# Environmental Assessment Document

Initial Environmental Examination: Sawai Madhopur Sewerage and Sanitation Subproject
Project Number:

August 2008

# India: Rajasthan Urban Sector Development Investment Program

Prepared by Local Self Government Department

## ABBREVIATION

| | | |
|---|---|---|
| ADB | - | Asian Development Bank |
| DSC | - | Design and Supervision Consultancy |
| EIA | - | Environmental Impact Assessment |
| EA | - | Executing Agency |
| EAC | - | Expert Appraisal Committee |
| FI | - | Financial Intermediary |
| GoI | - | Government of India |
| GoR | - | Government of Rajasthan |
| GSI | - | Geological Survey of India |
| HSC | - | house service connection |
| IA | - | Implementing Agency |
| IEE | - | Initial Environmental Examination |
| IPMC | - | Investment Programme Management Consultancy |
| IPMU | - | Investment Programme Management Unit |
| JNNURM | - | Jawaharlal Nehru National Urban Renewal Mission |
| lpcd | - | liter per capita per day |
| lps | - | liter per second |
| LSGD | - | Local Self-Government Department |
| mg/l | - | milligrams per liter |
| MFF | - | Multi-tranche Financing Facility |
| MLD | - | million liters per day |
| MoEF | - | Ministry of Environment and Forests |
| NAAQS | - | National Ambient Air Quality Standards |
| OD | - | outer diameter |
| OM | - | Operations Manual |
| PHED | - | Public Health Engineering Department |
| PMU | - | Project Management Unit |
| RCC | - | reinforced cement concrete |
| ROW | - | right-of-way |
| RPCB | - | Rajasthan State Pollution Control Board |
| RSPM | - | respirable suspended particulate matter |
| RUIDP | - | Rajasthan Urban Infrastructure Development Project |
| RUSDIP | - | Rajasthan Urban Sector Development Investment Program |
| SPM | - | suspended particulate matter |
| STP | - | Sewerage Treatment Plant |
| ToR | - | Terms of Reference |
| UA | - | Urban Agglomeration |
| UIDSSMT | - | Urban Infrastructure Development Scheme for Small and Medium Towns |
| uPVC | - | unplastized poly vinyl chloride |
| USEPA | - | United States Environmental Protection Agency |

## WEIGHT AND MEASURES

| | | |
|---|---|---|
| lakh | – | 100,000 (one hundred thousand) |
| crore | – | 10,000,000 (ten million) |

**CONTENTS**

## APPENDIX

# I. INTRODUCTION

## A. Purpose of the Report

1. Rajasthan Urban Sector Development Investment Program (RUSDIP) is intended to optimize social and economic development in 15 selected towns in the State, particularly district headquarters and towns with significant tourism potential. This will be achieved through investments in urban infrastructure (water supply; sewerage and sanitation; solid waste management; urban drainage; urban transport and roads), urban community upgrading (community infrastructure; livelihood promotion) and civic infrastructure (art, culture, heritage and tourism; medical services and health; fire services; and other services). RUSDIP will also provide policy reforms to strengthen urban governance, management, and support for urban infrastructure and services. The assistance will be based on the State-level framework for urban reforms, and institutional and governance reforms recommended by the Government of India (GoI) through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

2. RUSDIP Phase II to be implemented over a seven year period beginning in 2008, and will be funded by a loan via the Multi-tranche Financing Facility (MFF) of the ADB. The Executing Agency (EA) is the Local Self-Government Department (LSGD) of the Government of Rajasthan (GoR); and the Implementing Agency (IA) is the Project Management Unit (PMU) of the Rajasthan Urban Infrastructure Development Project (RUIDP), which is currently in the construction stage.

3. RUSDIP will improve infrastructure through the design and implementation of a series of subprojects, each providing improvements in a particular sector (water supply, sewerage, solid waste etc) in one town. RUSDIP has been classified by ADB as environmental assessment category B (some negative impacts but less significant than category A). The impacts of subprojects prepared according to ADB Environment Policy (2002) and Environmental Assessment Guidelines (2003).

## B. Extent of the IEE Study

4. Indian law and ADB policy require that the environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

### 1. ADB Policy

5. ADB's Environment Policy requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in Operations Manual (OM) 20: Environmental Considerations in ADB Operations. This states that ADB requires environmental assessment of all project loans, programme loans, sector loans, sector development programme loans, financial intermediation loans and private sector investment operations.

6. The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity,

scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts and are assigned to one of the following categories:

Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required.

Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects those are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

Category FI: Projects that involve a credit line through a financial intermediary (FI) or an equity investment in a FI. The FI must apply an environmental management system, unless all subprojects will result in insignificant impacts.

7. The Bank has categorized this program as Category B and following normal procedure for MFF loans has determined that one Environmental Examination will be conducted for each subproject, with a subproject being the infrastructure improvements in a particular sector (water supply, sewerage, etc) in one town.

## 2. National Law

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

9. Categories A projects require Environmental Clearance from the National Ministry of Environment and Forests (MoEF). The proponent is required to provide preliminary details of the project in the form of a Notification, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study, which are finalized within 60 days. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

10. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorises 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.

11. The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification is solid waste management, where EC is required for all Common Municipal Solid

Waste Management Facilities (facilities that are shared by more than one town)[1]. EC is thus not required for the sewerage and sanitation sub-project that is the subject of this Environmental Examination.

### 3. Review and Approval Procedure

12. For Category B projects, the IEE report and its summary (SIEE) are reviewed by ADB's Regional Department sector division and Environment and Social Safeguards Division, and by the Executing Agency, and additional comments may be sought from project affected people and other stakeholders. All comments are incorporated in preparing the final documents, which are reviewed by the Executing Agency and the national environmental protection agency (MoEF in this case). The EA then officially submits the IEE and SIEE reports to ADB for consideration by the Board of Directors. Completed reports are made available worldwide by ADB, via the depository library system and the ADB website.

### 4. Scope of Study

13. This is the IEE report for the Sawai Madhopur sewerage and sanitation sector. It discusses the potential environmental impacts and mitigation measures relating to the location, design, construction and operation of physical works proposed under this subproject.

## II. DESCRIPTION OF THE PROJECT

### A. Type, Category and Need

14. This is a sewerage and sanitation sub-project, and as has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts. Under ADB procedures such projects require an IEE to identify and mitigate the impacts, and to determine whether further study or a more detailed EIA may be required. The subproject is needed because currently, there is no underground sewage system in Sawai Madhopur. Only few households have covered individual septic tanks. The disposal of waste and effluent of septic tank is through the open drains constructed by the Municipal Board which convey the sludge and sewage to unhygienic and unsanitary conditions.

15. From the demand gap analysis, it is concluded that Urban Local Bodies (ULBs) need a comprehensive scheme for proper collection, treatment, and disposal of sewage. Significant land areas will be required for installation of the sewage treatment plant (STP) and there is low availability for this in Sawai Madhopur thus the Municipal Board recommends activated sludge process (ASP) technology to be developed.

### B. Location, Size and Implementation Schedule

16. The sub-project is located in Sawai Madhopur, the headquarters town of Sawai Madhopur District, in the eastern part of Rajasthan (**Figure 2.1**). The infrastructure will extend throughout many parts of the town, where pipes for new secondary and tertiary sewer networks will be buried within or alongside roadways. A new outfall sewer will be buried alongside the road. There will be a new STP to be built on a 63 hectares (ha.) land owned by the government. **Figure 2.2** shows proposed sewer network of the town and **Figure 2.3** shows the STP location.

[1] According to the Rajasthan State Pollution Control Board, the MoEF intends to issue a clarification to the EIA Notification in due course, which will add all landfill facilities and Sewage Treatment Plants to the list of projects specified as requiring EC under the Notification. This has not yet been issued, so the text above indicates the correct legal position at the time of writing

17. Detailed design will begin in the second quarter of 2008 and will be completed by the end of the year. Construction of all elements will begin in early 2009, and the treatment works will be built in around 6 months. Construction of the trunk sewer and networks will take up to 1½ years, so all work should be completed by the middle of 2010.

## C. Existing Sewerage and Sanitation Scheme

18. Sawai Madhopur town is fairly densely populated. Growth in town population and increase in water consumption result in generation of increased quantity of sewage being disposed without treatment into Lootiya *nalla* and eventually discharges to Banas River. This disposal method is, causing environmental pollution and unsafe giving rise to unhygienic conditions and health problems.

## D. Description of the Subproject

19. Description of the Area: Sawai Madhopur is composed of 36 wards. Under the subproject, 12 wards located in the northwest side of the railway line will be covered. These wards are Moti Nagar, Aman Nagar, Ambedkar Nagar, Hameer Nagar, Kachi Basti, Bus Stand, Ganesh Nagar, Agrasen Nagar, Subhash Coloney, Adarsh Nagar, Gulab Bagh, and BT Road. The total area of the 12 wards is 671 ha. and a population of 29,825 (based from 2001 census).

20. Details of Subproject: **Table 2.1** shows the nature and size of the various components of the subproject. There are three main elements: (i) provision of a network to collect sewage from different parts of the town; (ii) provision of a trunk sewer to transport waste to the STP; and (iii) construction of a new STP to treat sewage to Indian urban standards. The descriptions shown in **Table 2.1** are based on the preliminary engineering designs and certain details may change as development of the subproject progresses.

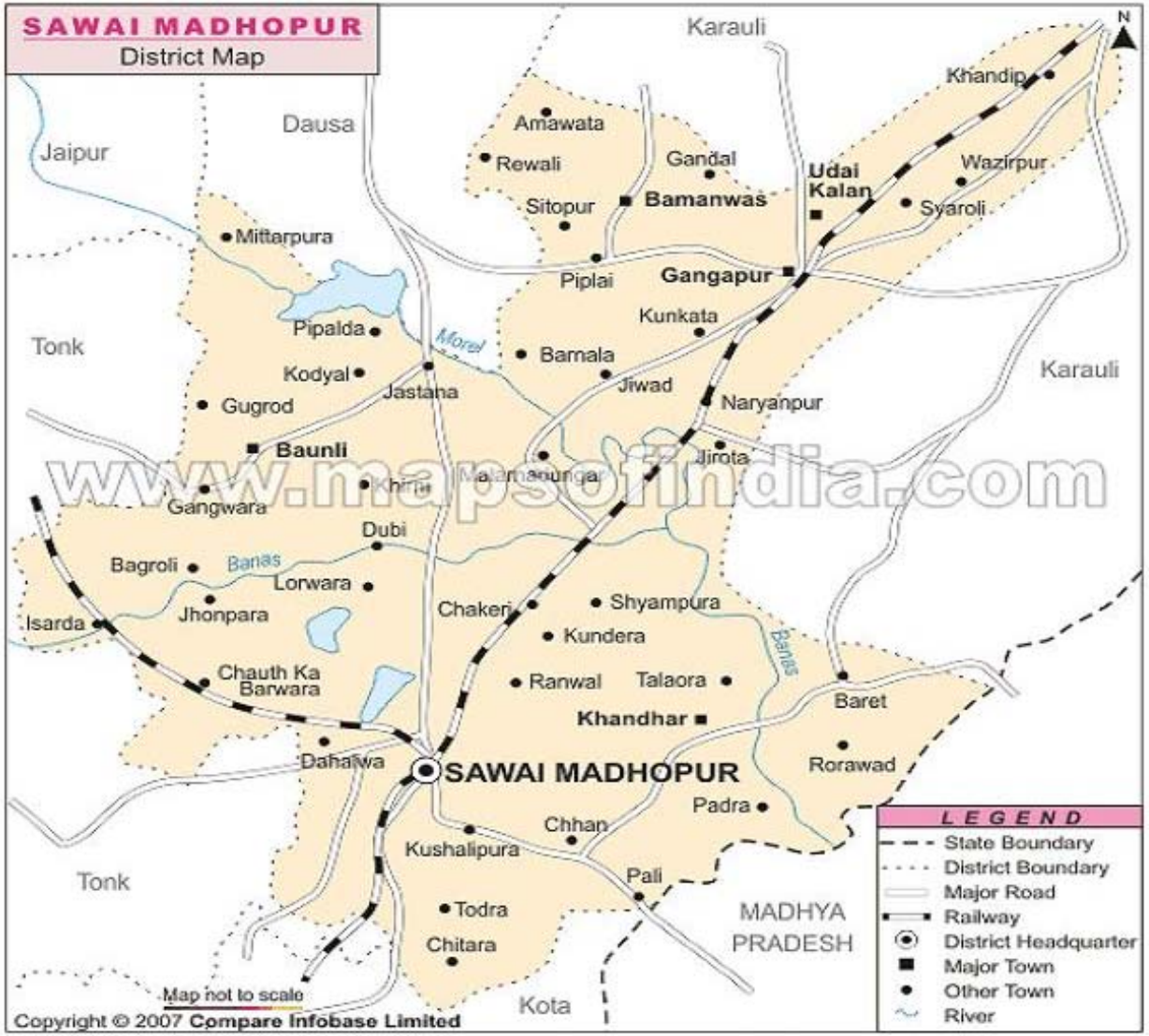
21. Under Tranche-II, sewerage works and a 10 million liter per day (MLD) capacity STP will be constructed. Sewerage works include network of pipelines, outfall, truck sewer, laterals, and house connections The STP will be constructed in a 63 ha. land owned by Sawai Madhopur Public Health Engineering Department (PHED).

