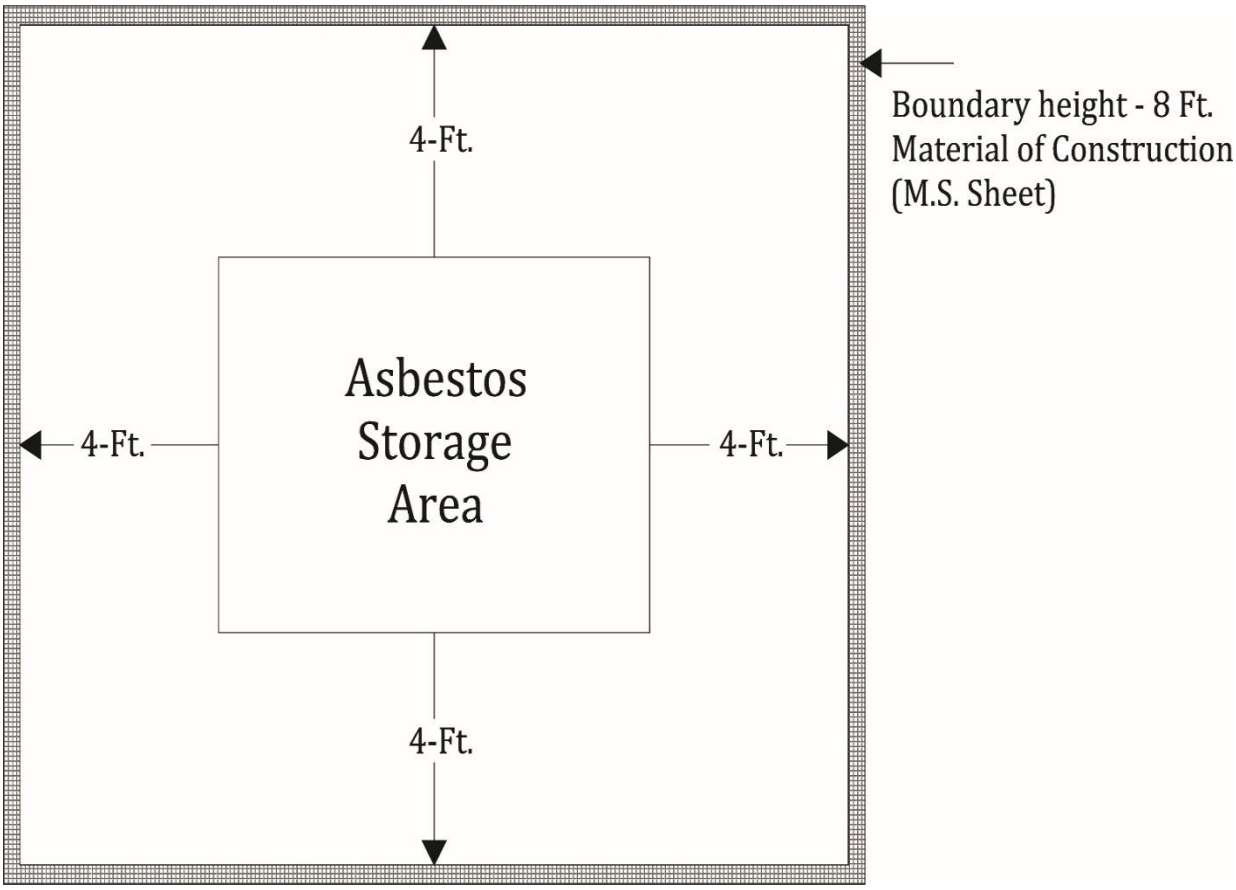


Figure 6: Schematic diagram showing ACM Pipes storage area

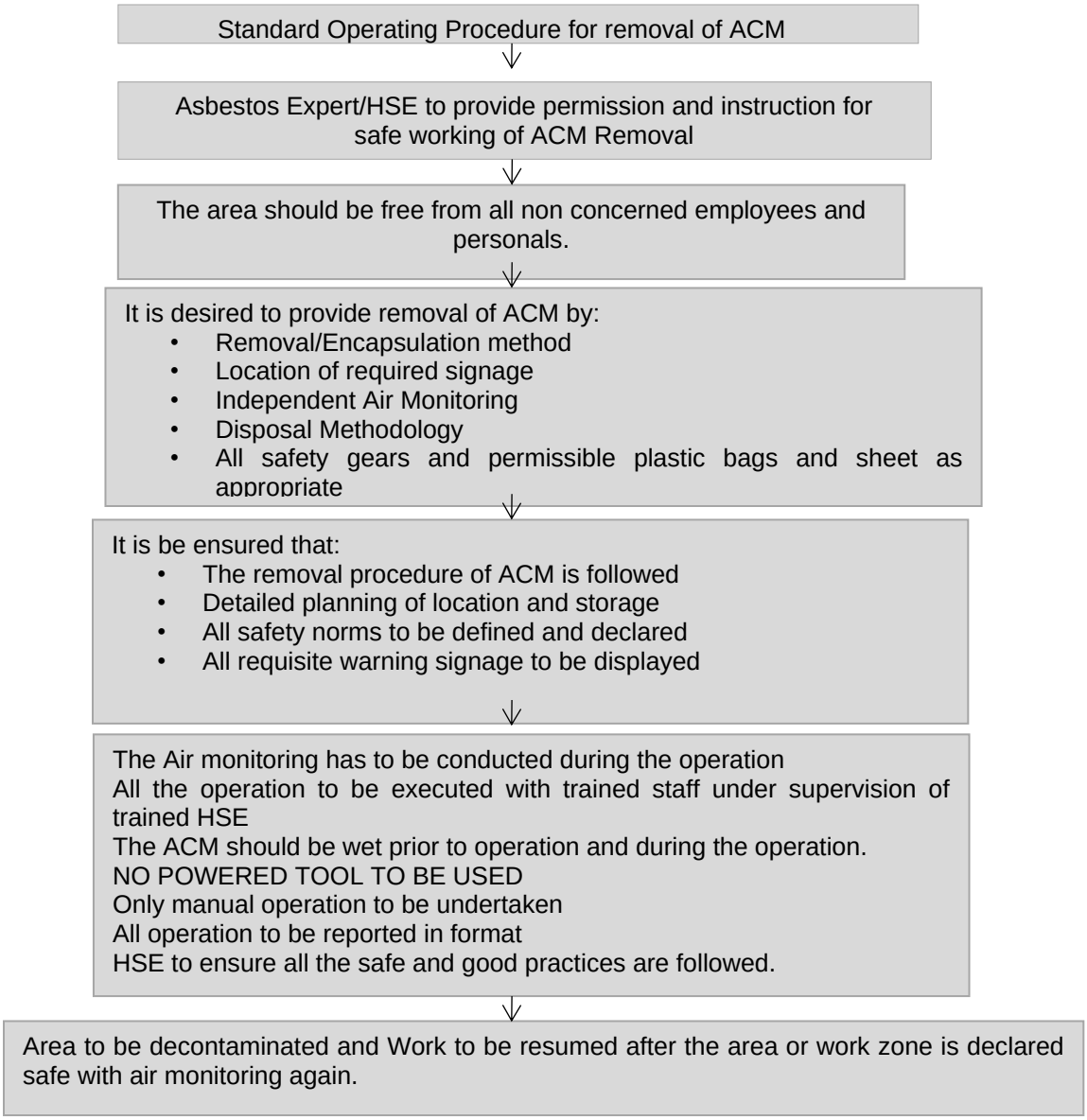


Figure 2-Standard Operating Procedure Flow Sheet

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 3- 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 inventorization has 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	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	As on daily wages

		pulling from one end, if required, with all safety precautions. A pipe shall not be stored inside another pipe. The 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	Approved/accredited laboratory	As stated above.

		workers is required when the Workers are or will be exposed to airborne concentrations of fibers of asbestos at or above OSHA's 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 etc have 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 – ASBETOS INVENTORY, INSPECTION AND ACTION FORM Format: RUDSICO-EAP/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: RUDSICO-EAP/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:				
DOCUMENTS AND RECORDS				
	Site Inventory			
	List of ACM storage and installation points			
	Structure of ACM management committee			
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 DBO Contractor (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: RUDSICO-EAP/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: RUDSICO-EAP/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 by road 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

   $C = A/a \times N/n \times 1/r \times 1/t$
   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,[49] asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste. The applicable legislation under the present scenario are:

[49] 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 ❑ Peritoneialmesotherlioma ❑ 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/RUDSICO-EAP	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	DBO Contractor /RUDSICO-EAP	All provision of safe working with proper signage has to be undertaken prior to work initiation, during the work and after the work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Remark
		there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods.		
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 ❑ Mesothelioma ❑ Peritoneialmesotherlioma ❑ Pleural plaques ❑ Asbestosis ❑ Bronchogenic Carcinoma Second hand-exposure	Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to	DBO Contractor/RUDSICO-EAP	Measure to avoid the encounter & removal has to be prioritized and if the same is 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/RUDSICO-EAP	To be kept intact for easy tracking and reference in legible format. The same can be kept in soft format as well.

****

Appendix 21:
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 22:
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

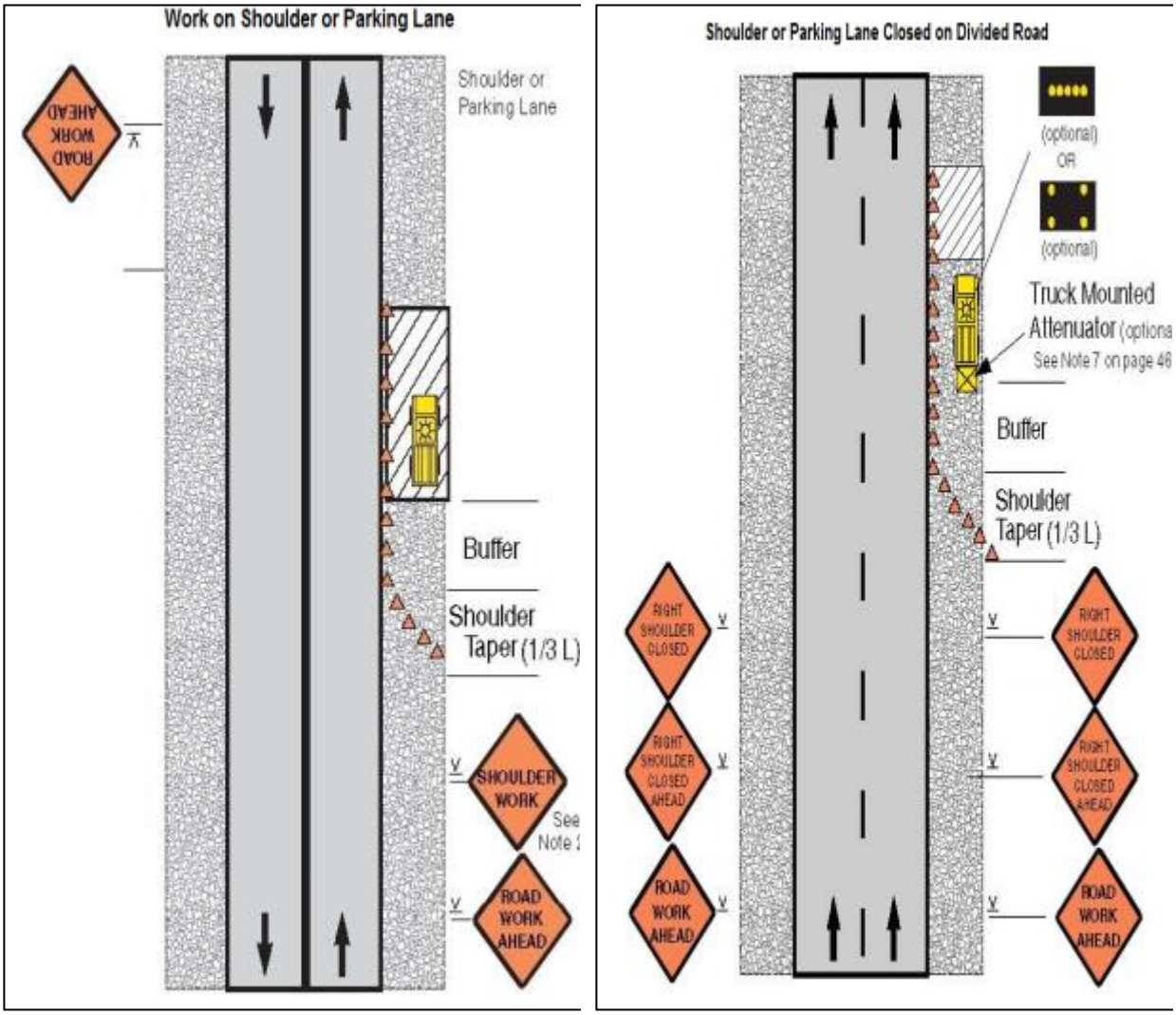


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume

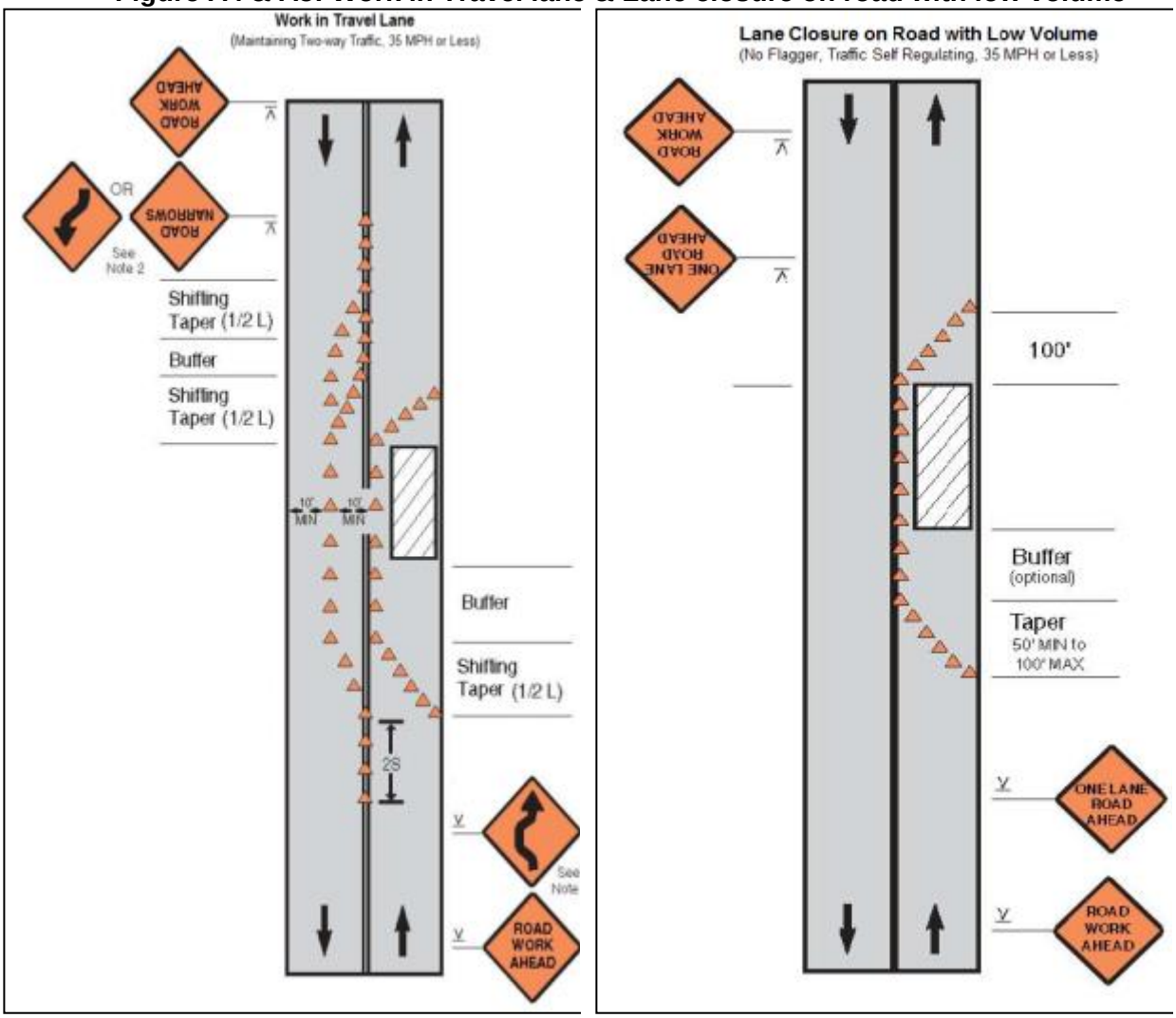
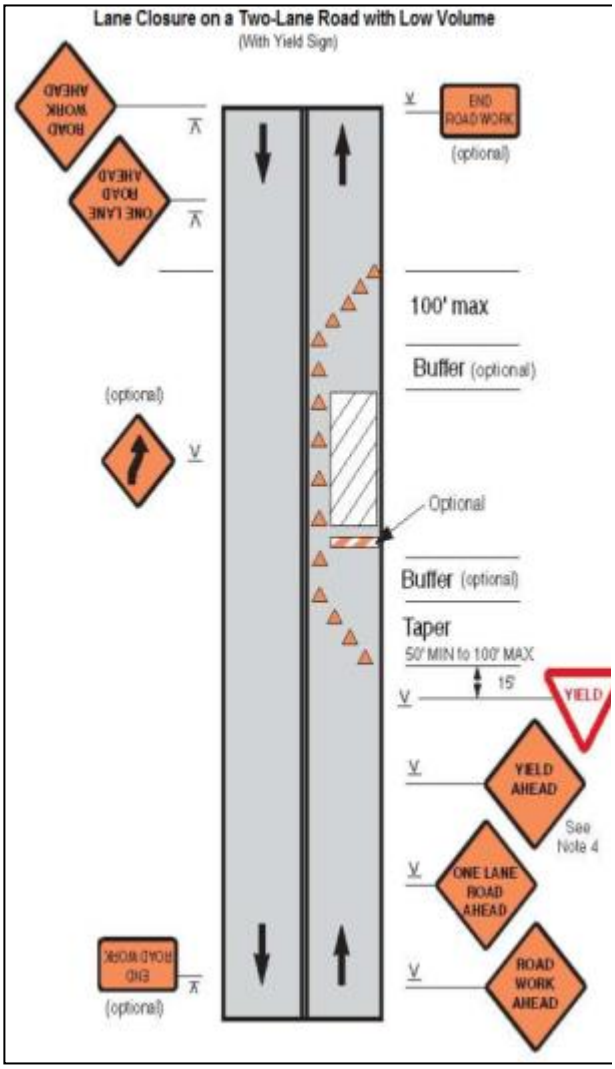


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



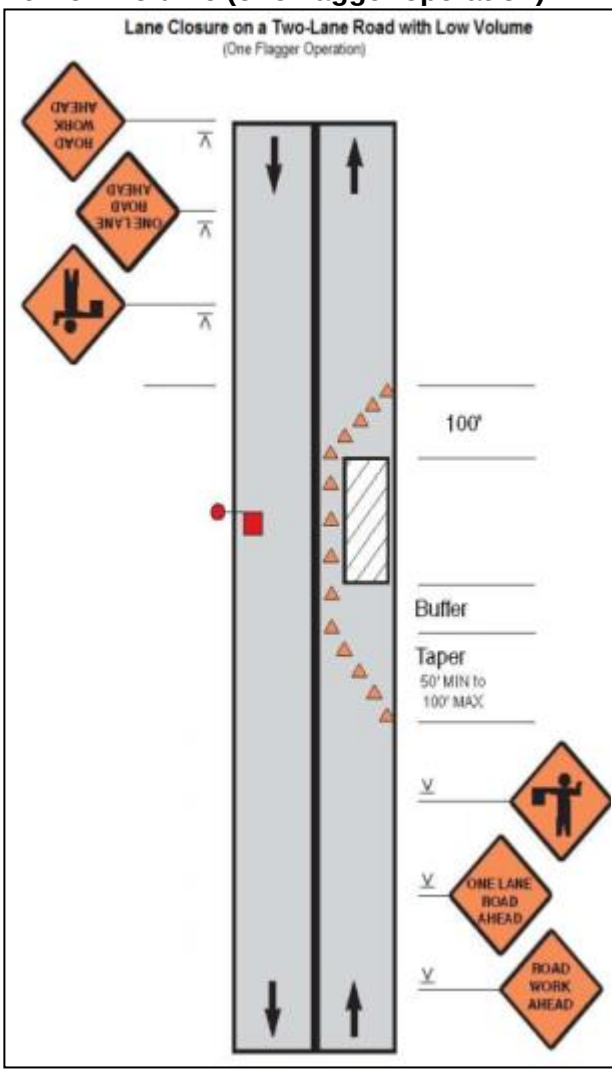


Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

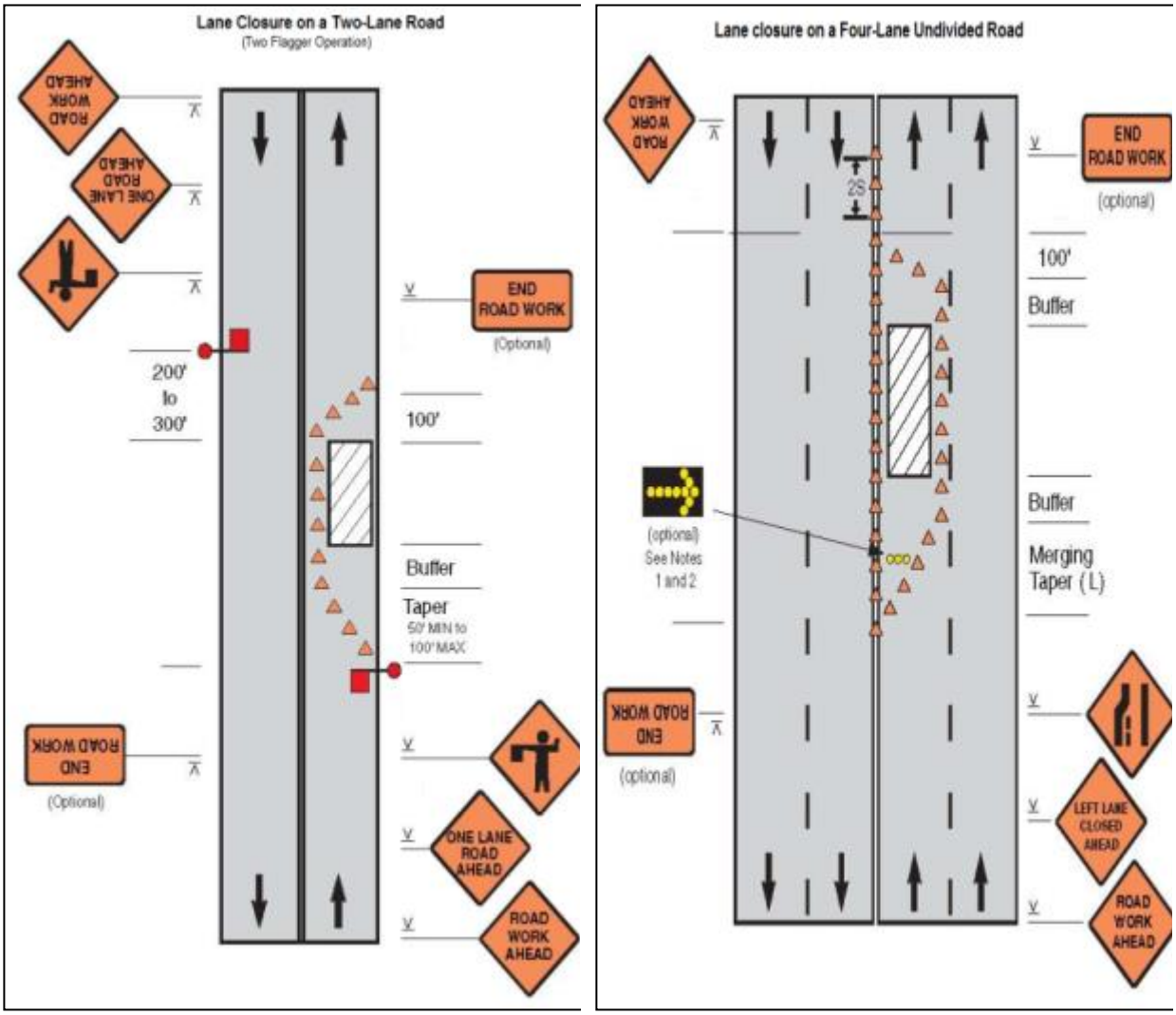
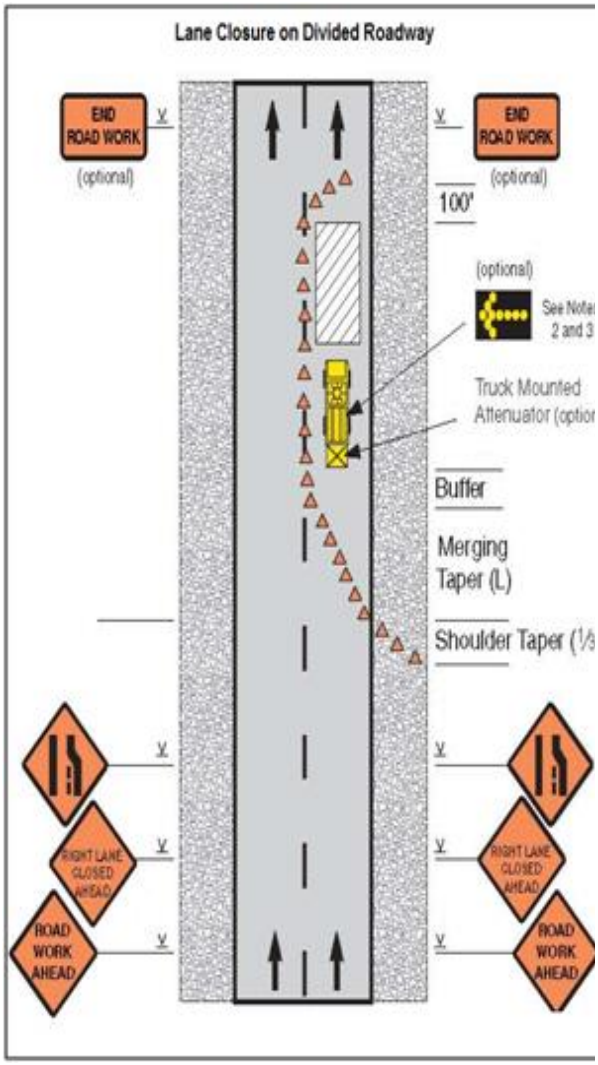