22. Design Criteria and Methodology: The sewerage system is designed to treat wastewater volume equivalent to generation rate of the population projected to year 2041, The estimated per capita wastewater generation is considered as 80% of the net water supply of 135 liter per capita per day (lpcd). Peak factor has been considered to design the sewer lines. Minimum velocity of 0.6 m/ sec to achieve self cleansing and maximum velocity of 2.5 m/ sec to avoid possible scouring have been considered for design purposes. For all the component designs, these standard design criteria and practices have been adopted. Provision of manholes at suitable intervals is also considered.

**Table 2.1: Proposed Sawai Madhopur Sewerage and Sanitation Improvements**

| Infrastructure | Function | Description | Location |
|---|---|---|---|
| Trunk and lateral (secondary) sewers and tertiary network and house connections | Channelling of sewerage to the sewage treatment plant (STP). | 81.965 kilometer (km.) of sewer network consisting of various diameters of pipes ranging from 200 millimeters (mm) to 800 mm | Moti Nagar<br>Aman Nagar<br>Ambedkar Nagar<br>Hameer Nagar<br>Kachi Basti<br>Bus Stand<br>Ganesh Nagar |

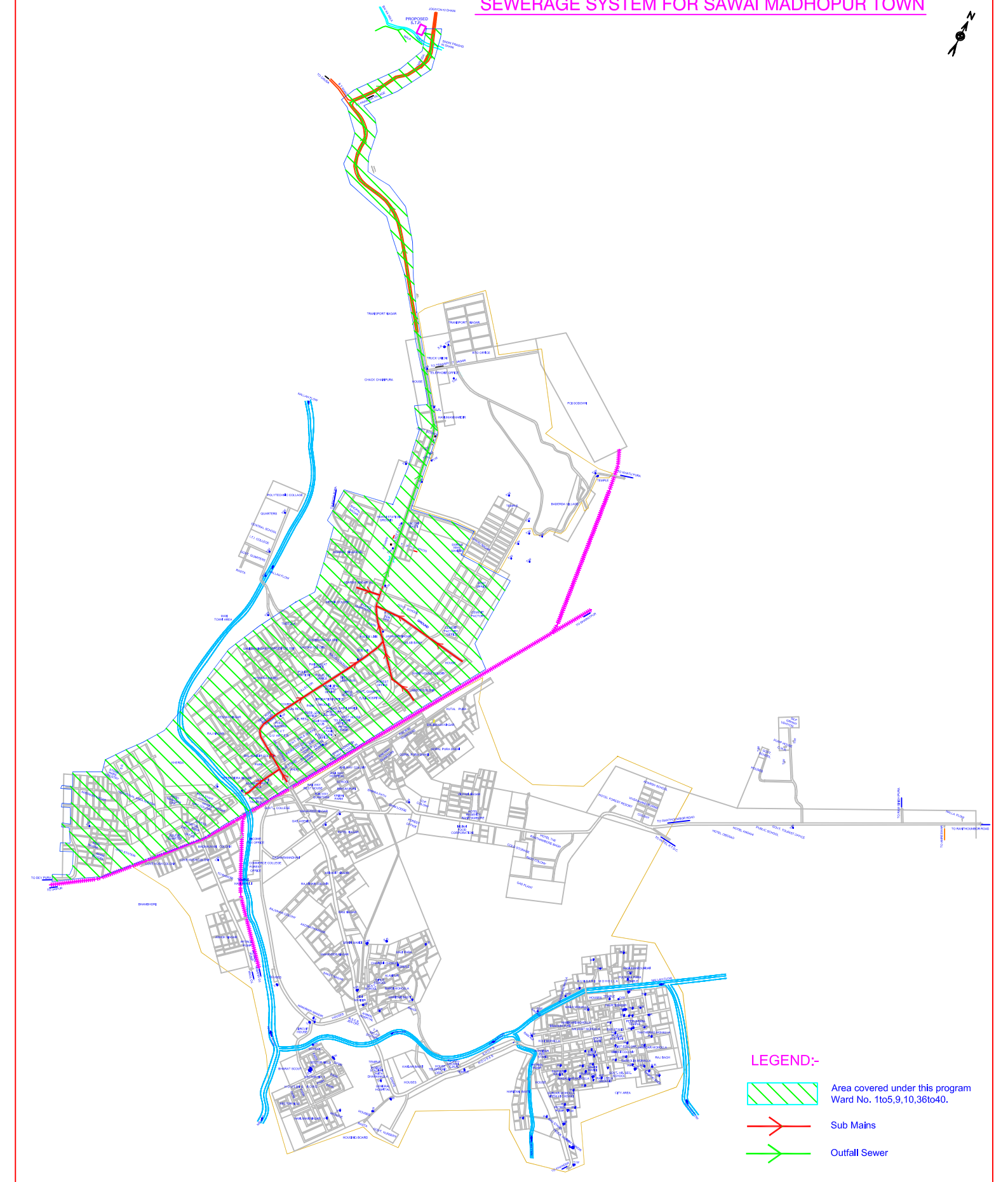
| Infrastructure | Function | Description | Location |
|---|---|---|---|
| | | | Agrasen Nagar<br>Subhash Coloney<br>Adarsh Nagar<br>Gulab Bagh<br>BT Road |
| STP | Treatment of raw sewage | 10 MLD capacity using WSP which includes 2 numbers (nos.) of anerobic ponds, 8 nos. facultative stabilization ponds, 1 pump sump , 1 stilling well, 1 Manual screen channel, 1 mechanical screen channel, and 1 degreasing tank | 63 ha. land area near Surwal Village<br>There are 2 numbers of anaerobic ponds of size 75 x 42 m at top and 8 nos. of facultative stabilization ponds of size 138m x 71 m at top<br>Total area used for these ponds<br>2 x (75x 42) +8(138x71) =84684 m (8.46 Ha)<br>Total land available 63.3 Ha for STP |
| Outfall Sewer | STP outfall/discharge | 6.15 km of outfall sewer with pipe diameters varying from 1000 mm to 1100 mm, | near Surwal Village draining to the Baika *nallah* |