Figure A10 & A11: Lane Closure On Divided Roadway & Half Road Closure On Multi-Lane Roadway



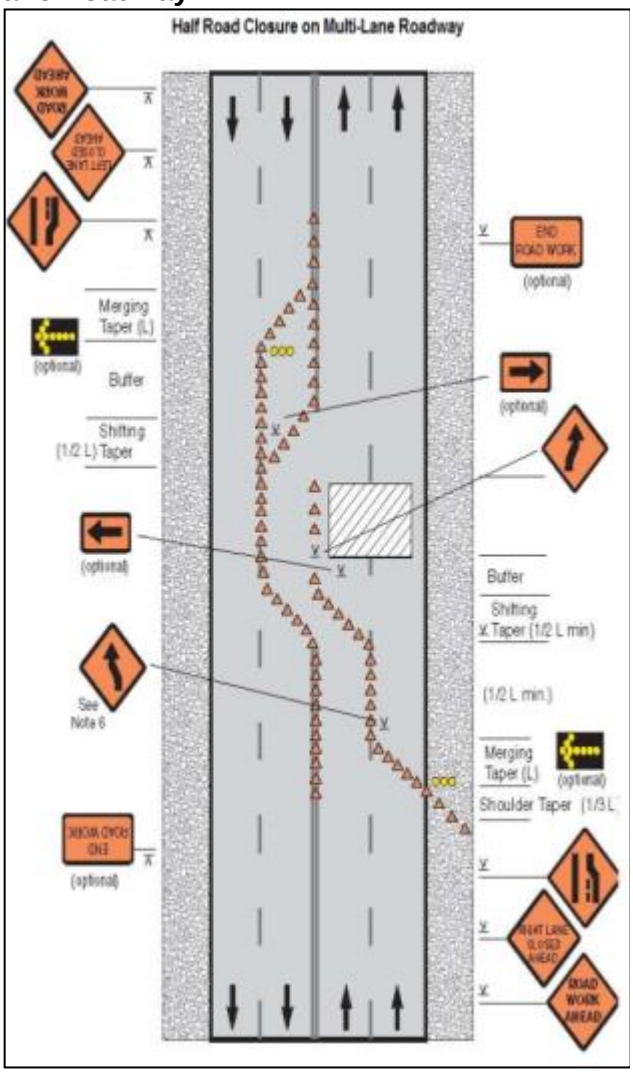
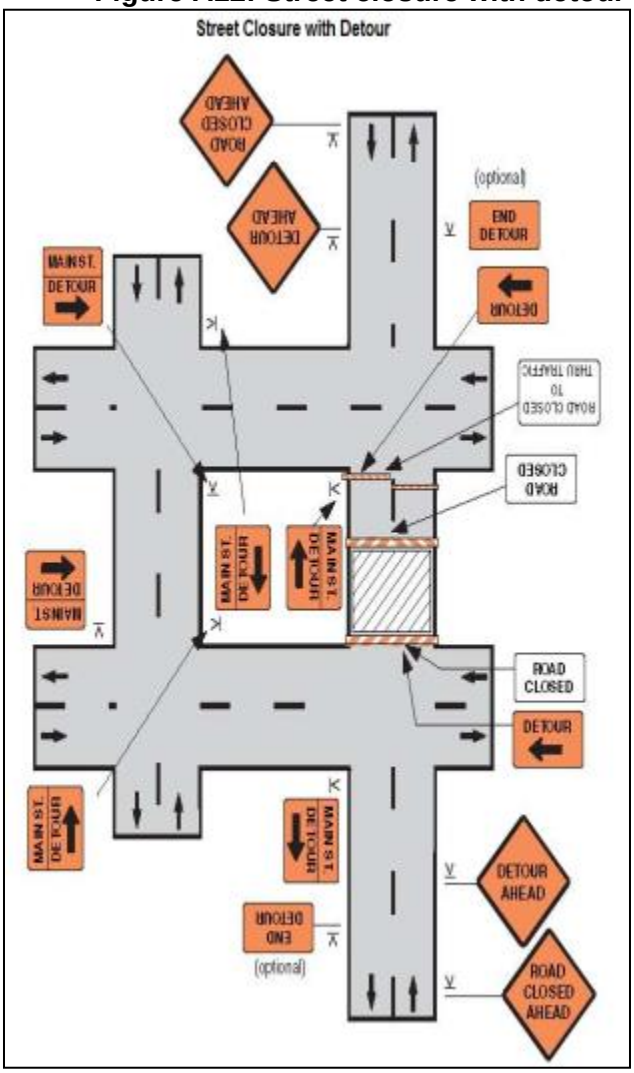


Figure A12: Street closure with detour



Appendix 23:
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.

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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 24: 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 25: Guidelines and Emergency plan for handling and storing chlorine

Instructions for Storage and Handling of Chlorine Cylinders (Based on the 'Manual on Operation and Maintenance of Water Supply Systems' published by the Central Public Health and Environmental Engineering Organization (CPHEEO) in 2005)

1.1Storage Area

(i) Obtain storage license from controller of explosives under Gas Cylinder Rules 2004 if the quantity of Cl2 containers to be stored is more than 5 Nos.
(ii) Storage area should be cool, dry, well ventilated, and clean of trash and protected from external heat sources. Please refer to Manual on "Water Supply and Treatment", (1999 Edition), for further details.
(iii) Ventilation must be sufficient to prevent accumulation of vapour pockets. The exhaust should be located either near the floor or duct be provided extending to the floor. All fan switches should be outside the storage area.
(iv) Do not store container directly under the sun.
(v) Weather cock should be installed near the storage to determine wind direction.
(vi) The storage building should be of non-combustible construction with at least two exits opening outside.
(vii) Neutralization system should be provided.
(viii) Continuous monitoring of chlorine leak detection equipment with alarm should be installed in the storage area.
(ix) The area should be free and remote from elevators, gangways or ventilating system to avoid dangerous concentration of Chlorine during leak.
(x) Two portable foam type fire extinguishers should be provided in the premises.
(xi) Corrosive substances shall not be stored nearby which react violently with each other.
(xii) Unauthorized person should not be allowed to enter into the storage area.
(xiii) The floor level of storage shed should be preferably 30 cms (at least one foot) higher from the ground level to avoid water logging.
(xiv) Ensure that all containers are properly fitted with safety caps or hooks.

1.2. Cylinder & Drum Containers

(i) Store chlorine cylinders upright and secure them so that they do not fall.
(ii) Drum containers should be stored on their sides on rails, a few inches above the floor. They should not be stacked one upon the other. They should be stored such that the valves are in vertical plane.
(iii) Keep enough space between containers so as to have accessibility in case of emergency.
(iv) Store the containers in a covered shed only. Keep them away from any source of heat as excessive heat may increase the pressure in container which will result into burst.
(v) Do not store explosives, acids, turpentine, ether, anhydrous ammonia, finely divided metals or other flammable material in the vicinity of Chlorine.
(vi) Do not store containers in wet and muddy areas.
(vii) Store filled and empty containers separately.
(viii) Protective covers for valves are secured even when the containers are empty, except during use in the system.
(ix) Never use containers as a roller to move other equipment.

(x) Never tamper with fusible plugs of tonners.
(xi) Check leakages every day by means of ammonia torch. However, it should not be touched to brass components like valves of container for safety.
(xii) Never carry out any welding work on the chlorine system as combustion of steel takes place at 2510C in presence of chlorine.
(xiii) The boxes containing emergency kit, safety applications and self contained breathing apparatus should be kept in working order in an easily approachable area.

1.3. Use of Cylinders & Drum Containers in Process System

(i) Use containers in the order of their receipt, as valve packing can get hardened during prolonged storage and cause gas leaks.
(ii) Do not use oil or lubricant on any valve of the containers.
(iii) Badly fitting connections should not be forced and correct tool should always be used for opening and closing valves. They should never be hammered.
(iv) The area should be well ventilated with frequent air changes.
(v) Transport the cylinders to the process area by using crane, hoist or railings etc.
(vi) The drum containers should be kept in a horizontal position in such a way that the valves are in a vertical plane. The upper valve gives out gas and the lower one gives out liquid chlorine.
(vii) The cylinder should be kept in upright position in order to release gas from the valve. For liquid chlorine withdrawal, it should be inverted with the help of an inverted rack.
(viii) Connect the containers to the system by using approved accessories.
(ix) Use copper flexible tube, with lead washer containing 2 to 4% antimony or bonded asbestos or teflon washer. Use yoke clamp for connecting chlorine container.
(x) Never use rubber tubes, PVC tubes etc. for making connections.
(xi) Use the right spanner for operating the valve. Always keep the spanner on the valve spindle. Never use ill fitting spanner.
(xii) After making the flexible connection, check for the leakage by means of ammonia torch but it should not come in contact with a valve.
(xiii) Keep minimum distance between the container valve and header valve so that during change-over of the container, minimum amount of gas leaks.
(xiv) The material of construction of the adopter should be same as that of valve outlet threads. o. The valve should not be used as a regulator for controlling the chlorine. During regulation due to high velocity of Chlorine, the valve gets damaged which in turn can cause difficulty in closing.
(xv) The tools and other equipment used for operating the container should be clean and free of grease, dust or grit.
(xvi) Wear breathing apparatus while making the change-over of the container from the process header.
(xvii) Do not heat the container to withdraw more gas at faster rate.
(xviii) Use pressure gauge and flow measuring device to control the flow and to know the quantity of gas left in the container.
(xix) Use an inverted U type barometric leg or vacuum breaking arrangement for connecting the container to the process piping.
(xx) Withdrawal of the gas should be stopped when the gas pressure inside the container is between 0.1 to 0.5 kg/cm2 approximately.

(xxi) If withdrawal of the gas from the container connected to the process system has to be suspended for long intervals, it should be disconnected from the system, and the valve cap and hood replaced.
(xxii) Gas containers should be handled by trained persons only.

1.4. Disconnecting Containers from Process System

(i) Use breathing apparatus before disconnecting the container.
(ii) First close the container valve fully. After removal of chlorine the process valve should be closed.
(iii) Remove the flexible connection, plug the flexible connection in order to avoid entry of humid air. Replace the valve cap or hood on the container.
(iv) Put the tag on the empty container & bring it to storage area marked for empties. e. Check for the leakage.

1.5. Loading and Unloading of Containers

(i) The handling of containers should be done under the supervision of trained and competent person.
(ii) It should be done carefully with a crane, hoist or slanted ramp. Do not use magnet or sharp object for lifting the containers.
(iii) Small cylinders should not be lifted by means of valve caps as these are not designed to carry the weight.
(iv) The containers should not be allowed to strike against each other or against any hard object.
(v) Vehicles should be braked and isolated against any movement.
(vi) After loading, the containers should be secured properly with the help of wooden wedges, rope or sling wire so that they do not roll away.
(vii) The containers should never be dropped directly to the ground or on the tyre from the vehicle.
(viii) There should be no sharp projection in the vehicle.
(ix) Containers must have valve caps and plugs fitted properly.
(x) Check containers for leakage before loading/unloading.

1.6. Transportation of Container

(i) The name of the chemical along with diamond pictorial sign denoting the dangerous goods should be marked on the vehicle.
(ii) The name of the transporter, his address and telephone number should be clearly written on the vehicle.
(iii) The vehicle should not be used to transport any material other than what is written on it. d. Only trained drivers and cleaners should transport hazardous chemical
(iv) The driver should not transport any leaking cylinder.
(v) The cylinder should not project outside the vehicle.
(vi) The transporter must ensure that every vehicle driver must carry “Trem Card” (Transport Emergency Card) and ‘Instructions in writing booklet’ and follow them.
(vii) Every driver must carry safety appliances with him, viz; Emergency kit, breathing apparatus etc.
(viii) The vehicles must be driven carefully, specially in crowded localities and on bumpy roads. Do not apply sudden brakes.
(ix) Check for the leakage from time to time.

(x) k. In the case of uncontrollable leakage the vehicle should be taken to an open area where there is less population.

1.7. Emergency Kit It consists of various tools and appliances like gaskets, yokes, studs, tie rods hoods, clamps, spanners, mild steel channels, screws, pins, wooden pegs etc. of standard sizes. Separate kits are used for cylinders and tonners. All the gadgets are designed for using in controlling or stopping the leakages from valves, fusible plug and side walls of cylinders and containers used for handling chlorine.

(i) Leakage may occur through the valve. There are basically four types of valve leaks.
   a. Valve packing
   b. II. Valve seat
   c. Defective inlet thread
   d. Broken valve thread

(ii) Leakage may occur through container wall. For controlling such leakages, clamps are used for cylinders and chain and yoke arrangement is used for tonner. Sometimes wooden peg is used by driving into the leaking hole as a temporary arrangement.

(iii) Leakage may occur through fusible plug.
   a. If the leakage is through the threads of fusible plug, yoke, hood and cap nut arrangement is used to control the leak.
   b. If fusible metal itself in the plug is leaking, yoke and stud arrangement is used to control the leak.

1. First Aid to be Provided for a Person Affected by Chlorine

a. General Remove the affected person immediately to an uncontaminated area. Remove contaminated clothing and wash contaminated parts of the body with soap and plenty of water. Lay down the affected person in cardiac position and keep him warm. Call a physician for medical assistance at the earliest. Caution: Never attempt to neutralize chlorine with other chemicals.

b. Skin Contact. Remove the contaminated clothes, wash the affected skin with large quantity of water. Caution: No ointment should be applied unless prescribed by the physician.

c. Eye Contact If eyes get affected with liquid chlorine or high concentration of chlorine gas, they must be flushed immediately with running water for atleast 15 minutes keeping the eyelids open by hand. Caution: No ointment should be used unless prescribed by an eye specialist.

d. Inhalation If the victim is conscious, take him to a quiet place and lay him down on his back, with head and back elevated (cardiac position). Loosen his clothes and keep him warm using blankets. Give him tea, coffee, milk, peppermint etc. for making good effect on breathing system. If the victim is unconscious, but breathing, lay him down in the position mentioned above and give oxygen at low pressure until the arrival of doctor. If breathing has stopped, quickly stretch him out on the ground or a blanket if available, loosen his collar and belt and start artificial respiration without delay. Neilson arm lift back pressure method is useful. Automatic artificial respiration is preferable if available. Continue the respiration until the arrival of the doctor. Amboo bag can also be used for this purpose.

3. On-Site Emergency Plan to Cover the Leakage ofChlorine

3.1. Introduction As chlorine is a hazardous chemical, handling and storage of it demand adequate precautions to avoid possible hazards. Leakage of chlorine may develop into a major emergency. Therefore the emergency procedure to cover this eventuality is essential. It is drawn in the form of on-site emergency plan. The elements of onsite emergency plan are as follows:

3.2. Identification of Hazard Chart
In this case the site risk is evaluated by the expert and the extent of the probable damage is calculated on the basis of stored chlorine quantity, nearby population, wind direction, type of equipment failure etc. For this purpose hazard analysis is conducted in which case all the hazardous properties of chlorine are considered. If evacuation is required, the range of it is calculated.

3.3. Appointing Key Persons In order to control the incident like chlorine leakage, it is essential to appoint various persons with their well-defined responsibilities. Taking into account the various activities likely to be involved, the following key persons are appointed (i) Site Controller, (ii) Incident controller, (iii) Shift Executive In charge, (iv) Communication Officer, (v) Safety Officer, (vi) Fire and Security Officer, (vii) Utilities and Services In charge, (viii) Traffic Controller, (ix) First Aider.

3.4. Assembly Points These points are set up where persons from the plant would assemble in case of chlorine leakage. At these points the in-charge for counting the heads will be available.

3.5. Emergency Control Center
The control centre is the focal point in case of an emergency from where the operations to handle the emergency from are directed and coordinated. It contains site plan, telephone lines, public address system, safety equipment, first aid boxes, loud speaker, torches, list of essential telephone numbers, viz. fire brigade, police, hospital, civil defence, collector, factory inspector, organizational authorities, chlorine suppliers, mutual aid group, social workers, list of key persons and their addresses, copy of chemical fact sheet, location plan of fire hydrant, details of dispersion model of chlorine gas, population distribution pattern, location of alarm system.

3.6. Procedure to Meet Emergency
The actions to be taken by the staff and authority are given below; Emergency Alarm: An audible emergency alarm system is installed throughout the plant. On hearing the alarm the incident controller will activate the public address system to communicate with the staff about the emergency and give specific instructions for evacuations etc. anyone can report the occurrence of chlorine leakage to section in-charge or incident controller through telephone or intercom or in person.

3.7. Communication
Communication officer shall establish the communication suitable to that incident.

3.8. Services
For quickness and efficient operation of emergency plan the plant is divided into convenient number of zones and clearly marked on the plan. These are emergency services viz. fire fighting, first aid, rescue, alternative source of power supply, communication with local bodies etc. The incident controller will hand over the charge to the site controller of all these coordinating activities, when the site controller appears on the site. The site controller will coordinate all the activities of the key persons. On hearing the emergency alarm system all the key persons will take their charge. Incase of their absence other alternatives are nominated. The person nominated for personnel and administration purposes will be responsible for informing all statutory authorities,

keeping account of all persons in the plant including contract labour, casual workers and visitors. He will be responsible for giving information to press or any outside agencies. He is also responsible for organizing canteen facilities and keeping informed the families of affected persons. The person nominated as security officer should guide police, fire fighting and control the vehicle entries. The site controller or any other nominated person will announce resumption of normalcy after everything is brought under control. The onsite emergency plan needs to be evaluated by mock drill. Any weaknesses noticed during such drills should be noted and the plan is modified to eliminate the weaknesses.

3.9. Emergency

Measures In case of leakage or spillage of Chlorine, the following emergency measures should be taken:

a. Take a shallow breath and keep eyes opened to a minimum.
b. Evacuate the area.
c. Investigate the leak with proper gas mask and other appropriate Personal protection.
d. The investigator must be watched by a rescuer to rescue him in emergency.
e. If liquid leak occurs, turn the containers so as to leak only gas.
f. In case of major leakage, all persons including neighbours should be warned.
g. As the escaping gas is carried in the direction of the wind all persons should be moved in a direction opposite to that of the wind. Nose should be covered with wet handkerchief.
h. Under no circumstances should water or other liquid be directed towards leaking containers, because water makes the leak worse due to corrosive effect.
i. The spillage should be controlled for evaporation by spraying chilled water having temperature below 9.4oC. With this water crystalline hydrates are formed which will temporarily avoid evaporation. Then try to neutralize the spillage by caustic soda or soda ash or hydrated lime solution carefully. If fluroprotein foam is available, use for preventing the evaporation of liquid chlorine.
j. Use emergency kit for controlling the leak.
k. On controlling the leakage, use the container in the system or neutralize the contents in alkali solution such as caustic soda, soda ash or hydrated lime. Caution: Keep the supply of caustic soda or soda ash or hydrated lime available. Do not push the leaking container in the alkali tank. Connect the container to the tank by barometric leg.
l. If container commences leak during transport, it should be carried on to its destination or manufacturer or to remote place where it will be less harmful. Keeping the vehicle moving will prevent accumulation of high concentrations.
m. Only specially trained and equipped workers should deal with emergency arising due to major leakage.
n. If major leak takes place, alert the public nearby by sounding the siren.
o. Any minor leakage must be attended immediately or it will become worse.
p. If the leakage is in the process system, stop the valve on the container at once.

3.10. Safety Systems Required at Chlorination Plant

The following safety systems should be kept ready at the chlorination plant:

a. Breathing apparatus.
b. Emergency kit.
c. Leak detectors.

d. Neutralisation tank.
e. Siren system.
f. Display of boards in local language for public cautioning, first aid and list of different authorities with phone numbers.
g. Communication system.
h. Tagging system for equipments.
i. First aid including tablets and cough mixtures.
j. Exhaust fans.
k. Testing of pressure vessels, chlorine lines etc. every year as per factory act.
l. Training & mock drill.
m. Safety showers.
n. Eye fountain.
o. Personal protective equipment.
p. Protecting hoods for ton-containers.
q. Fire extinguishers.
r. Wind cock.

Appendix 26:

A. Results of Public Consultation Conducted During Project Preparation in Sirohi in October 2018

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
1.	Govind Singh, Shaitan Goswami, Gatejaram, Ganeshram, Khetaram etc.	Teen Batti	Awareness of the project– including Project Coverage area, Present condition of water supply in the town 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. Dust and noise pollution and disturbances during construction work. Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities.	People are aware of the proposed Project of water supply & sewerage in the town. Present water supply is very erratic. The quality of water is poor. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor & flouridated. People demand 24x7 supply connections to be provided to their area under the proposed. They are willing to pay for getting regular potable water. People are concerned about the poor sewerage conditions in the town. There is not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Requirement of enhancement of other facilities Environmental Health & hygiene Willingness to pay for improved services.	The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not prone for such incidences. Solid waste collection facility is poor in this area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. No need to cut the trees, Afforestation/ plantation activities provides shade, shelter and enhance the biodiversity in the area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Traffic density is slightly

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				higher near the area due to highway. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks play grounds and Community halls are required in this town and in addition. By the proposed project of water supply and sewerage, environmental health and hygiene will be improved. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.
2.	Teer Singh, Dargaram, Laxman Ram, Annamma & Modaram	Angore	Awareness of the project-including Project Coverage area. Present condition of water supply & Sewerage. 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. Drainage and sewerage problem facing.	People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Present drinking water problem-quantity and quality Dust and noise pollution and disturbances during construction work. Public Health by proposed water supply & Sewerage subproject Present solid waste collection and disposal problem. Setting up worker camp site within the village/ project locality Plantation measures in nearby the area. Safety of residents during construction phase and applying of vehicle for construction activities. Requirement of enhancement of other facilities. Willingness to pay for improved services.	quality is poor and flouridated. People use RO water for drinking purposes. 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 not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. Drainage and sewerage condition is poor in the town and flow in open drains. Water supply in the town is very erratic & quality of water is poor. Fluoride content is reported. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. PPE's will be mandatory for engaged workers at site. Traffic density is very low in the area. By the proposed project of water supply & sewerage in the town, health of public

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				will be improved. Sanitation will be improved by measures of sewage treatment & Management. There is enough space available nearby the project area to establish labour camp. People suggested to establish the worker camp away from the habitation so there is no conflict and disturbances. People want to plantation programme in the town and ensure the aftercare measures such as watering and manuring etc. 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 CAPC and outreach team of contractor before start of work in particular area. The local feels that Parks, play grounds and Community halls are required in this town and in addition. People are willing to pay for improved services in the town. By the proposed project, people of the town will be benefitted.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
3.	Rohit Mali, Narendra Kumar Jain, Om Prakash, Kamlesh Kumar & Jaswant Mali	Kalkaji, Sirohi	Awareness of the project-including Project Coverage area. Present condition of water supply & Sewerage. In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Drainage and sewerage problem facing. Present drinking water problem-quantity and quality Presence of historical/ cultural/religious sites nearby. Unfavorable climatic condition. Occurrence of flood, earthquake etc. Present solid waste collection and disposal problem. Dust and noise pollution and disturbances during construction work. Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities. Requirement of enhancement of other facilities Willingness to pay for improved services.	People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor with slightly flouridated. 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 not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. Drainage and sewerage condition is poor in the town and flow in open drains. Water supply is very erratic. The quality of water is poor. The

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				quality of water is poor. Fluoride content is reported. The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not prone for such incidences. Solid waste collection facility is poor in this area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. No need to cut the trees, plantation activities provides shade, shelter and enhance the biodiversity in the area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				congestion. Traffic density is normal or low in the area. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks play grounds and Community halls are required in this town and in addition. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.
4.	Suryakant Mishra, Kailash Bairwa, Rekharam, Manohar Singh & Manusingh	Nehru Nagar, Sirohi	Awareness of the project-including Project Coverage area. Present condition of water supply & Sewerage. In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Drainage and sewerage problem facing. Present drinking water problem-quantity and quality Presence of historical/ cultural/religious sites nearby. Unfavorable climatic condition.	People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor with slightly flouridated. People demand 24x7 supply connections to be provided to their

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Occurrence of flood, earthquake etc. Present solid waste collection and disposal problem. Dust and noise pollution and disturbances during construction work. Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities. Foul Smell & Vector Borne diseases etc. Environmental Health & Hygiene STP treated water management Requirement of enhancement of other facilities Willingness to pay for improved services.	area under the proposed. They want to engage with the project as a job opportunity and want to become beneficiaries. There is not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. Drainage and sewerage condition is poor in the town and flow in open drains. Water supply is very erratic. The quality of water is poor. The quality of water is poor. Fluoride content is reported. They are willing to pay for getting regular potable water. The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not prone for such incidences. Solid waste collection facility is poor in this area.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. No need to cut the trees, plantation activities provides shade, shelter and enhance the biodiversity in the area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Traffic density is low in the area. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. Foul smell and vector borne diseases will be mitigated by the proposed project of sewerage in the town. All the municipal waste will be properly treated and managed. This will

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				improve the quality of environment. By the proposed project of water supply and sewerage in the town, improve the quality of environment, health and hygiene. Treated water from STP will be use in agricultural activities etc. The locals feel that Parks play grounds and Community halls are required in this town and in addition. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.
5.	Dheeraj Kumar, Mahendra Rao, Jagdish Bhai, Sunil Pal & Ram Singh	Rampura, Sirohi	Awareness of the project-including Project Coverage area. Present condition of water supply & Sewerage. In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Drainage and sewerage problem facing. Present drinking water problem-quantity and quality	People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. 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

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Presence of historical/ cultural/religious sites nearby. Unfavorable climatic condition. Occurrence of flood, earthquake etc. Present solid waste collection and disposal problem. Dust and noise pollution and disturbances during construction work. Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities. Environmental Health & Hygiene Requirement of enhancement of other facilities Willingness to pay for improved services.	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 not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. Drainage and sewerage condition is poor in the town and flow in open drains. Water supply is very erratic. The quality of water is poor. The quality of water is poor. They are willing to pay for getting regular potable water. The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not prone for such incidences. Solid waste collection facility is poor in this area.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. Plantation / afforestation activities provides shade, shelter and enhance the biodiversity in the area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. The problem of traffic is not seen in the area. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. By the proposed project of water supply and sewerage in the town, improve the quality of environment, health and hygiene.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				The locals feel that Parks play grounds and Community halls are required in this town and in addition. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.
6.	Ankur Rawal, Gopal Mali, Arvind Rawal, Ashok Rao & Kishna Ram	Sarneshwar, Sirohi	Awareness of the project– including Project Coverage area, Present condition of water supply in the town 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. Dust and noise pollution and disturbances during construction work.	People are aware of the proposed Project of water supply and sewerage in the town. Present water supply is very erratic. The quality of water is poor. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor & fouridated. People demand 24x7 supply connections to be provided to their area under the proposed. They are willing to pay for getting regular potable water. People are concerned about the poor sewerage conditions in the town. There is not any forest, wildlife or any sensitive /unique environmental,

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities. Requirement of enhancement of other facilities Willingness to pay for improved services.	component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not prone for such incidences. Solid waste collection facility is poor in this area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. No need to cut the trees, plantation activities in the area provides shade, shelter and enhance the local biodiversity in the area.