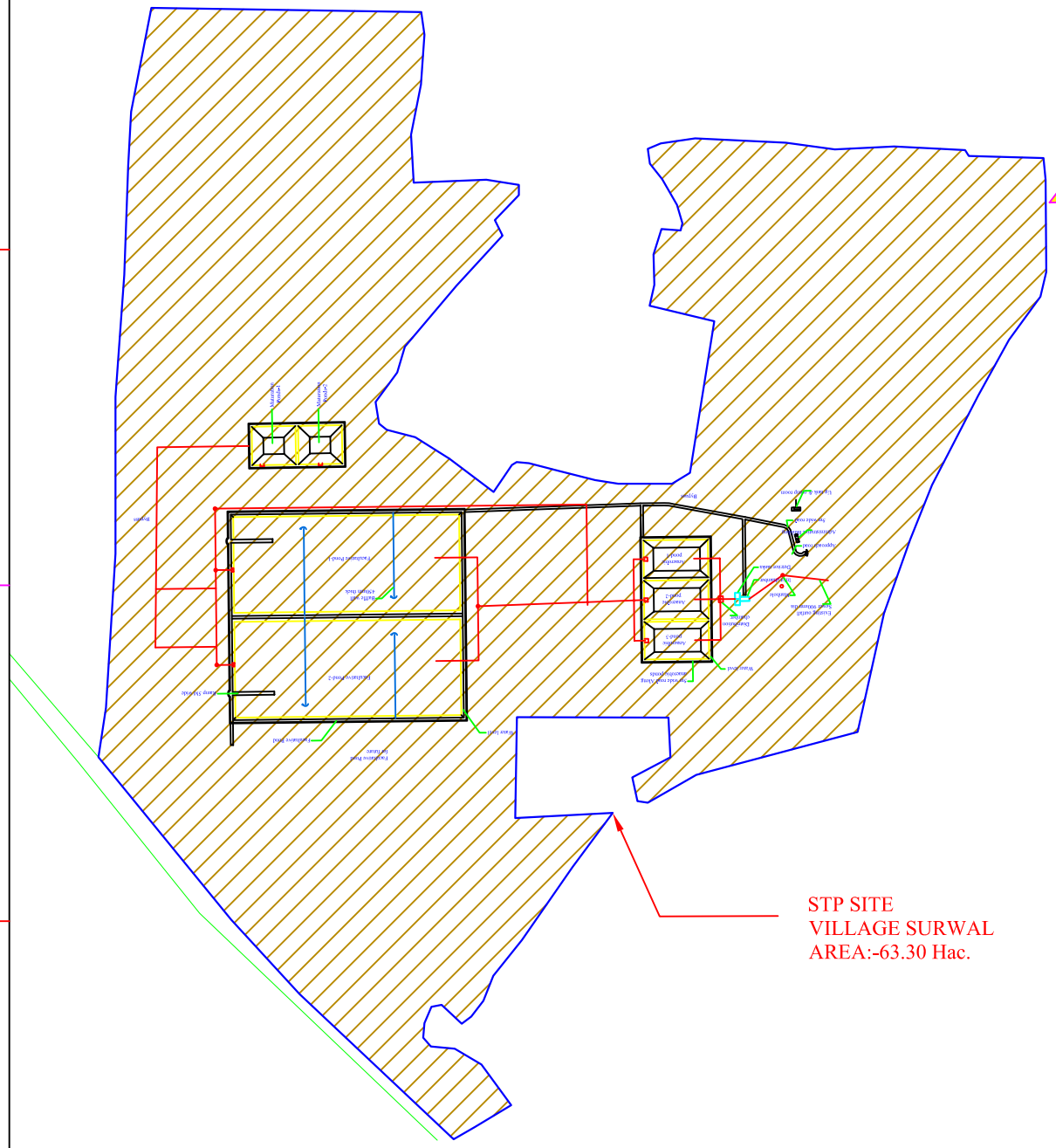



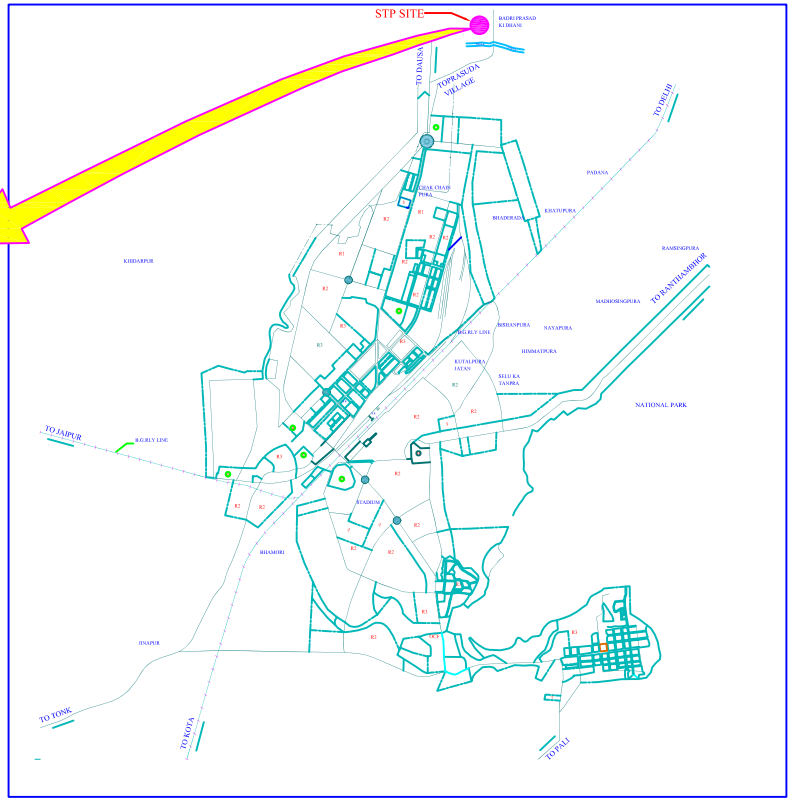


| | |
|---|---|
| Rajasthan Urban Sector Development Investment Program<br>ADB TA 4814-IND | Govt of Rajasthan<br>Asian Development Bank |
| **Sawai Madhopur Regional Map** | |

# SEWERAGE SYSTEM FOR SAWAI MADHOPUR TOWN








LEGEND:

- RAILWAY STATION AND YARD
- STATE HIGHWAY AND OTHER ARTERIAL ROADS
- SUB ARTERIAL ROADS
- 120 STP SITE

STP SITE
VILLAGE SURWAL
AREA:-63.30 Hac.

| | |
|---|---|
| RUSDIP(SAWAI-MADHOPUR) | RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM |
| SECTOR:- | TITLE:- PROPOSED STP SITE |
| CONTENT:- CLIP DRAWING | DRAWING NO. RUSDIP/SWP/01 R0 |
| | DRAWN BY:- R.KRISHNA APPROVED BY:- |
| | DATE:- MAR-2008 SCALE:- NOT TO SCALE |

## III. DESCRIPTION OF THE EXISTING ENVIRONMENT

### A. Physical Resources

#### 1. Location

23. The Urban Agglomeration (UA) of Sawai Madhopur District is located about 180 km in the north-eastern part of Jaipur along the rolling hills of Vindhyas and Aravali ranges. It is surrounded by Kota, Tonk, and Karauli districts. Its total land area is 504,299 sq. km. The district has been divided into 4 subdivisions: Sawai Madhopur, Bonli, Gangapur Town, and Bamanwas. There are seven tehsil[2] headquarters in this district: Sawai Madhopur, Khandar, Choth Ka Barwara, Bonli, Malarna Dungar, Gangapur Town, and Bamanwas.

24. Sawai Madhopur is well connected by road networks and is connected with Jaipur, Delhi and other important cities. It is about 428 km from Delhi and 167 km from Jaipur. The nearest airport is at Jaipur (190 km). The Delhi-Bombay broad-gauge railway lines pass through Sawai Madhopur, Gangapur and Hindaun towns of the district. A broad-gauge line connecting Jaipur with Sawai Madhopur passes through Isarda, Chauth-Ka-Barwara and Deopura stations. District map of Sawai Madhopur shown in **Figure 3.1.**

#### 2. Topography, Drainage, Natural Hazards, and Droughts

25. Topography: Sawai Madhopur is located at latitude 25°45' north and longitude 75°59' east, at a height of 400 to 600 m above mean sea level.

26. Drainage: In the east of Aravalli ranges the main drainage is towards northeast. The Chambal catchment occupies 21% of the total geographical area.

27. Natural Hazards: **Figure 3.2** depicts the earthquake zones of Rajasthan and the natural hazard zone map of Sawai Madhopur District is shown in **Figure 3.3**. Sawai Madhopur town lies in low damage risk zone II. The area is less prone to earthquakes and based on evaluation of the available earthquake zone information, it is located on relatively stable geological plains. Natural hazard include mainly water erosion which are moderate and severe to very severe. Other hazards include area prone to water logging salination, flash floods and high fluorine concentration in groundwater

28. Drought: Low rainfall coupled with erratic behavior of monsoon in the Rajasthan makes it the most vulnerable to drought. Based on discussions with PHED officials, the drought combined with significant drawdown conditions caused water tables in Sawai Madhopur to continuously decrease by 1 to 2 m annually.

[2] A *tehsil* consists of a city or town that serves as its headquarters, possibly additional towns, and a number of villages. As an entity of local government, it exercises certain fiscal and administrative power over the villages and municipalities within its jurisdiction. It is the ultimate executive agency for land records and related administrative matters. Its chief official is called the *tehsildar* or *talukdar*.