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Traffic density in very low. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks play grounds and Community halls are required in this town and in addition. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.
7.	Ajay Rawat, Bhanumati, Praveen Kumar, Dinesh Kumar & Mahendra Kumar	STP-2, Revdar Road	Awareness of the project-including Project Coverage area. Present condition of water supply & Sewerage. In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Drainage and sewerage problem facing.	People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
			Present drinking water problem-quantity and quality Presence of historical/ cultural/religious sites nearby. Unfavorable climatic condition. Occurrence of flood, earthquake etc. Present solid waste collection and disposal problem. Dust and noise pollution and disturbances during construction work. Perception of villagers on tree felling and afforestation Safety of residents during construction phase and applying of vehicle for construction activities. Foul Smell & Vector Borne diseases etc. Environmental Health & Hygiene STP treated water management Requirement of enhancement of other facilities Willingness to pay for improved services.	supply is erratic and quality is poor with slightly flouridated. 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 not any forest, wildlife or any sensitive /unique environmental, component near the project area. There are not any historical/cultural and religious sites in nearby the subproject area. Drainage and sewerage condition is poor in the town and flow in open drains. Water supply is very erratic. The quality of water is poor. The quality of water is poor. Fluoride content is reported. They are willing to pay for getting regular potable water. The climate of Sirohi varies between dry and partially sub-humid. There are no natural disasters such as flood and earthquake occurred in recent past. The area is not

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				prone for such incidences. Solid waste collection facility is poor in this area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. No need to cut the trees, plantation activities provides shade, shelter and enhance the biodiversity in the area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Traffic density is low in the area. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. Foul smell and vector borne diseases will be

S.No	Name of Persons	Location	Topic Discussed	Response/Outcome
				mitigated by the proposed project of sewerage in the town. All the municipal waste will be properly treated and managed. This will improve the quality of environment. By the proposed project of water supply and sewerage in the town, improve the quality of environment, health and hygiene. Treated water from STP will be use in agricultural activities etc. The locals feel that Parks play grounds and Community halls are required in this town and in addition. People are willing to pay for the improved services in the town, there will no problem face out by the proposed project of water supply & sewerage in the town but benefitted by the project.

Photographs of Public Consultation

Angore Village

Rampura

STP 1Near Nehru Nagar

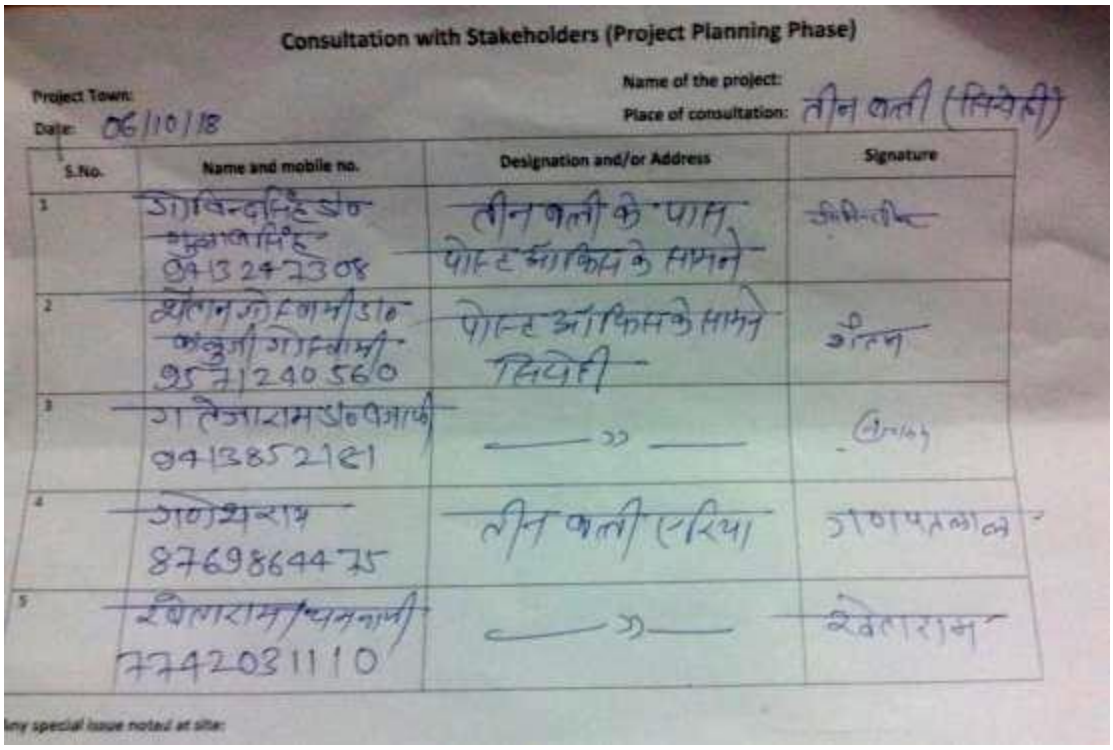
Kalkaji

Near Nehru Colony

STP-2 Near Revdar Road

Teen Batti

Attendance Sheet-Sirohi

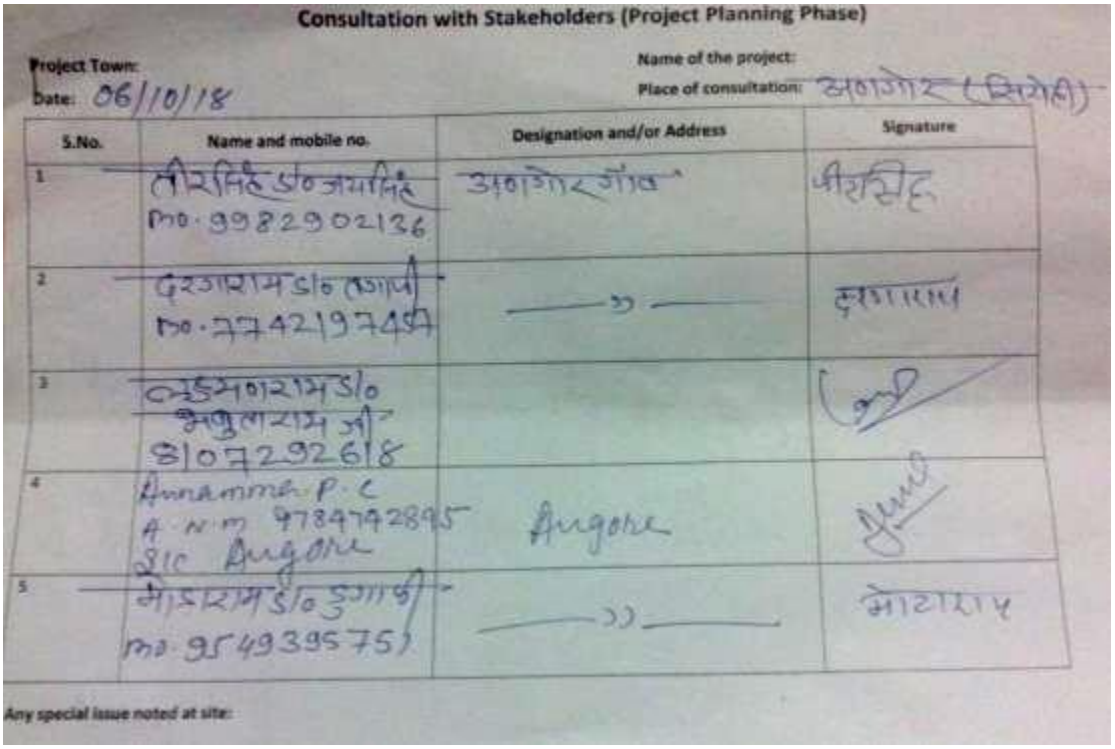


Consultation with Stakeholders (Project Planning Phase)

Project Town:
Date: 06/10/18
Name of the project:
Place of consultation: तीन पत्ती (सिरोही)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	गोविन्दसिंह डोड भुवानसिंह 9413247308	तीन पत्ती के पास, पोस्ट ऑफिस के सामने	
2	श्रेयान्स कोठारी डोड अनुजा गोस्वामी 9571240560	पोस्ट ऑफिस के सामने सिरोही	
3	ग तेजाराम डोड पंजाबी 9413852181	—»—	
4	गणेश राम 8769864475	तीन पत्ती एरिया	
5	देवाराम पंचनामी 7742031110	—»—	देवाराम

Any special issue noted at site:

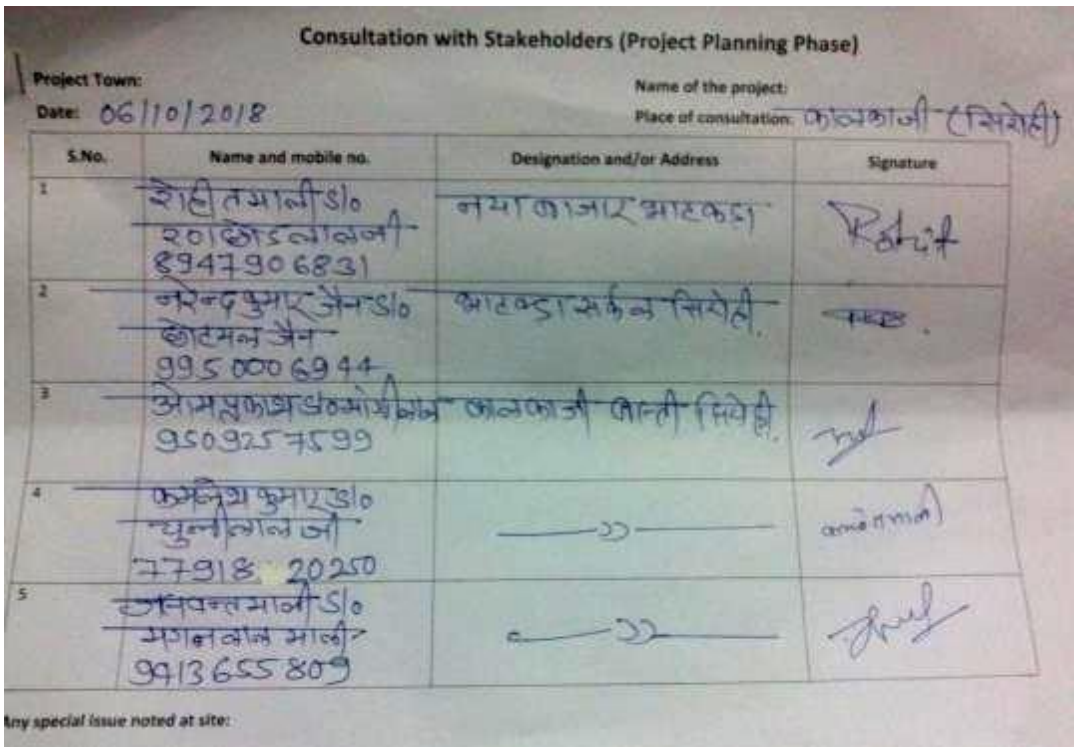


Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/18
Place of consultation: अणगोर (सिरोही)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	वीरसिंह s/o जयसिंह m० 9982902136	अणगोर गाँव	वीरसिंह
2	दुर्गाराम s/o (illegible) m० 7742197457	—»—	दुर्गाराम
3	(illegible) भंवरलाराम जी 8107292618		
4	Annamma P.C A.N.M 9784792895 SIC Angore	Angore	
5	मोटाराम s/o दुर्गाजी m० 9549395751	—»—	मोटाराम

Any special issue noted at site:

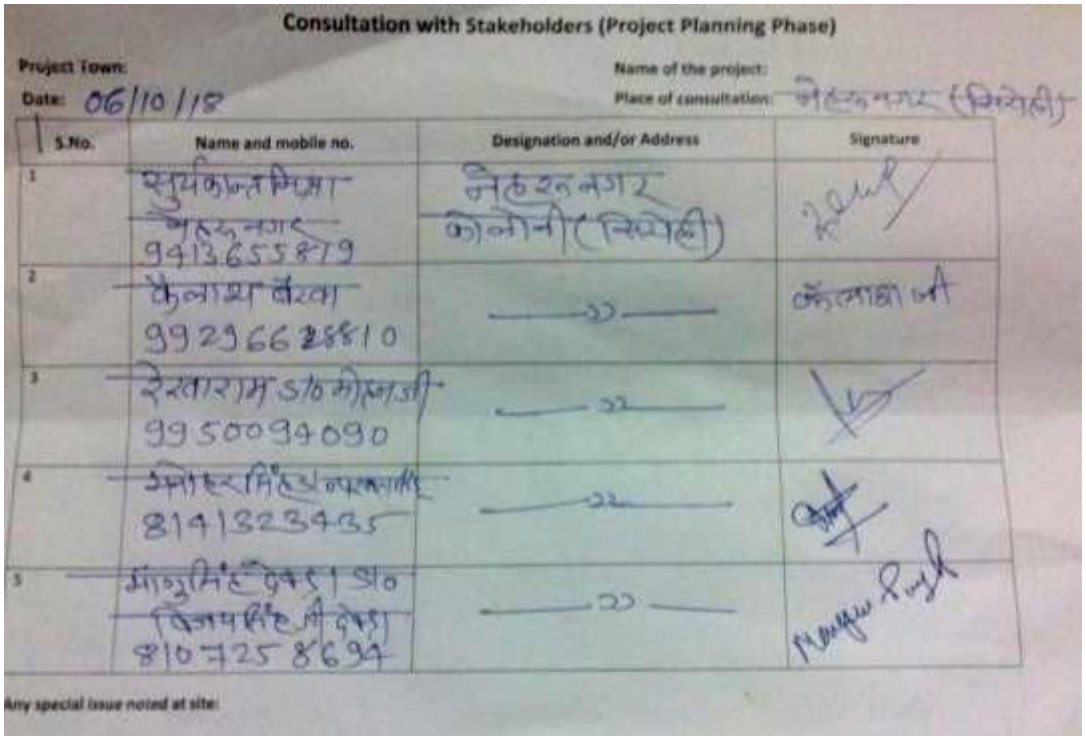


Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/2018
Place of consultation: कालकाजी (सिरोही)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	रोहितमाली s/o रावलोडलालजी 8947906831	नया बाजार आहड़ा	Rohit
2	नरेन्द्रकुमार जैन s/o छोटमल जैन 9950006944	आहड़ा सर्कल सिरोही	
3	ओमप्रकाश s/o मांगीलाल कालकाजी (वाली) सिरोही 9509257599		
4	कमलेश कुमार s/o चुन्नीलाल जी 7791820250	—»—	
5	शिवन्तमाली s/o भगवानलाल माली 9413655809	—»—	

Any special issue noted at site:

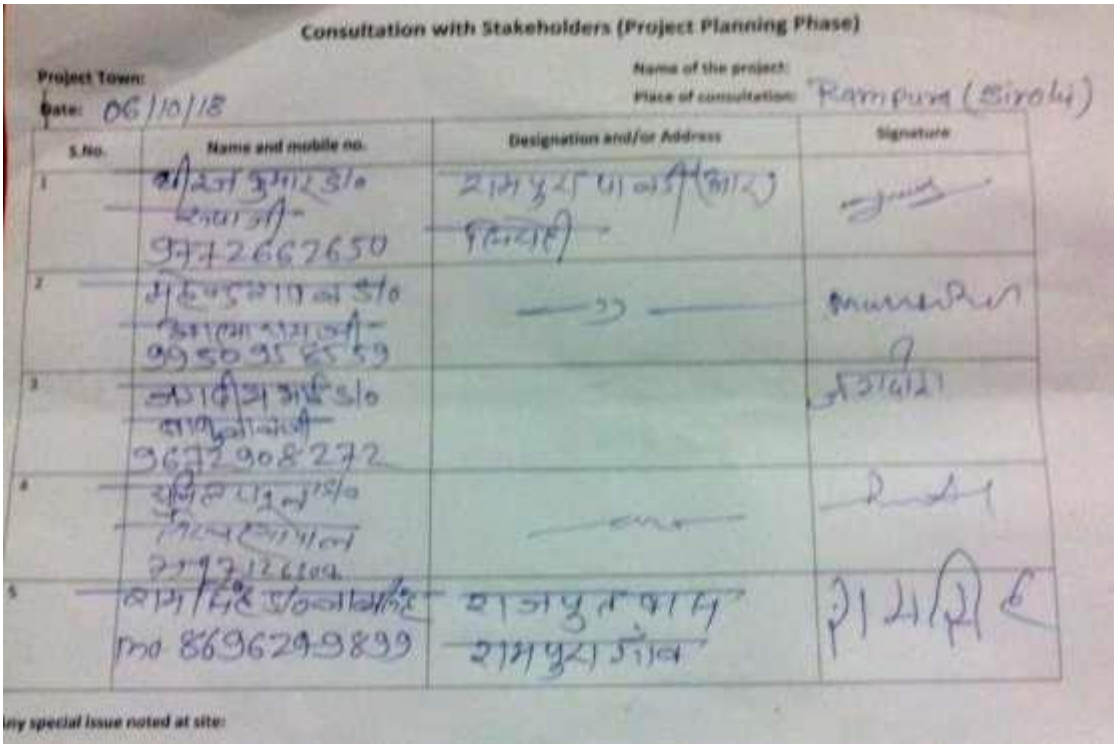


Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/18
Place of consultation: नेहरूनगर (सिरोही)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	सुधिकान्त मिश्रा नेहरूनगर 9413655879	नेहरूनगर कॉलोनी (सिरोही)	
2	कैलाश देवरा 9929662810	—"—	
3	देवाराम S/o मोलाजी- 9950094090	—"—	
4	शेरसिंह S/o नथाजी 8141323435	—"—	
5	मानुसिंह देवड़ा S/o विजयसिंह जी देवड़ा 8107258699	—"—	

Any special issue noted at site:

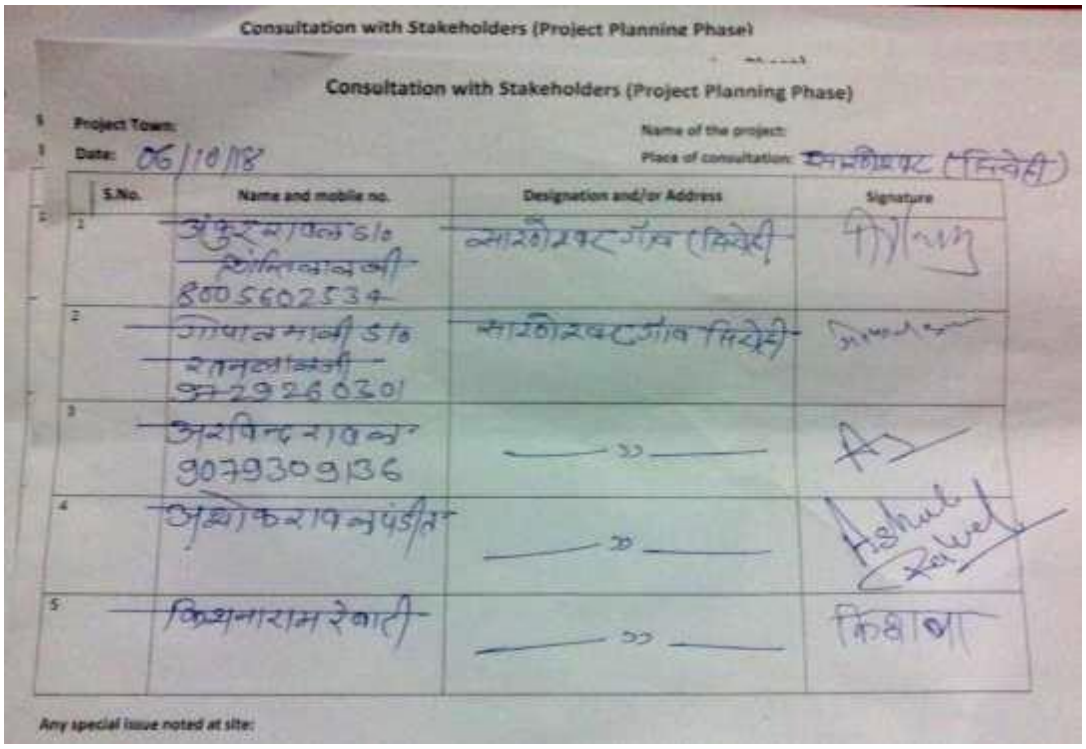


Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/18
Place of consultation: Rampura (Sirohi)

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	[illegible] S/o [illegible] 9772667650	रामपुरा पाल्डी (आर) सिरोही	
2	[illegible] S/o [illegible] 9950958559	—"—	
3	[illegible] S/o [illegible] 9672908272		
4	[illegible] S/o [illegible] 9772122604	—"—	
5	[illegible] Rno 8696299899	राजपुत पाल रामपुरा गांव	

Any special issue noted at site:



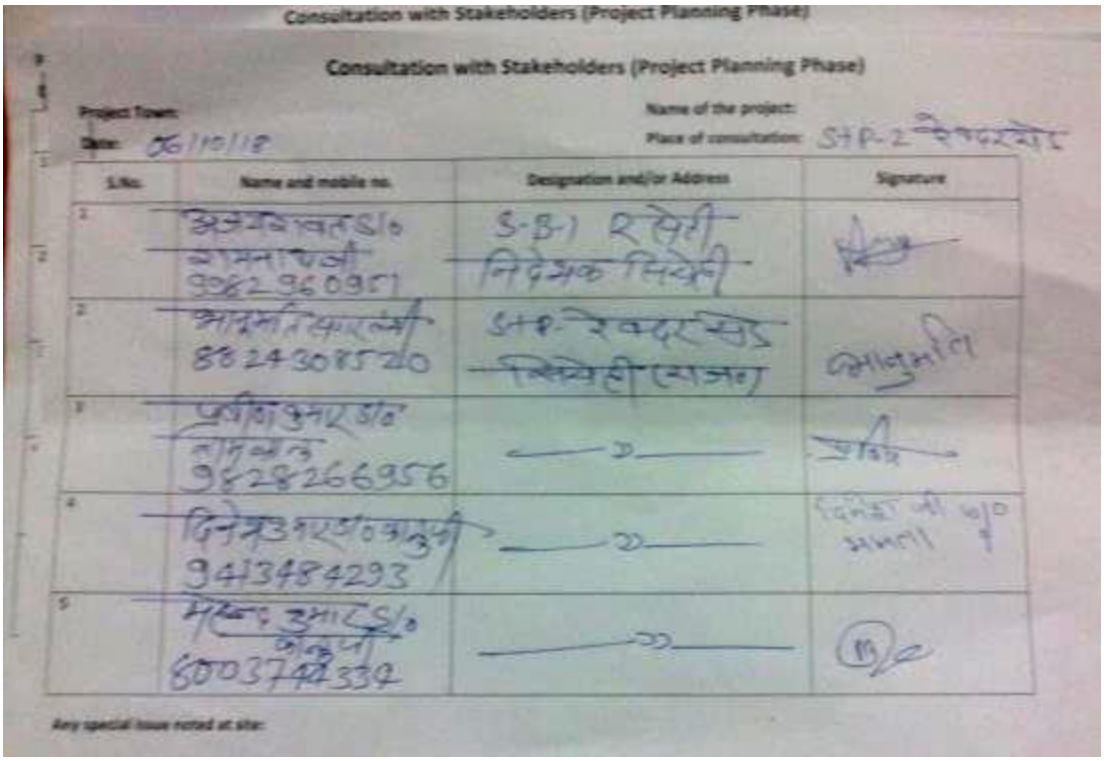
Consultation with Stakeholders (Project Planning Phase)

Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/18
Place of consultation: [illegible]

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	[illegible] 8005602534	[illegible]	
2	[illegible] 9929260301	[illegible]	
3	[illegible] 9079309136	"	
4	[illegible]	"	
5	[illegible]	"	

Any special issue noted at site:



Consultation with Stakeholders (Project Planning Phase)

Consultation with Stakeholders (Project Planning Phase)

Project Town:
Name of the project:
Date: 06/10/18
Place of consultation: [illegible]

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	[illegible] 9982960951	[illegible]	
2	[illegible] 8824308520	[illegible]	
3	[illegible] 9828266956	"	
4	[illegible] 9413484293	"	
5	[illegible] 8003744334	"	

Any special issue noted at site:

B. Stakeholders and Public Consultation Conducted in April 2018

During design stage site visit was conducted to assess potential social and environmental impacts of proposed components. Discussions with public including vendors, shopkeepers and hawkers were held to understand their perception about the proposed works and their co-operation during implementation of project. During consultations it was found that most of the public is aware about the proposed works and shown their interest to co-operate during construction works. Details of public consultations are given below