**Figure 3.1: District Map of Sawai Madhopur**

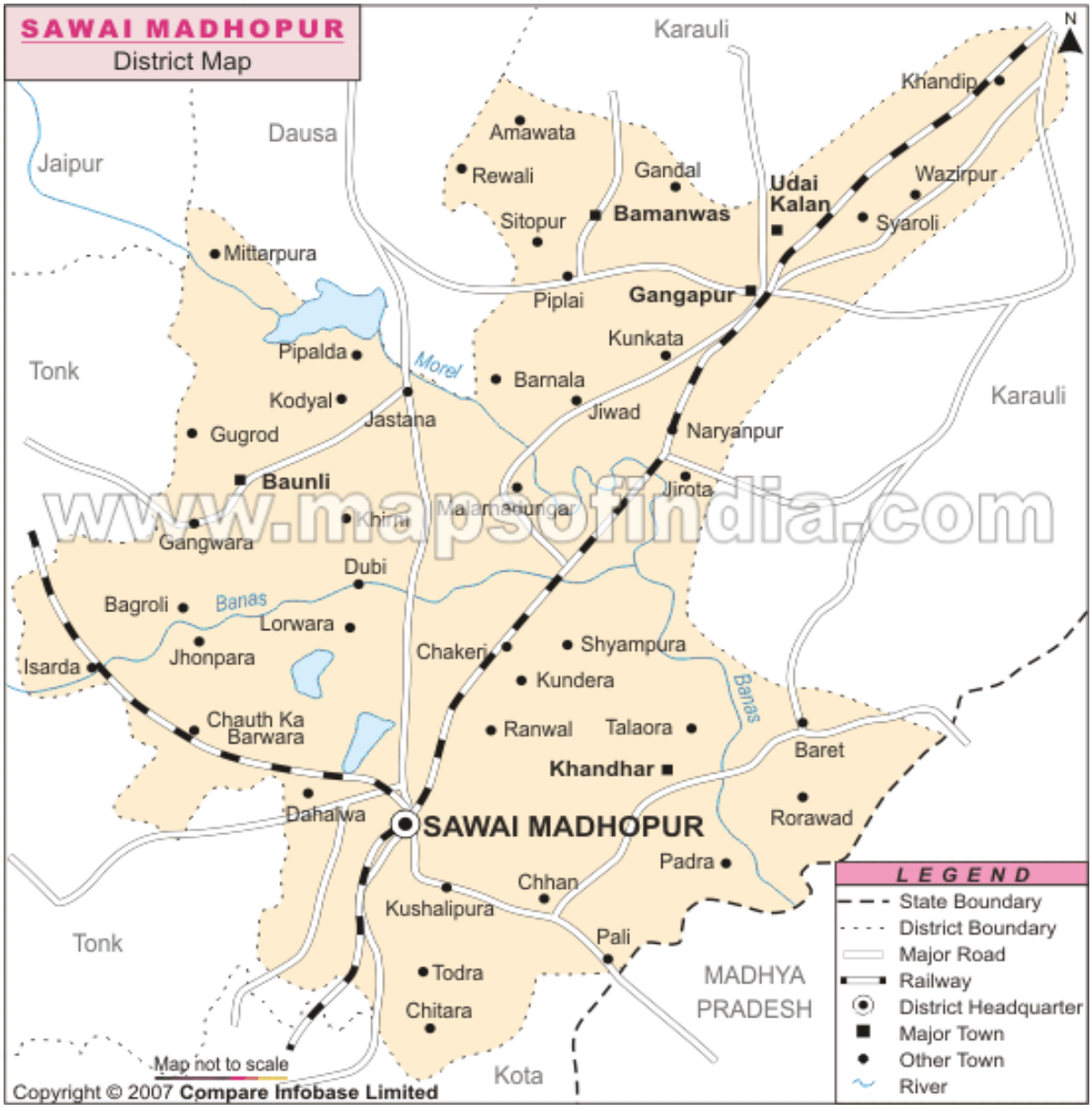


**Figure 3.2: Earthquake Zones of Rajasthan**

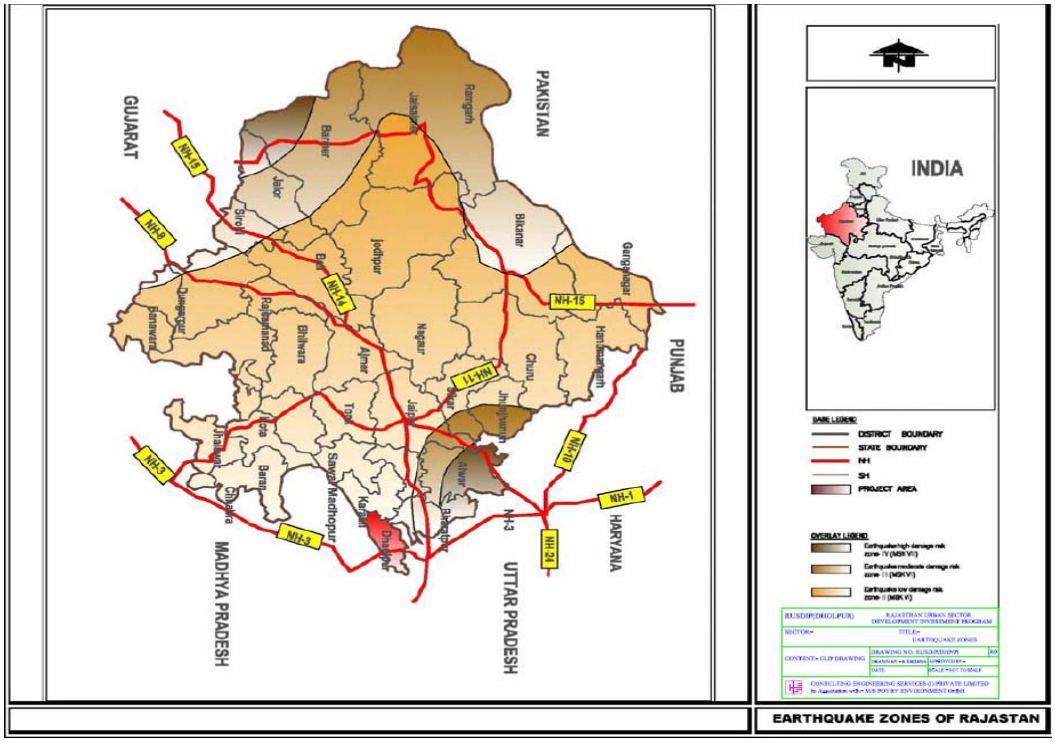
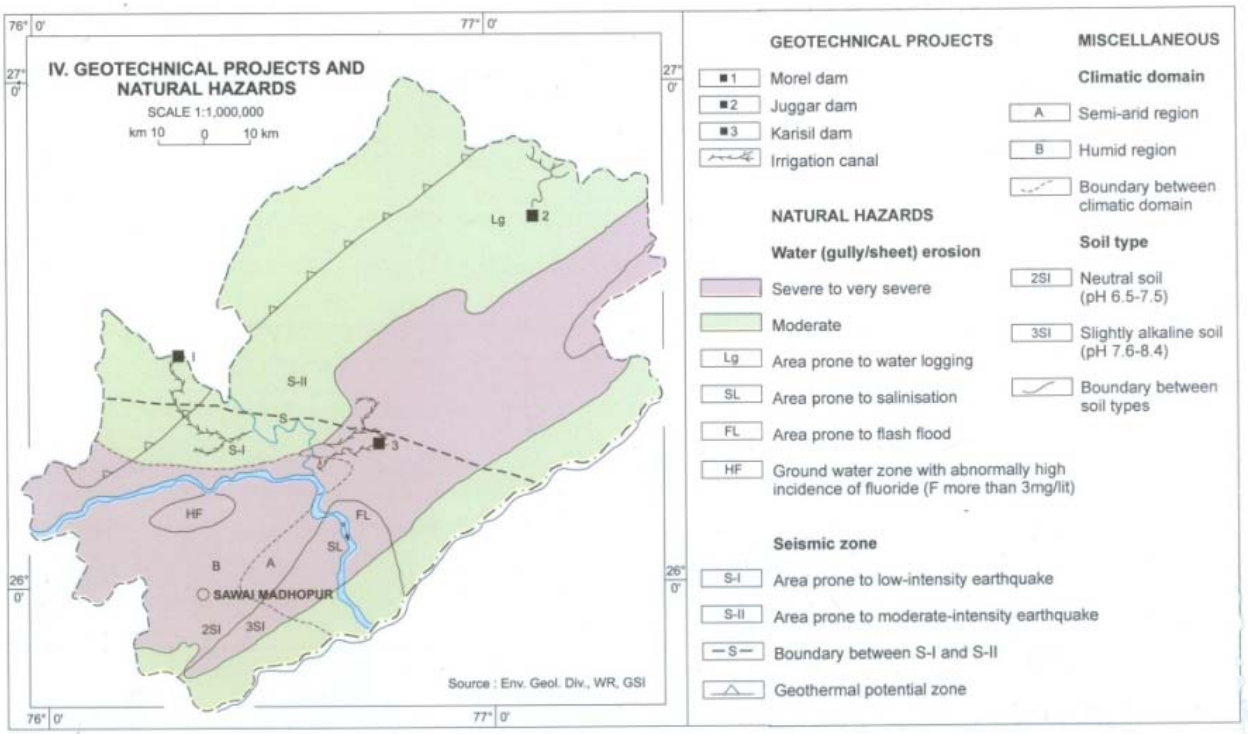



**Figure 3.3: Natural Hazard Zone Within Sawai Madhopur District**



## 3. Geology, Geomorphology, Mineral Resources, and Soil

29. The various rocks type exposed in the area belong to Bhilwara, the Delhi, and the Vidhyan Supergroups. The Bhilwara Supergroup represented by the Mangalwar Complex, the Hindoli Group and the Ranthambore group is in decreasing order of antiquity, is exposed in south western part. The northeast-southwest trending linear quartzite ridges between Baunli and Sarsop belong to the Mangalwar Complex. Low grade metamorphites of the Hindoli group indicate shale, slate, phyllite with mirror quartzite which are exposed northwest of Jatwara. The overlaying Ranthambor quartzite occurs east of Jathwara and support luxuriant growth of vegetation and hosts game sanctuary. Several quartzite bands belonging to the Alwar Group (Delhi Supergroup) from strike-ridges between Toda Bhim and Gudha Chandraji in northwestern corner of the district. These are intruded by granite. The Vindhyan Supergroup consist of various types of shale sandstone and limestone is represented by the Bhander, Rewa, Kaimur, Sand, and Satola Groups in increasing order of antiquity. These rocks occupy the eastern half the district and are separated from the older rocks by a major reverse fault, the great Boundary Fault. A major part of these districts is occupied by thick alluvium related to the various river systems.

30. Geomorphologically, the district is classified into nine geomorphic units namely: bad land, sand sheet, alluvial plain, pediment, structural and denudational plateau, and hills and valleys belonging to Vindhyan and pre-Vindhyan hills. Valleys are restricted to the western part of the district whereas those of Vindhayan occurs along a northeast-southeast strip through the middle part of the district. The area classified into three hydrogeological domains of unconsolidated porous Quaternary formation, consolidated fissured formation and hilly area with groundwater potential ranging form less than 1 to 10 liter per second (LPS). (**Figure 3.3).**

31. Mineral Resources: Sizeable reserves of limestone, soapstone, silica sand china clay, and building stones are found in the district. About 100 million tons (Mt) of cement grade Vindhyan limestone occurs near Pahlodi. Additional 100 Mt of limestone are likely to be available from Naroli and Jirota areas. Soapstone, as veins and lenses up to 20 m in width, occurs in within dolomite in the area between Morara and Dholeta over a strike length of 8 km. The significant deposits are located at Rajauli, Garhi and Kampura. Good quality sand occurs near Sapotra, Naroli, Tatwara Railway Station, and near Alanpur. China clay (Kaolin) associated with feldspathic quartzite occurs near Raisana, Basu, Phalodi, and Matasor. The Banjari Mines located at Chauth–ka–Barwara is well known for lead. Small iron ore deposits are located near Karwari and Hindaun. A small bentonite deposit is located near Karauli. Pink and white spotted Bhander sandstone is extensively quarried in Karauli and Hindaun areas and has been used in many historical monuments and modern buildings. **Figure 3.4** shows geology and mineral map of Sawai Madhopur and **Figure 3.5** shows geomorphology of the district.

**Figure 3.4: Geology and Mineral Map of Sawai Madhopur District**

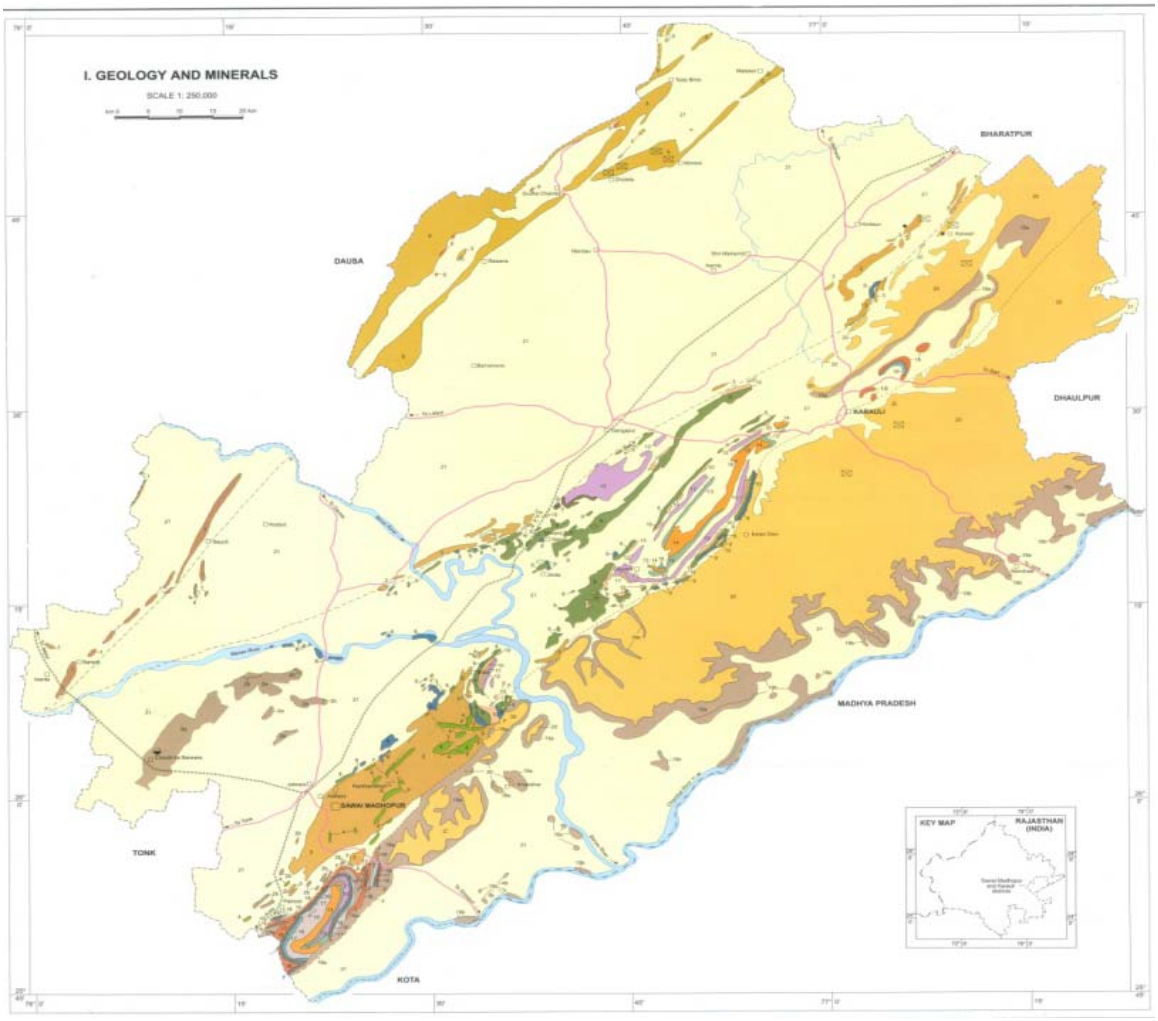
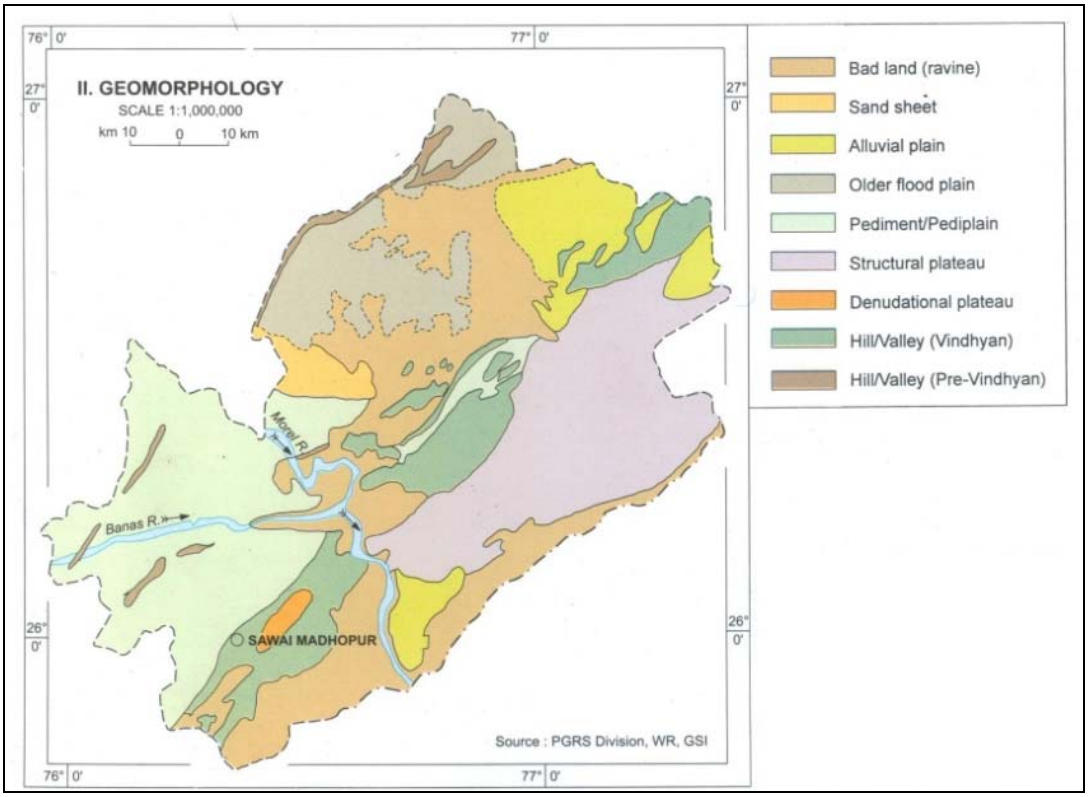