Sr. No	Name of Persons	Location	Topic Discussed	Outcome
1	Vishnu Garg, A.En, PHED, Anoop Agarwal J.En. PHED, Mahendra Choudhary A.En. MC **Sirohi** Mohan Lal Meena JEn MC **Sirohi**.	Nagar Parishad & Campus PHED	Proposed water supply and sewerage works and availability of land, R&R issues etc**.**	Meeting with PHED and Nagar Parishad officials and discussion were done about Proposed project under phase-4. PHED officers assured of their full cooperation with RUIDP during planning and implementation of the project
2	Ramesh Singvi, Subhash Chandra Mali, Kuldeep Rathod, V.K. Trivedi,Manu Bhai Mewada, Rajeev Vyas, N.S. Rathod	Shanti Nagar	1) Present Status of Water Supply and sewerage in the town 2) Work Proposed by RUIDP 3) Quality of present Water Supply. 4) Willingness to pay for improved services	1) People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. No sewerage system exist. 2) People are supportive of the project. 3) People are willing to pay for improved services.
3	Tara Chand Mali, D.S. Chauhan, Aanand Mewada, Vipul Chepa, Kanti Lal Mali,	Bedhnath Colony (Mali Samaj Road)	1) Present Status of Water Supply in the town 2) Work Proposed by RUIDP 3) Quality of present Water Supply. 4) Willingness to pay for improved services	1) Water supply is intermittent and on alternate days. 2) People are willing to pay for the improved quality of water and sewerage. People understand direct benefits of the project
4	Kishan Prajapat, Kamlesh Prajapat, Chhagan Meghwal, Abid Husain, Imtiaz Khan, Moh. Irfan	Dr.Samporn and Colony	1) Present Status of Water Supply in the town 2) Work Proposed by RUIDP	1) People are supportive of the project and indicated their willingness to participate in the project to make it successful. (especially women)

Sr. No	Name of Persons	Location	Topic Discussed	Outcome
			3) Quality of present Water Supply. 4) Willingness to pay for improved services	2) People understand direct benefits along with latent benefits of the project
5	Prakash Parihar, Inder Meghwal, Gopal Meghwal, Altaf Khan, Ramesh Meghwal	South Meghwalbas	1) Present Status of Water Supply and sanitation in the town 2) Work Proposed by RUIDP 3) Quality of present Water Supply. 4) Willingness to pay for improved services	1) Poor supply and quality of water are persistent problem. No sewer exist in the town. 2) People are supportive of the project and indicated their willingness to participate (especially women); they are willing to pay for improved services.

Meeting with Sirohi EO (Nagar Palika) & Other Officers of PHED

Consultation with Persons engaged in Fisheries work near Angor Dam

Consultation with Local Persons Near Kalki Dam

Consultation with Local Persons Near WTP site

Consultation with Local Persons near Tulsi Nagar

Opposite Bus Stand Road and Discussion with Street Vendors-Sirohi

Market Area nearby Bus Stand and Discussion with Street Vendors- Sirohi

C. City level Stakeholder Committee (CLC) Meeting. City stakeholder committee meeting was organized in Udaipur on Dtd. 25.08.2017 to discuss the matter of proposed sewerage works in Sirohi under the chairmanship of District Collector, Sirohi in presence of consultants, RUIDP officials, PHED officials and other invitee members. Proposed scope of works and technology was discussed in the meeting and it was decided that treated effluent shall be reused by Municipal Council in beneficial uses.

Appendix 27:
Minutes of CLC Meeting at Sirohi Dated 25 August 2017

RUIDP

राजस्थान सरकार
कार्यालय अधिशाषी अभियन्ता, उदयपुर
राजस्थान शहरी आधारभूत विकास परियोजना (आर.यू.आई.डी.पी.)
173, Vakil Colony, Opp. Income Tax Colony, Hiran Magri Sec. No. 11, Udaipur- 313002
web site : www.ruidp.rajasthan.gov.in Phone No. 0294-2481721 E-mail – ipiu.udaipur@gmail.com

सिटी लेवल कमेटी मिटिंग दिनांक 25.08.2017 सिरोही
आर.यू.आई.डी.पी. फेस चतुर्थ की बैठक कार्यवाही विवरण

आरयूआईडीपी चतुर्थ चरण के अन्तर्गत जलप्रदाय एवं सीवरेज योजना पर विस्तृत चर्चा हेतु जिला कलेक्टर, सिरोही की अध्यक्षता में दिनांक 25.08.2017 को सिटी लेवल कमेटी की बैठक आयोजित की गई। सलाहकार फर्म द्वारा प्रजेन्टेशन के माध्यम से योजना के अन्तर्गत किए जाने वाले कार्यो की विस्तृत जानकारी दी गई। नगर पालिका, आबूरोड एवं सिरोही द्वारा नियुक्त सलाहकार फर्म के द्वारा जलप्रदाय एवं सीवरेज योजना की विस्तृत परियोजना रिपोर्ट बनवाई जा रही है। आरयूआईडीपी द्वारा इन विस्तृत परियोजना रिपोर्ट की समीक्षा की जावेगी। बैठक मे उपस्थित जनप्रतिनिधियों एवं अधिकारियों की सूची अनुच्छेद–अ पर संलग्न है। सलाहकार द्वारा निम्नलिखित प्रस्तावित जलप्रदाय व सीवरेज योजना के कार्यो पर प्रस्तुतिकरण दिया गया:–

आबूरोड

(अ) जल प्रदाय कार्य :– शहरी क्षेत्र मे पानी की छीजत (NRW-Non Revenue Water) को कम करने के साथ उचित दबाव के साथ निर्बाध जल वितरण करने का प्रावधान रखा गया है। इस जल वितरण प्रणाली के अन्तर्गत निम्नलिखित कार्य प्रस्तावित किये गये है :–

- वाटर ट्रीटमेन्ट प्लांट – 10 एम.एल.डी. (Near Santpur)
- ट्रांसमिशन मेन – डीआई के–9 (100 एम.एम से 450 एम.एम व्यास) की पाईप लाईन – 53 किमी
- सी.डब्लू.आर. – 6.2 एम.एल.
- ड्रिस्टीब्यूशन मेन – एच.डी.पी.ई. (75 एम.एम से 355 एम.एम व्यास) की पाईप लाईन – 127 किमी
- हाउस सर्विस कनेक्शन – 15500 कनेक्शन

(ब) सीवरेज कार्य :– इस परियोजना के अन्तर्गत निम्नलिखित निर्माण कार्य प्रस्तावित किये गये है :–

- एच.डी.पी.ई. – (200 एम.एम से 315 एम.एम व्यास) की पाईप लाईन – 103.5 किमी
- आर.सी.सी एन.पी–4 – (400 एम.एम से 500 एम.एम व्यास) की पाईप लाईन – 2.1 किमी
- एच.डी.पी.ई. (Trenchless) – (200 एम.एम से 700 एम.एम व्यास) की पाईप लाईन – 5.2 किमी
- सीवरेज ट्रीटमेन्ट प्लांट (एसबीआर टेक्नोलॉजी) – 7.0 MLD (Near Santpur)
  2.0 MLD (Near Aakhar Bhata)

उपरोक्त कार्यों की विस्तृत परियोजना रिपोर्ट की अनुमानित लागत राशि रूपये 167 करोड है।

सिरोही

(अ) जल प्रदाय कार्य :– जिसके अन्तर्गत शहरी क्षेत्र मे पानी की छीजत (NRW-Non Revenue Water) को कम करने के साथ उचित दबाव के साथ निर्बाध जल वितरण करने का प्रावधान रखा गया है। इस जल वितरण प्रणाली के अन्तर्गत निम्नलिखित कार्य प्रस्तावित किये गये है :–

- वाटर ट्रीटमेन्ट प्लांट – 8 एम.एल.डी.
- ट्रांसमिशन मेन – डीआई के – 9 (100 एम.एम से 450 एम.एम व्यास) की पाईप लाईन –27 किमी
- सी.डब्लू.आर. – 5.0 एम.एल.
- ड्रिस्टीब्यूशन मेन – एच.डी.पी.ई. (75 एम.एम से 355 एम.एम व्यास) की पाईप लाईन – 95 किमी
- हाउस सर्विस कनेक्शन – 12000 कनेक्शन

(ब) सीवरेज कार्य :– इस परियोजना के अन्तर्गत निम्नलिखित निर्माण कार्य प्रस्तावित किये गये है :–

- एच.डी.पी.ई. – (200 एम.एम से 315 एम.एम व्यास) की पाईप लाईन – 98 किमी
- आर.सी.सी एन.पी–4 – (350 एम.एम से 500 एम.एम व्यास) की पाईप लाईन – 2.6 किमी
- एच.डी.पी.ई. (Trenchless) – (200 एम.एम से 450 एम.एम व्यास) की पाईप लाईन – 5.6 किमी
- सीवरेज ट्रीटमेन्ट प्लांट (एमबीआर टेक्नोलॉजी) – 4.0 MLD(Near Nehru Nagar)
  1.5 MLD (On Revdar road)

उपरोक्त कार्यों की विस्तृत परियोजना रिपोर्ट की अनुमानित लागत राशि रूपये 129 करोड है।

बैठक मे निम्न बिन्दुओं पर चर्चा की गई एवं निर्णय लिया गया –

1. चेयरमैन, नगर पालिका द्वारा आबूरोड़ शहर के समीप 6 गांवों की भी मांग को इस परियोजना में सम्मिलित करने की मांग की गई। चूंकि शहर के समीप भैंसासिंह बांध के अलावा अन्य कोई स्त्रोत उपलब्ध नहीं है तथा यह 6 गांव शहर के समीप स्थित है अतः समिति द्वारा बैठक में चर्चा के दौरान इस मुद्दे पर विचारविमर्श कर इन 6 गांवों को जो कि इस परियोजना में सम्मिलित करने का निर्णय किया गया। इस हेतु पीने योग्य पानी को स्वच्छ जलाशय के आउट लैट पर उपलब्ध करवाया जावेगा एवं गांवों को पेयजल उपलब्ध करवाने के समस्त कार्य जन.स्वा.अभि. विभाग द्वारा करवाए जायेंगे क्योंकि आरयूआईडीपी द्वारा शहरी क्षेत्र के लिए ही कार्य किए जाने का प्रावधान है।
2. परियोजना के अन्तर्गत अण्गौर बांध से 95 MCFT पानी का प्रावधान रखा गया है, लेकिन सिरोही शहर की जलापूर्ति हेतु जल संसाधन विभाग द्वारा विगत वर्षों में औसतन 65 MCFT पानी ही अण्गौर बांध से जलदाय विभाग को दिया जाता है। अण्गौर बांध में विगत कुछ वर्षों में पानी की आवक कम होने के कारण वर्ष 2014–15 में मात्र 65 MCFT पानी ही उपलब्ध हो पाया था अतः अण्गौर बांध से 95 MCFT पानी का प्रावधान उचित नहीं होगा। बैठक में विचारविमर्श कर उपरोक्त परिस्थिति के मद्देनज़र शहर के समीप कालका बांध को भी स्त्रोत के रूप में उपयोग किये जाने हेतु निर्णय लिया गया है। जिसमें 53 MCFT जल उपलब्धता बताई गई। अतः शेष पानी 53 MCFT कालका बाँध से लेकर प्रस्तावों में संशोधन किया जावे।
3. आबूरोड/सिरोही शहर की जलापूर्ति/सीवरेज योजना में प्रस्तावित वाटर ट्रीटमेंट प्लांट, सीवरेज ट्रीटमेन्ट प्लॉट एवं स्वच्छ जलाशय हेतु जमीन नगरपरिषद/नगरपालिका के द्वारा सम्बन्धित विभाग को प्रस्तावों की स्वीकृति से पूर्व उपलब्ध करवाई जावेगी एवं सम्बन्धित नक्शे खसरा संख्या एवं क्षेत्रफल दर्शाते हुए उपलब्ध करवाए जावेंगे।

4. परियोजना के अन्तर्गत जलापूर्ति योजना हेतु SCADA system काम मे लिया जावेगा एवं पम्पिंग स्टेशन पर डी.जी. सैट का प्रावधान लिया जावेगा।
5. सीवरेज योजना हेतु S.T.P. पर SCADA system काम मे लिया जावेगा एवं मैनहोल पर आवश्यता अनुसार सेन्सर लगाए जावेगें। सीवरेज योजना में सीवरेज ट्रीटमेन्ट प्लॉट में शोधित सीवरेज के पूर्ण उपयोग का प्रावधान लिया गया है।
6. पुराने उच्च जलाशय जो काम मे आ सकते है उनको काम मे लेत हुए अन्य क्षेत्रों में वी.एफ.डी. पम्पों के द्वारा जल वितरण प्रस्तावित किया गया है। इस योजना के अन्तर्गत शहर के सभी House service connection के साथ वाटर मीटर लगाने का भी प्रावधान किया गया है। अवैध जल सम्बन्धों को नियमित किया जावेगा।
7. 3.5 मीटर से अधिक गहरी सीवर लाईनों को ट्रेंचलेस द्वारा डाला जायेगा जिससे शहरवासियों को असुविधाओं का सामना न करना पडे। 4.0 मीटर चौडाई तक सभी सडकों का पूर्ण चौडाई में रोड रेस्टोरेशन किया जायेगा।
8. सभी कार्यों का संचालन एवं संधारण कॉन्टेक्टर फर्म द्वारा 10 वर्ष तक किया जायेगा। जिसमें पानी तथा सीवरेज लाईनों का भी रखरखाव शामिल है।