**Figure 3.5: Geomorphology of Sawai Madhopur District**




32. Soil characteristics: Soil in Sawai Madhopur falls within rainfall zone of 500 to 700 mm. The soil is generally alluvial in nature which prone to water logging. Also nature of recently alluvial calcareous has been observed. **Table 3.1** shows soil nutrient level in Sawai Madhopur including area coverage of saline and sodic soil. The nutrient status of the Sawai Madhopur soil is graded as low to medium level.

**Table 3.1: Soil Characteristics in Sawai Madhopur District**

| | Nutrient | | | Saline Soil (ha) | Sodic or Alkali (ha) |
|---|---|---|---|---|---|
| | N | P | K | | |
| Status | L | M | M | 12, 530 | 20,027 |

Source: Vital Agricultural Statistics 2004-05, Directorate of Agriculture, Rajasthan

## 4. Climate

33. The climate of Sawai Madhopur is hot and arid with large variation in temperature. The average temperature variation in summers and winters are 45$^{o}$ to 24.94$^{o}$ C and 20.05$^{o}$ C to 4$^{o}$ C respectively. The maximum and minimum temperature recorded is 45$^{o}$ C in summer and 4$^{o}$ C in winter. Dust storms and thunderstorms occur all through the summer and are particularly active in pre-monsoon period. In summer, mean humidity is 60%. The predominant wind direction is from west and south-west.

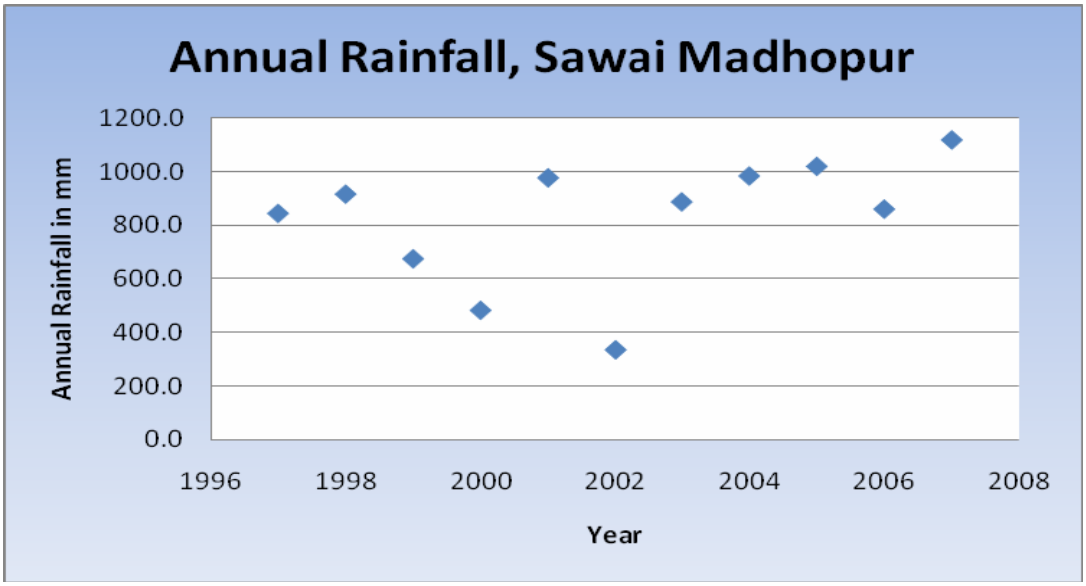
34. The rainfall over Sawai Madhopur is scanty and is concentrated over four month i.e. from June to September. The south-west monsoon is active from July to mid September, recording an annual rainfall of 837.40 mm. The rains are erratic and so is the distribution of the rainfall. Seasonal rainfall data for year 2005 to 2006) is shown in **Table 3.2.** **Figure 3.6** shows the yearly variation of rainfall at Sawai Madhopur from 1997 to 2007.

**Table 3.2: Sawai Madhopur Rainfall Data (2005 to 2006)**

| Months | Rainfall (mm) |
|---|---|
| June | 220 |
| July | 578 |
| August | 74 |
| September | 107 |
| October | 0 |
| November | 0 |
| December | 0 |
| January | 0 |
| February | 0 |
| March | 8 |
| April | 0 |
| May | 25 |
| **Monsoon Rainfall** | 979 |
| **Non-monsoon Rainfall** | 33 |
| **Annual Rainfall** | **1,012** |

Source: Irrigation Department, Govt. of Rajasthan

**Figure 3.6: Sawai Madhopur Historical Rainfall Data (1997 to 2007)**




Source: Investigation Design and Research unit, Water Resources Jaipur

### 5. Air Quality

35. Vehicles are considered to be the only significant source of air pollution in Sawai Madhopur. The Rajasthan Pollution Control Board (RPCB) does not monitor the ambient air quality of Sawai Madhopur because there are no major industries located in the district therefore no data on ambient air quality is available. The nearest ambient air quality monitoring station is located at Alwar (254 km from Sawai Madhopur). The ambient air quality data is depicted in **Table 3.3.**

**Table 3.3: Annual Average Ambient Air Quality in Alwar (2004)**

| Monitoring Station | Land use | SOx ($\mu g/m^3$) | NOx ($\mu g/m^3$) | RSPM ($\mu g/m^3$) | SPM ($\mu g/m^3$) |
|---|---|---|---|---|---|
| Alwar Residential, Rural and others area | Residential | 8.1 | 11.6 | 175.0 | 302.0 |
| *NAAQ Standard* | *Residential* | *60* | *60* | *60* | *140* |
| Alwar Industrial area | Industrial | 7.6 | 12.4 | 107.0 | 182.0 |
| *NAAQ Standard* | *Industrial* | *80* | *80* | *120* | *360* |

SOx = sulphur oxides; NOx = nitrogen oxides; RSPM = respirable suspended particulate matter; SPM = suspended particulate matter
Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

### 6. Surface Water

36. The major Sawai Madhopur Rivers include Morel, Chambal and Banas. The Morel River flows through the towns of Mittarpura, Pipalda, Jastana, Shyampura and Rorawad. The tributaries of this river are Dhund, Kankrauli and Kalisil rivers. It has a catchment area of approximately 5,491 sq km. The Chambal River is also known as Charmawati River. Its total length is approximately 376 km. The Banas River originates in the Khamnor Hills of the Aravalli Range in the district of Rajsamand and flows through Isarda, Dubi, Shyampura, Rorawad, Bagroli and Padra towns in Sawai Madhopur then flows through the northeastern region of Mewar meeting Chambal River near the Rameshwar Village. There is no available data for surface water quality. It was observed that surface water quality deteriorates during monsoon due to total suspended solids (TSS) load. Due to high temperature at summer most of the surface water sources become dried.

37. Tributary of Banas River, River Morel originates in the hills near Dharla and Chainpura villages in Bassi Tehsil of Jaipur District. It flows southeast for 29 km, then southwest for 35 km, up to the confluence with river Dhund, and then southeast for 83 km in Jaipur and Sawai Madhopur Districts, before joining Banas river near Hadoli village in Karauli Tehsil of Sawai Madhopur District. Tributaries of river Morel are Dhund, Kankrauli and Kalisil rivers

38. River Kalisil originates in the hills near Rajpura village in Sawai Madhopur District. The river flows generally southwest, partly through hills and partly in the plains of Sawai Madhopur District, for about 48 km, before joining Morel River. Number of small *nallahs* [3]of Sawai Madhopur are joining to River Kalisil.

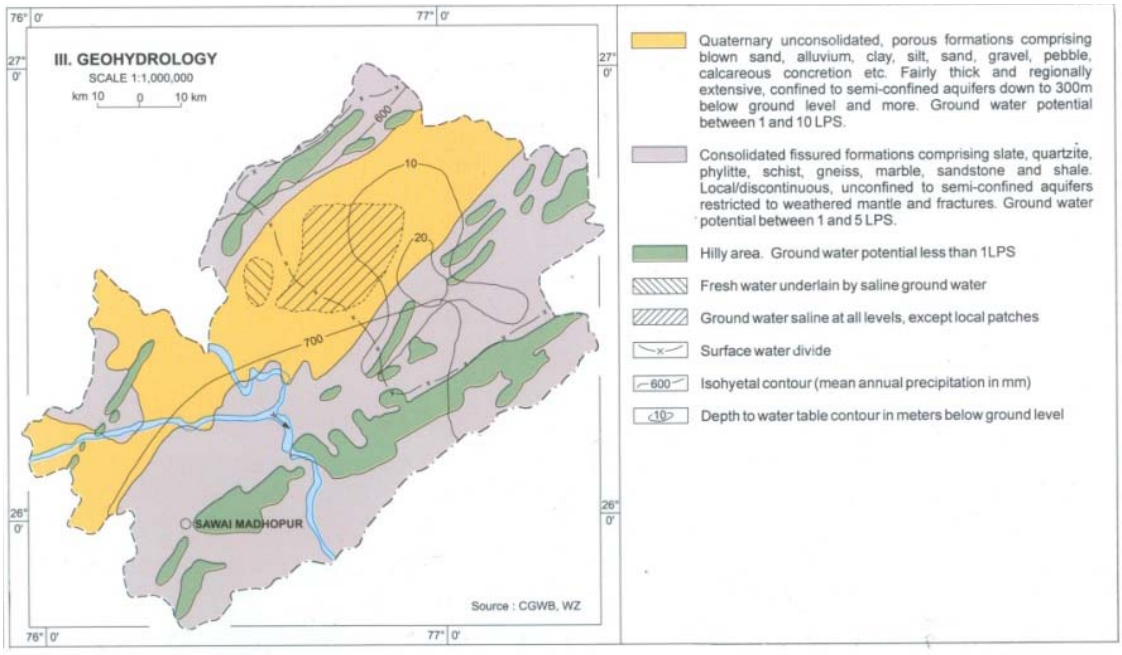
### 7. Geohydrology and Groundwater

[3] *Nallahs* are canals where water drains out specifically during rainy season

39. The Geohydrological map of Sawai Madhopur is shown in **Figure 3.7.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into two groups on the basis of their degree of consolidation and related parameters. These are porous formations – quaternary unconsolidated formations and fissured formations – consolidated sedimentary rocks

40. On an average, 40% of the district area (mostly south and eastern part of the district) covered with consolidated fissured formation with some patches of hilly area.

**Figure 3.7: Sawai Madhopur Geohydrological Map**




41. The Central Ground Water Board (CGWB) established a number of National Hydrographic Monitoring Stations in and around Sawai Madhopur to monitor fluctuations of groundwater level (**Table 3.4**). In most of the cases, groundwater table ranged between 10 to 20 m below ground level (bgl).

**Table 3.4: Number and Percentage of National Hydograph Network Stations (Sawai Madhopur) with Water Fluctuation Range**

| Period | No of wells analysed | Range | | 0-2m | | 2-5m | | 5-10m | | 10-20m | | 20-60m | | >60m | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | No | % | No | % | No | % | No | % | No | % | No | % |
| Jan-06 | 24 | 1.99 | 35.77 | 1 | 4.17 | 1 | 4.17 | 6 | 25.0 | 11 | 45.83 | 5 | 20.83 | 0 | 0 |
| Nov05 | 24 | 1.03 | 34.47 | 1 | 4.17 | 4 | 16.67 | 5 | 20.83 | 9 | 37.5 | 5 | 20.83 | 0 | 0 |
| Aug05 | 24 | 2.41 | 33.18 | 0 | 0 | 6 | 25 | 6 | 25 | 10 | 41.67 | 2 | 8.33 | 0 | 0 |
| May05 | 21 | 3.65 | 35.7 | 0 | 0 | 2 | 9.52 | 6 | 28.57 | 9 | 42.86 | 4 | 19.05 | 0 | 0 |

Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

## B. Ecological Resources

42. Flora: The principal species found in Sawai Madhopur is Dhok (*Anogeis pendula*) .Some other species sparsely scattered are Raunj (*Acacia leucophloea*), Tendu (*Diospyros melanoxylon*). *Acacia cataechu* Scrub: These scrubs exclusively occur in Deoli blocks of Uniara range in Tonk District. Small patches also occur in Rawanjna Doongar main and Sawai Madhopur 'B' blocks. The growing stock chiefly consists of stunted and crooked Khair (*Accacia catechu*), Raunj (*Acacia lencophloea*) and Krail (*Capparies deciduas*).The undergrowth is scanty and consists of Ber-Jhari (*Zizyphus nummulana*) and Papadhani (*Fluggea viscosa*).

43. Fauna: Sawai Madhopur is rich in wild life. It has a large variety of animals, birds, and fishes. Tigers, leopards or panthers, and wild dogs (Dhole) are also found in this area. Sloth bears are less uncommon here than in many other parts of India where they were once well known. Wild pigs are also plentiful. Among the forest birds are the peafowl, doves, parakeets, owls and other birds of prey. Other birds seen here are egrets, pond herons, grey and purple herons.

44. There are no forest areas near the subproject site. The nearest reserve is the Ranthambore Tiger Reserve which is 7 km away. Ranthambore was established as the Sawai Madhopur Game Sanctuary in 1955 by GoI, and was declared one of the Project Tiger reserves in 1973. In 1984, the adjacent forests were declared the Sawai Man Singh Sanctuary and Keladevi Sanctuary, and in 1991 the tiger reserve was enlarged to include Sawai Man Singh and Keladevi sanctuaries. The park lies at the edge of a plateau, and is bounded to the north by the Banas River and to the south by the Chambal River. There are several lakes in the park. It is named for the historic Ranthambore fortress, which lies within the national park. The park covers an area of 392 sq km, and is famous for its tiger population. Other major wild animals include the tiger, leopard, nilgai, dhole, wild pig, sambar and chital. It is also home to wide variety of trees, plants, birds and reptiles. Ranthambore is also the site for one of the largest Banyan trees in India. No endangered flora and fauna is reported from the site. No works will be done within 500 meter radius of the protected forest area.

### C. Economic Development

45. Sawai Madhopur being a desert district generally faces famines & drought. The bulk of population depends upon agriculture & animal husbandry. Being the district headquarter, Sawai Madhopur town is the main regional center for the entire district and is working as service center for providing services like trade and commerce, transport, commercial and other higher level public facilities for the entire district.

46. The economic condition of people in Sawai Madhopur is not satisfactory. As per information in 1998 about 28% population comprised of families below poverty line. These people are mostly labor class working in industries, shops, restaurant, construction, transport and others.

47. Total workers in the districts as per 2001 census are 109,248 out of which 86,836 are main workers and 22,412 are marginal workers and 169,393 are non worker. The work participation rate is 39 %. The occupational structure as per 2001 census is assessed as follows:

**Table 3.5: Distribution of Work Force (2001)**

| Category | Nos. | % of Work Force |
|---|---|---|
| **1. Main Workers** | | |
| Cultivators | 3473 | 4.00 |
| Agriculture Labourer | 868 | 1.00 |
| House Hold Industry | 5210 | 6.00 |
| Other Workers | 77284 | 89.00 |
| **Sub-Total** | **86,836** | |
| **2. Marginal Workers** | | |
| Cultivators | 2689 | 12.00 |
| Agriculture Labourer | 1792 | 8.00 |
| House Hold Industry | 2913 | 13.00 |
| Other Workers | 15016 | 67.00 |
| **Sub-Total** | **22,412** | |
| **Grand Total** | **109248** | |

Source: Compiled from District Census Handbook Data, 2001

48. The detailed break-up of occupational structure is not available for 2001 census data. However, the occupational structure data for 1971, 1981, and 1991 are available on the basis of which the estimation for 2001 has been made as shown in the below **Table 3.6.**

**Table 3.6: Sawai Madhopur Occupational Structure (1971 to 2001)**

| Occupation | 1971 | | 1991 | | 2001 | |
|---|---|---|---|---|---|---|
| | Workers | % | Workers | % | Workers | % |
| Agriculture, mining and allied activities | 1,220 | 9.80 | 2,091 | 10.03 | 2,466 | 8.50 |
| Industrial | 4,124 | 33.10 | 4,997 | 24.5 | 8,125 | 28.00 |
| Construction | 400 | 3.20 | 1,405 | 6.9 | 1,742 | 6.00 |
| Trade & Commerce | 1,958 | 15.72 | 4,001 | 19.6 | 5,804 | 20.00 |
| Transport & Communication | 1,377 | 11.05 | 2,229 | 10.9 | 3,046 | 10.50 |
| Other Services | 3,380 | 27.13 | 56.83 | 27.8 | 7,835 | 27.00 |
| **Total** | **12,459** | **100.00** | **20,406** | **100.00** | **29018** | **100.00** |

Source: Census of India and Estimates

49. The occupational structure of people in Sawai Madhopur District shows that Sawai Madhopur town is a commercial center as well as service town. A number of district level offices are located in the town and as such about 23% workers are engaged in the service sector. Industrial activity is not very significant due to lack of water supply and power, as well as raw material. Therefore, employment in industrial sector is only 16%. It may be mentioned that Sawai Madhopur is famous for mason and construction workers. They are not only worked at Sawai Madhopur or other neighboring states, but also in Gulf countries. The high percentage of workers of about 11.25% in construction justifies this fact.

50. There is no power generating unit in Sawai Madhopur. The consumption of electricity by different sectors is shown in **Table 3.7**.

**Table 3.7: Consumption of Electricity in Sawal Madhopur in KWh (2003 - 2004)**

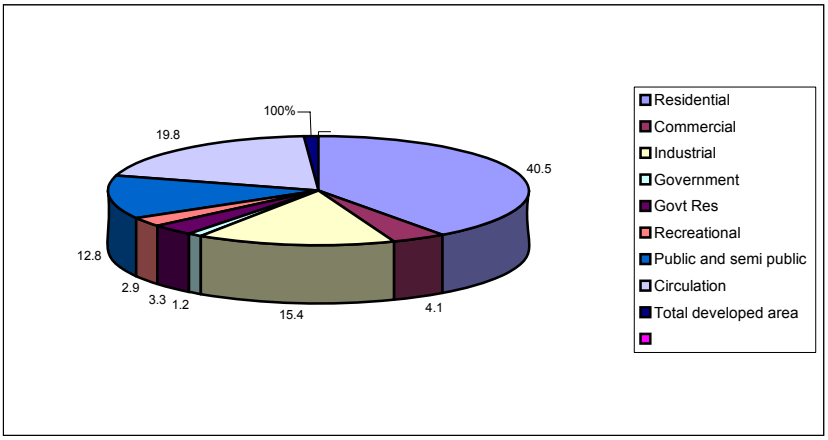
| Domestic | Non- Domestic (Commercial) | Industrial | Public Lighting | Public Water Works | District | Domestic |
|---|---|---|---|---|---|---|
| | | Small | Medium | Large | | |
| 32.948 | 7.875 | 4.36 | 1.7330 | 1.89 | 0.596 | 7.547 |

51. Land use: Total area within the municipal limits of Sawai Madhopur is 59 sq km or 14,575 acres. Out of which only 1,220 acres is the developed area and the rest consists of water bodies hills, agricultural lands, etc. Out of the total developed area, 40.05 % is under residential use and 12.08 % under public and semi public use. Land under government offices is only 1.2% of the total development area. About 15.04 % of the total development area is under industrial use, which includes large chunk owned by an existing cement factory. **Table 3.8** and **Figure 3.8** shows land use break up of the Sawai Madhopur developed area. Land use of entire district is shown in **Figure 3.9.**

**Table 3.8: Existing Land-use, Sawai Madhopur, 1985**

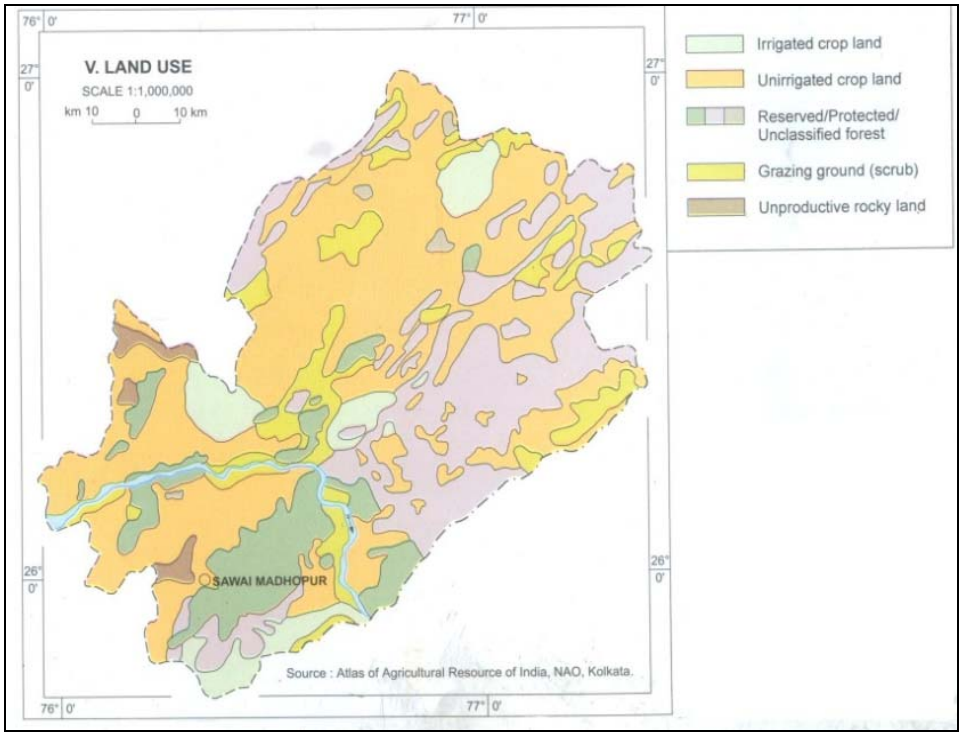
| Use | Area in Acres | % of Developed Area |
|---|---|---|
| Residential | 490 | 40.5 |
| Commercial | 50 | 4.1 |
| Industrial | 195 | 15.4 |
| Government | 15 | 1.2 |
| Government Reserved Area | 40 | 3.3 |
| Recreational | 35 | 2.9 |
| Public & Semi-public | 155 | 12.8 |
| Circulation | 240 | 19.8 |
| **Total Developed Area** | **1,220** | 100% |

**Figure 3.8: Existing Land-Use and Percentage of Developed Area (Year)**




Source: District Statistics Handbook

**Figure 3.9: Land Use of Sawai Madhopur District (1987)**




Source: GSI Resource Map

52. Commerce, Industry and Agriculture: The main retail and wholesale business activities are still carried out in the market of the old Sawai Madhopur town. These traditional markets are located in the principal business areas of the town. Originally planned straight roads in this area have become narrower because of the continuous Chabutara-type encroachments in front of the shops, bus stand and the business related to transportation is located along Khandar road.