6.9.17

अधिशाषी अभियन्ता,
आर.यू.आई.डी.पी. (पी.आई.यू.)
उदयपुर

कमांक : आरयूआईडीपी/पीआईयू/उदयपुर/ CLC Meeting /2017-18/227-241 दिनांक: 06.09.2017

प्रतिलिपि निम्नांकित को सूचनार्थ :–

1– माननीय श्री देवजी भाई पटेल, लोकसभा सदस्य, सिरोही
2– माननीय श्री ओटाराम देवासी, विधायक एंव मंत्री महोदय, सिरोही
3– श्रीमान् परियोजना निदेशक, आर.यू.आई.डी.पी., एवीएस बिल्डिंग, जवाहर सर्किल, जयपुर
4– श्रीमान् जिला कलक्टर एंव अध्यक्ष, सिटी लेवल कमेटी, सिरोही
5– अध्यक्ष/उपाध्यक्ष/आयुक्त, नगर परिषद, सिरोही
6– अधीक्षण अभियन्ता,(वेस्ट वाटर) आर.यू.आई.डी.पी., जयपुर ।
7– अधीक्षण अभियन्ता,(वाटर सप्लाई) आर.यू.आई.डी.पी., जयपुर ।
6– अधीक्षण अभियन्ता,सा.नि.वि./जन.स्वा.अभि.विभाग/जल संसाधन विभाग, सिरोही
7– वरिष्ठ नगर नियोजक, उदयपुर
8– अधिशाषी अभियन्ता, नगर परिषद, सिरोही
9 – प्रबुद्धजन, सिरोही

6.9.17

अधिशाषी अभियन्ता,
आर.यू.आई.डी.पी. (पी.आई.यू.)
उदयपुर

दिनांक 25.08.2017 को जिला कलक्टर महोदय के अध्यक्षता में आयोजित बैठक (रूडीफ फेज –II) के संदर्भ में उपस्थित जन प्रतिनिधि / अधिकारीगण ।

क्रम सं.	नाम जन प्रतिनिधि / अधिकारी	पदनाम	हस्ताक्षर
1	Shri Ota Ramji Devasi	Minister of KVIA Sirohi	
2	Devji M. Patel	M.P. Jalore Sirohi	
3	[illegible]	[illegible]	
4	Jawahar Chaudhary	ADM, Sirohi	
5	Tasleem R. Rais	C.M.P. Sirohi	
6	SURESH KOTHARI	Chairman UIT Abu	
7	सुरेश कोठारी	अध्यक्ष नगर पालिका आबूरोड	
8	Praveen Ankodia	SE(WS), RUIDP, Jaipur	
9	Bharat Tepan.	Ken-Ruidp Udaipur.	
10	Mahendra Singh	E.O M.B. Abunad	
11	Ashok Chawla	S.E. (PHED) Sirohi	
12	प्रहलाद राय वर्मा	आयुक्त नगर परिषद सिरोही	
13	Nemichand Gehlot	AEN, PHED Project Dir. Sirohi	
14	Vishnu Khadi	Civil Eng Cadcon	
15	VINOD MEHTA	Director Cadcon consultants Pvt Ltd	

Transcript

A city level committee meeting was held under the chairmanship of District Collector, Sirohi on dated 25.08.2017. Project Consultant briefed them about the proposed water supply and sewerage works and informed that main objective of proposed water supply works is to reduce Non-Revenue Water.

<u>For ABU ROAD</u>

- Water supply works – to reduce the non revenue water following works are proposed under water supply scheme
    - Water treatment plant – 10 MLD (Near Santpur)
    - Transmission main – DI K9 (100 mm to 450 mm dia) pipeline – 53 km
    - CWR – 62 MLD
    - Distribution main – HDPE (75 mm to 355 mm dia) pipeline – 127 km
    - House service connection 15500

- Sewerage works – following works proposed under sewerage scheme
    - HDPE (200 mm to 315 mm dia) pipeline – 103.5 km
    - RCC NP-4- (400 mm to 500 mm dia) pipeline – 2.1 km
    - HDPE (trenchless) – (200 mm to 700 mm dia) pipeline – 5.2 km
    - STP (SBR technology) – 7.0 MLD (Near Santpur)
      2.0 MLD (Near Aakar Bhata)

As per detailed project report the estimated cost of above works is INR 167 crore

For Sirohi

- Water supply works – to reduce the non revenue water following works are proposed under water supply scheme
    - Water treatment plant – 8 MLD
    - Transmission main – DI K9 (100 mm to 450 mm dia) pipeline – 27 km
    - CWR – 50 MLD
    - Distribution main – HDPE (75 mm to 355 mm dia) pipeline – 95 km
    - House service connection 12000

- Sewerage works – following works proposed under sewerage scheme
    - HDPE (200 mm to 315 mm dia) pipeline – 98 km
    - RCC NP-4- (400 mm to 500 mm dia) pipeline – 2.6 km
    - HDPE (trenchless) – (200 mm to 700 mm dia) pipeline – 5.6 km
    - STP (SBR technology) – 4.0 MLD (Near Nehru Nagar)
      1.5 MLD (Near Revdar Road)

As per detailed project report the estimated cost of above works is INR 129 crore

Following points are discussed in the meeting

1. Chairmen ULB, Abu Road has requested to provide water to 6 villages near Bhaisa Singh Dam, which will be provided by PHED as RUIDP is entitled to work only in urban area.
2. Water demand for Sirohi water supply is 95 MCFT from Angore dam, but due to average availability of water in Angore dam is only 65 MCFT. The suggestion of using the Kalka dam for additional demand was approved in meeting. The Kalka dam has average availability of 53 MCFT water.
3. Land for proposed WTP, STP, CWR in Abu road/ Sirohi water supply/ sewerage scheme will be provided by ULB along with revenue map and land records.
4. SCADA system will be used in water supply scheme and DG sets will be used at pumping stations
5. For sewerage system SCADA system will installed at STP and as per requirements sensors will be installed at man holes. The entire treated sewer in sewerage scheme will be used.
6. Useable old water structures will be used with VFD pumps. Under this scheme all houses will be connected to House service connection and all illegal connections will be regularized.
7. All sewer lines below 3.5 m will be laid using trenchless technique to avoid discomfort to people. Roads up to 4 m will be resorted completely.
8. The O&M of all works will be done by contractor firm for 10 years. Including maintenance of water supply and sewerage pipelines.

CLC Meeting at Sirohi Dated: 25 August 2017

Appendix 28:
Sample Grievance Registration Form

(To be available in Hindi and English)

The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.
Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration	Project Town Project:			
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 officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

Appendix 29: Office order for establishing GRM

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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) 15/5/18
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)

Appendix 30: 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**

Semi Annual Environment 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	Remarks
			Not yet due (detailed design not yet	Submitted to ADB (Provide Date of	Disclosed on project website	Final IEE provided to Contractor/s		

			completed)	**Submission)**	**(Provide Link)**	**(Yes/No)**	**by Project Director? (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 $\mu g/m^3$	PM2.5 $\mu g/m^3$	SO2 $\mu g/m^3$	NO2 $\mu g/m^3$

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:				
A. DOCUMENTS AND RECORDS				
1.	Site Inventory			
2.	List of Asbestos materials storage and installation points			
3.	Structure of Asbestos materials management committee			
B. 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

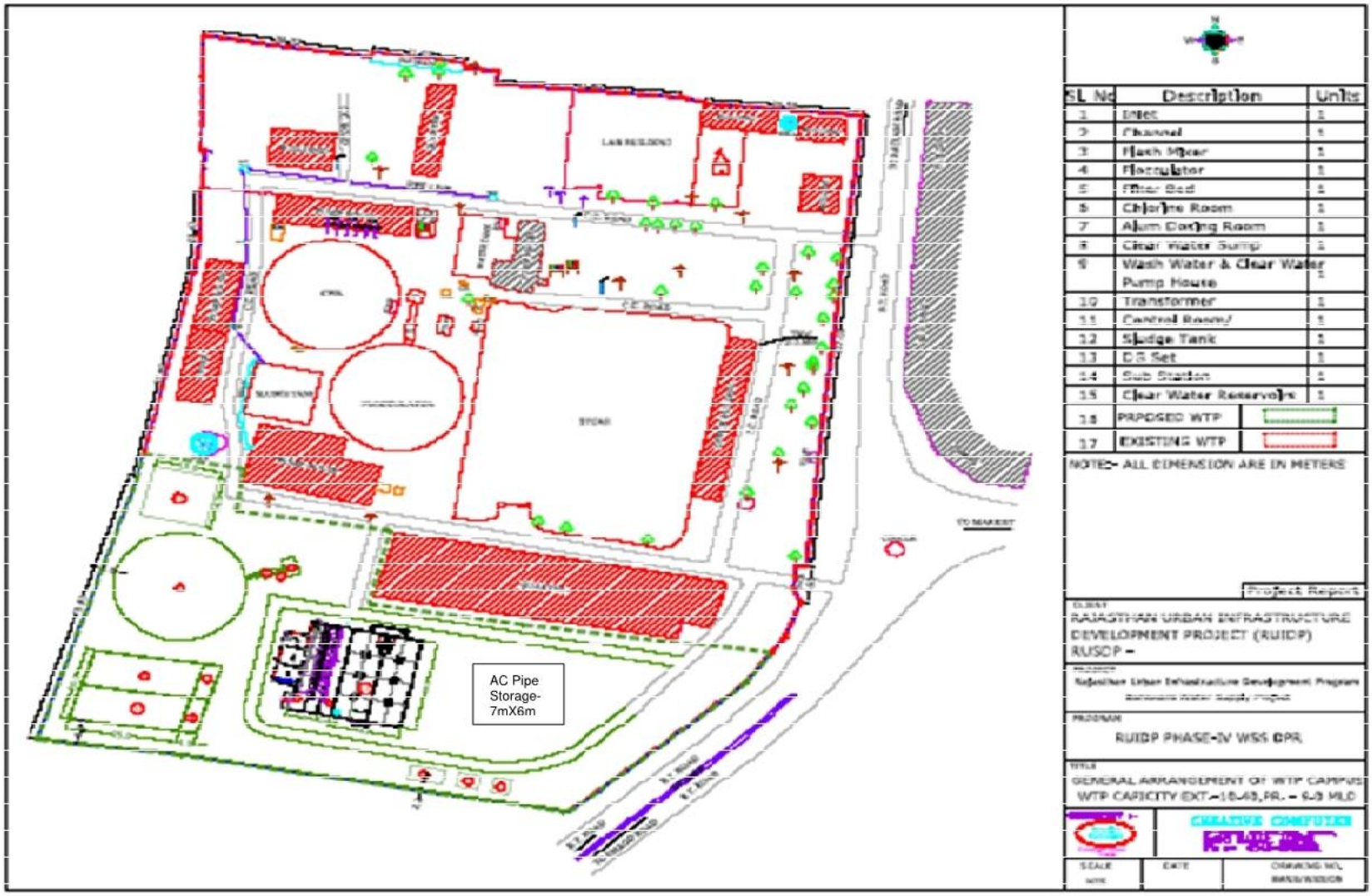
S.No	Activity	Number of Stacks	Area occupied	Details of Asbestos materials Pipes	Day/month/year Of storage
Site History					
For existing Stacks, details of re-handling of pipes in number or volume to be mentioned under supervision of Authorized Experts.					
Details of Location of re-handled Asbestos 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 31:
Temp. ACM Store Area within WTP campus at Angore Headworks, Sirohi



Appendix 32:
Treated Water Reuse of STP-1 and STP-2 Letters from ULB, Sirohi

कार्यालय नगर परिषद्, सिरोही (राज.)

क्रमांक : न0प0सि / विकास / 2019 / 2507 दिनांक :- 26/04/2020

सहमति–पत्र

नगरपरिषद, सिरोही द्वारा आरयूआईडीपी के फैज चतुर्थ के तहत् प्रस्तावित सीवरेज परियोजना के अन्तर्गत 5 MLD सीवरेज ट्रीटमेन्ट प्लान्ट (STP-1) हेतु नेहरू नगर के पास एवं 1.7 MLD सीवरेज ट्रीटमेन्ट (STP-2) हेतु रेवदर रोड के पास आवश्यकतानुसार भूमि में प्रस्तावित है। उक्त एसटीपी से निकलने वाले ट्रीटेड जल का पुनः उपयोग हमारे द्वारा प्लांटेशन (वृक्षारोपण), पार्को में पेड–पौधों को पानी देने एवं आस–पास के खेतों में फसलों की सिंचाई हेतु काम में लिया जायेगा तथा गंतव्य स्थान तक ट्रीटेड जल पहुंचाने की जिम्मेदारी आरयूआईडीपी की रहेगी।

यह सहमति पत्र आज दिनांक 26.04.2020 को मेरे हस्ताक्षर एवं कार्यालय मुद्रा से जारी किया जाता है।

आयुक्त
नगर परिषद,सिरोही