53. Retail- and transport-oriented businesses are located in the newly development "Bazaria" in the main market street of Sawai Madhopur town. The street is overcrowded and congested because of intermingling of traffic and there are no parking facilities for vehicles.

54. The vegetable and grain market located in the old town is a very congested area. However a new site has been constructed near Alanpur village along main road. The grain storehouses are located at isolated location on Ranthambhore road and College road in old Khasa Kothi building. Food Corporation of India has taken up work of development of godowns which is located in the east of Jaipur Udyog Cement Factory.

55. Industrial Development: Sawai Madhopur town is a fast developing industrial town of Rajasthan mainly because of its nodal location at the junction of Broad Gauge railway lines. The industrial employment has increased from 4,124 in 1971 to 8,125 by 2001. The town has one large scale industrial unit namely, Jaipur Udyog Cement Limited which is located in the north town. There are two planned industrial areas by Rajasthan State Industrial Development & Investment Corporation (RIICO) for small scale industries, Kherda industrial area is located on Tonk road in the west, with an area of 100 acres for 137 plots while the other industrial area is located on Ranthambhore road in the east with an area of 57 acres for 62 plots .Both industrial areas have been fully developed.

56. In and around the Sawai Madhopur town area, about 60% of the land is used for agricultural purpose. Crop production statistics as shown in **Table 3.9** indicates that total crop production during Rabi season is comparatively more than in Kharif season and that basically due to oilseed production during Rabi season.

**Table 3.9: Crop Production In and Around Sawai Madhopur (2003 to 2004)**

| Type of Crops | Under Rabi Crops (ton) | Under Kharif Crops (ton) |
|---|---|---|
| Cereals | 133,823 | 199,069 |
| Pulses | 28,825 | 4,591 |
| Food Grains | 162,648 | 203,660 |
| Oilseeds | 138,480 | 12,265 |
| Others | 1,614 | 10,391 |
| **Total** | **302,742** | **226,316** |

Source: Vital Agricultural Statistics 2004-2005, Directorate of Agriculture, Rajasthan

### 3. Infrastructure

57. Water Supply: Presently both groundwater and surface water are used as sources for Sawai Madhopur town. There are 63 tubewells and 10 open wells in town. Water is also lifted from Banas River through one existing intake well .Total production from all these sources is 8 MLD. The gross water supply through the piped system is currently estimated 67.79 lpcd and the transmission and distribution losses is 40%. This is much less than the standard norm of 135 lpcd. The water is supplied through various ward-wise service reservoirs. As of 2006, there are 13,846 water connections and most of these are metered.

58. The Central Ground Water Board seasonally carries out chemical testing of water from tube wells. The Drinking Water Standards and results of groundwater testing in Sawai Madhopur are shown in **Table 3.10**.

**Table 3.10: Ground Water Quality In and Around Sawai Madhopur District**

| Parameters | Maximum Level | Minimum Level | Standard of Drinking Water (IS: 10500: 1991) | |
|---|---|---|---|---|
| | | | Desirable Limit | Maximum Permissible Limit |
| pH | 8.8 | 7.2 | | |
| EC (micromhos /cm at 25°C) | 6,650 | 580 | | |
| Cl (mg/l) | 1,775 | 28 | 250 | 1000 |
| $SO_4$ (mg/l) | 585 | 5 | 200 | 400 (if Mg does not exceeds 30 ppm) |
| $NO_3$ (mg/l) | 250 | 1 | - | 100 |
| $PO_4$ (mg/l) | 2 | 0.11 | | |
| Total Hardness (mg/l) | 1,380 | 150 | 300 | 600 |
| Ca (mg/l) | 340 | 12 | 75 | 200 |
| Mg (mg/l) | 145 | 12 | 30 | 100 |
| Na (mg/l) | 1,265 | 12 | - | - |
| K (mg/l) | 312 | 1 | - | - |
| F (mg/l) | 7.0 | 0.1 | 1.0 | 1.5 |

| Parameters | Maximum Level | Minimum Level | Standard of Drinking Water (IS: 10500: 1991) | |
|---|---|---|---|---|
| | | | Desirable Limit | Maximum Permissible Limit |
| Fe (mg/l) | 3.6 | 0.03 | 0.3 | 1.0 |
| $SiO_2$ (mg/l) | 28 | 3 | - | - |
| TDS (mg/l) | 4,323 | 377 | 500 | 2,000 |

EC = electric conductivity, Cl = chloride, $SO_4$ = sulfates, $NO_3$ = nitrates, $PO_4$ = phosphates, Ca = calcium, Mg = Magnessium, Na = sodium, K = potassium, F = fluoride, Fe = iron, $SiO_2$ = silicates, TDS = total dissolved solids, mg/l = milligrams per liter
Source: Ground Water Yearbook 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

59. PHED conducts quarterly surface water, groundwater, and water supply quality monitoring prior to distribution to households, industries and other users. The most recent data available is for the monitoring conducted in 2007. The result is shown in **Table 3.11**. It is noted that groundwater contains high levels of fluoride (F), total dissolved solids (TDS), and nitrate ($NO_3$).

**Table 3.11: Present Supply Water Quality at Sawai Madhopur District**

| Total supply per day (lac liter ) | Type of Sources Surface /Ground | Ground | Surface | No. of CWR | No. of SR | $F^-$ Min | $F^-$ Max | TDS Min | TDS Max | $NO_3$ Min | $NO_3$ Max |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72.95 | Ground | 100 | 0 | 6 | 20 | 0.2 | 1.6 | 588 | 1,351 | 10 | 324 |

CWR = clear water reservoir, SR = service reservoir, F = fluoride, TDS = total dissolved solids, $NO_3$ = nitrates

60. Sewerage and Sanitation System: Sawai Madhopur town does not have underground sewerage system. Only 50% of the households reportedly have septic tanks and soak-well systems for sewerage disposal. The remaining household practice open defecation which is an unacceptable and unhygienic practice. The raw settled sewage from septic tank is periodically flushed out by sanitary workers of the MB and discharge to open spaces, agricultural lands in an indiscriminate manner. The municipal drains are mostly open and overflowing into the *nalla* causing problems during the rainy season. The water flows to the drains resulting to unsanitary conditions specially in the 14 slum areas identified in the town.

61. Drainage: The topography of Sawai Madhopur town is cup-shaped. Due to scanty rains in the region, natural drainage system has not been so far evolved..In Sawai Madhopur town itself no natural drainage system exists to drain away the rainwater or wastewater from the town. Presently there exists a minimal network of storm water drains in the town. The existing network of (roadside) storm water drains in Sawai Madhopur has been identified under three broad categories as follows: (i) open *pucca* (concrete drains 40 km) (ii) closed *pucca* (48 km) *and* (iii) Kutchha.

62. Industrial Effluents: Small industries exists under RIICO, which are located outside of the town area. There are small amount of effluent generated and disposed in local *nallahs*. As reported by the local Municipal Board, the responsibility of effluent disposal is under RIICO's own and could not be connected to the proposed sewer network. The individual industry must treat their effluent to bring it to the required standard before final disposal.

63. Solid Waste: The municipal solid wastes (MSW) generated in the Sawai Madhopur town (including slum area) mainly consists of domestic refuse, wastes from commercial area,

vegetable-fruit market, bio-medical waste, waste from hotels and restaurants, industries etc. The waste collection system being followed is quite primitive, individual households/units throw the garbage on road side/open drains close to their houses and the sweepers collect the garbage in the form of small heaps on road sides. Similarly the open drains are also cleaned periodically and the sludge is heaped adjacent to the drain where it is left for 2-3 days to get dried and lifted. Tractor trolleys then lift these dumps the heaped garbage once or twice a day. In the process, part of the garbage gets dispersed on the road or finds it way into to the open drains or open low lying pits.

64. The MSW generated is transported to garbage dumping site. The Municipality of Sawai Madhopur has engaged one loader, three tractors, and four private tractors for collecting and transporting the solid waste material. The capacity of 7 tractors is approximately 10 cubic meters. The waste material is lifted by loaders and put on trolley for transportation to disposal site. Details of the quantity of garbage collected and disposed of are not available. However based on population density and spatial distribution of income groups in the Sawai Madhopur town, the waste generation has been assessed as 30 tons per day, which is close to approximate quantitative information provided by the Municipal Junior Engineer. Break up of the present (2006) quantity of MSW is given in **Table 3.12.**

**Table 3.12: Break Up of Present Waste Collection**

| Type | Tons |
|---|---|
| Residential Area (Domestic) | 18 |
| Commercial Area | 6 |
| Industrial | 4 |
| Hospital Area | 2 |
| **Total** | **30** |

65. Road Network and Transportation: India has a huge network of 3.3 million km of roadways, making it one of the largest road network in the world. This huge network, which includes both paved and unpaved roads, are categorized as expressways or freeways, National Highways (NH), State Highways (SH), major district roads, and rural and other roads. The roads generally are dual carriageways in expressways and highways. **Table 3.13** provides a breakdown of road network in Sawai Madhopur. This has resulted in a corresponding increase in vehicular traffic greater than that of the town's population growth due to improving economic status of the town.

**Table 3.13 Road Surface Composition (2007)**

| Surface Type | Total (km) |
|---|---|
| Concrete | 54 |
| Black Topped | 3500 |
| Water Bound Macadam | 10 |
| Others/Earthen | 10 |
| **Total** | **109.00** |

Source: Public Works Department (PWD) Sawai Madhopur

## D. Social and Cultural Resources

### 1. Demography

66. The population of Sawai Madhopur District is more than 1.11 million. The population density is 248 persons per sq km, which is more than the state's population density of 165 persons per sq km. The literacy rate of the district is 57.347%, which is little higher than the state literacy rate (61.03%).

67. Sawai Madhopur Municipal area comprises is 59 sq km and of 36 wards.

**Table 3.14 : Ward wise Population of Sawai Madhopur Town, 2001**

| Ward No | Population | | | Sex Ratio |
|---|---|---|---|---|
| | Persons 2001 | Male | Female | |
| 1 | 2409 | 1257 | 1152 | 916 |
| 2 | 3386 | 1784 | 1602 | 898 |
| 3 | 3533 | 1921 | 1612 | 839 |
| 4 | 3830 | 1988 | 1842 | 927 |
| 5 | 2000 | 1081 | 919 | 850 |
| 6 | 1909 | 1075 | 834 | 776 |
| 7 | 3448 | 1936 | 1512 | 781 |
| 8 | 5244 | 2823 | 2421 | 858 |
| 9 | 4120 | 2211 | 1909 | 863 |
| 10 | 5056 | 2692 | 2364 | 878 |
| 11 | 3543 | 1786 | 1757 | 984 |
| 12 | 1348 | 699 | 649 | 928 |
| 13 | 1874 | 995 | 879 | 883 |
| 14 | 2297 | 1198 | 1099 | 917 |
| 15 | 1608 | 818 | 790 | 966 |
| 16 | 3585 | 1902 | 1683 | 885 |
| 17 | 2005 | 1011 | 994 | 983 |
| 18 | 2669 | 1388 | 1281 | 923 |
| 19 | 1924 | 1005 | 919 | 914 |
| 20 | 1764 | 938 | 826 | 881 |
| 21 | 2339 | 1236 | 1103 | 892 |
| 22 | 2488 | 1300 | 1188 | 914 |
| 23 | 2217 | 1126 | 1091 | 969 |
| 24 | 2815 | 1441 | 1374 | 954 |
| 25 | 2613 | 1354 | 1259 | 930 |
| 26 | 2489 | 1294 | 1195 | 923 |
| 27 | 2128 | 1118 | 1010 | 903 |
| 28 | 2543 | 1327 | 1216 | 916 |

| Ward No | Population | | | Sex Ratio |
|---|---|---|---|---|
| | Persons 2001 | Male | Female | |
| 29 | 3144 | 1628 | 1516 | 931 |
| 30 | 3021 | 1596 | 1425 | 893 |
| 31 | 2075 | 1071 | 1004 | 937 |
| 32 | 4951 | 2634 | 2317 | 880 |
| 33 | 1897 | 1036 | 861 | 831 |
| 34 | 2862 | 1581 | 1281 | 810 |
| 35 | 2359 | 1260 | 1099 | 872 |
| 36 | 4505 | 2393 | 2111 | 882 |

Source: Census of India, 2001

## 2. Health and Educational Facilities

68. There are good educational facilities in Sawai Madhopur District, which serve townspeople, inhabitants of surrounding villages, and towns in the hinterland. There are 688 primary schools, 161 secondary schools and 58 higher secondary schools, plus five general degree colleges and one Industrial Training Institute (ITI).

**Table 3.15: Educational facility of Sawai Madhopur District**

| | |
|---|---|
| Primary School Govt. | 575 |
| Primary School Private | 113 |
| Upper Primary School Govt. | 294 |
| Upper Primary School Pvt. | 320 |
| Secondary School Govt. | 74 |
| Secondary School Pvt. | 87 |
| Senior Secondary School Govt. | 38 |
| Senior Secondary School Pvt. | 20 |
| Navodaya Vidyalaya | 1 |
| Kendriya Vidyalaya | 2 |
| College | 5 |
| I.T.I. | 1 |
| Rajeev Gandhi Pathshala | 342 |

Source: Official website of Rajasthan Government

69. As the district headquarters town, Sawai Madhopur is the main centre for health facilities in the area. There is also a district general hospital, 4 community health centers (CHC) and 22 primary health center in the district. The detail of the health facilities is given in **Table 3.16.**

**Table 3.16: Health facility Sawai Madhopur District**

| | |
|---|---|
| General Hospital | 1 at district headquarter (150 beds) |
| Community Health Center (CHC) | 4 (Gangapur town, Bamnawas, Bonli, Khandar) |
| Primary Health Center (PHC) | 22 |
| Sub Health Centre | 194 |
| T.B. Clinic | 1 |
| Private Hospital | 14 |

Source: Official Website of Rajasthan Government

### 3. History, Culture and Tourism

70. The Muslim conquest brought about major changes in the political map of northern India. In Rajasthan, the Chauhan kingdoms of Sapadalaksa and Nodal dis-appeared, Govinda the grandson of Prithviraj Chauhan established himself at Ranthambore and ruled as feudatory of the Sultan of Delhi. Following disturbances after the death of Iltumish, Vagbhatta besieged the fort of Ranthambore. He then ruled from here for 12 years waging continuous battles against the Sultanate. Rao Hamir was yet another figure who carved a niche for himself. In the annals, it is only now and then do we come across men of such heroism. Rana Kumbha captured the Ranthambore Fort the middle of the 15$^{th}$ century. After the death of Aurangzeb, the fort was taken over by the rulers of Jaipur.

71. Sawai Madhopur has moderate tourist inflows with main attractions being Ranthambore National Park, Ranthambore Fort, Ganesh Temple, Kala – Gaura Bhairwa Temple, ChamatkarJi Jain Mandir, Man Sarovar Dam, Chouth Mata Temple, Shiwad Temple, Bhagwatghar Kunda, Ambreshwaram Temple , Rameshwaram, Khandar Fort., Persian inscriptions in a Baori. Sawai Madhopur functions as an ideal weekend resort for inhabitants of the Delhi Metropolis in addition to being a place of interest for foreign tourists.

## IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: LOCATION AND DESIGN

72. ADB Environmental Assessment Guidelines require that an IEE should evaluate impacts due to the location, design, construction and operation of the project. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. In assessing the effects of these processes therefore, all potential impacts of the project are identified, and mitigation is devised for any negative impacts.

73. The ADB Rapid Environmental Assessment Checklist for Sewerage and Sanitation found in the Environmental Assessment Guidelines (2003) was used to screen the subproject for environmental impact and to determine the scope of the IEE investigation. The completed Checklist is found in **Appendix 1.**

74. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen.

75. However in the case of this subproject, it is not considered that there are any impacts that can clearly be said to result from either the design or location. This is because:

- Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant;

- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation. However, these are more routine in nature, and the impacts that can be most easily mitigated; and

- The project is not adjacent to or in any environmentally sensitive, reserve or protected areas, and hence does not cause an impact on biodiversity values. The project location is the urban, or built up, environment of Sawai Madhopur. Infrastructure will be installed and constructed in public rights-of-way, easements, roads and properties held by the Government, hence land acquisition and encroachment on private property will not occur.

76. In one of the major areas in which there could be significant impacts (archaeology), those impacts are clearly a result of the construction process rather than the project design or location, as they would not occur if this did not involve trenching or other ground disturbance.

## V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: INFRASTRUCTURE CONSTRUCTION

### A. Screening out Areas of No Significant Impact

77. From the descriptions given in Section II, it is clear that implementation of the project will affect a significant proportion of the town as branches of the new sewerage network will be built alongside many roads. Areas outside the town will also be affected, by construction of the trunk sewer and STP.

78. It is not expected that the construction work will cause major negative impacts, mainly because:

- Most of the network and the trunk sewer will be built on unused ground alongside existing roads and can be constructed without causing major disruption to road users and any adjacent houses, shops and other businesses;

- The STP will be located on government-owned land that is not occupied or used for any other purpose;

- Most network construction will be conducted by small teams working on short lengths at a time so most impacts will be localised and short in duration; and

- The overall construction program will be relatively short for a project of this nature, and is expected to be completed in 1.5 to 2 years.

79. As a result, there are several aspects of the environment that are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in **Table 5.1**, with an explanation of the reasoning in each case.

80. These environmental factors have screened out presently but will be assessed again before starting of the construction activities.

**Table 5.1: Fields in which Construction is not Expected to have Significant Impacts**

| Field | Rationale |
|---|---|
| Climate | Short-term production of dust is the only effect on atmosphere |
| Geology and seismology | Excavation will not be large enough to affect these features |
| Fisheries & aquatic biology | No rivers or lakes will be affected by the construction work |
| Wildlife and rare or endangered species | Ranathambore Tiger Reserve and National Park is located in the town (protected areas), so the sewer network construction will be not be allowed within or outside the protected area. Blasting, air, and noise pollution will not be allowed near the areas |
| Coastal resources | Sawai Madhopur is not located in a coastal area |
| Population and communities | Construction will not affect population numbers, location or composition |

## B. Sewage Treatment Plant

### 1. Construction Method

81. Work components of STP involve:

There are 2 numbers of anaerobic ponds of size 75 x 42 m at top and 8 nos. of facultative stabilization ponds of size 138m x 71 m at top

Total area used for these ponds
2 x (75x 42) +8(138x71) =84684 m (8.46 Ha)

Total land available 63.3 Ha for STP

- Pump stations and pipes with valves to transfer material between ponds; and
- An outfall to discharge the treated wastewater.

82. Although the site is fairly large, the construction will be straightforward and involving mainly simple excavation. The ponds will be dug by backhoe diggers and bulldozers, and soil will be transferred into trucks for offsite disposal. Clay will then be applied to the floor and sloping sides of each pond and after watering will be covered with low density polyethylene (LDPE) sheeting. A thin layer of cement mortar is then added, and concrete tiles are embedded into the surface by hand, with more cement grouting applied to seal joints between tiles.

83. Trenches for the pipe-work will also be dug by backhoe, and pipes will be brought to site on trucks, offloaded and placed into each trench by small cranes or pipe-rigs, after which soil will be replaced by hand to cover the trenches.

84. Foundations for the small pump houses will be dug by backhoe, and concrete and aggregate will be tipped in to create the foundations and floor. The brick sides will then be built by hand by masons and pumps will be brought in on trucks and placed inside the pump house by crane. The roof material will then be attached by hand.

### 2. Physical Resources

85. Although the impacts of constructing the STP will be confined to a single site, because of its size and the invasive nature of the excavation work, physical impacts could be significant, so mitigation measures will be needed.

86. Ponds will be dug on around 80% of the site, and if these are excavated to a depth of 2 to 3 m, and substantial waste soil will be generated. This is a very large amount of waste, which could not be dumped without causing further physical impacts on air quality (dust), topography, soil quality, etc. It will be important therefore to reduce the amount of dumping by finding beneficial uses for as much waste soil as possible. This will require:

- Contacting the town authorities to arrange for the use of this material where possible, such as in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas; and

- Preventing the generation of dust (which could affect surrounding agricultural land and crops) by removing waste materials as soon as it is excavated, by loading directly onto trucks, and covering with tarpaulins to prevent dust during transportation.

87. Another physical impact associated with large-scale excavation is the effect on drainage and the local water table if groundwater and/or surface water collect in the voids. Given the difficulties of working in wet conditions the Contractor will almost certainly conduct all excavation in the dry season, so this should avoid any impacts on surface water drainage. If water collects in any quantity it will need to be pumped out, and it should then be donated to neighboring farmers to provide a beneficial use to the communities most affected by this aspect of the work, and improve public perceptions of the project.

### 3. Ecological Resources

88. Ecological sensitive objects were not noted in the site, so construction will cause minimum ecological impacts. There are some trees that will need to be removed, and given global concerns regarding the loss of trees, the project should make a small positive ecological contribution by planting three native trees at a nearby site for every one that is removed.

### 4. Economic Development

89. The site of the proposed STP is owned by the government so there should be no need to acquire land from private owners, which might affect the income and assets of owners and tenants. The land is also not used for any purpose except for the unauthorized grazing of animals, and there is other suitable grazing nearby, so this activity should not be affected. The land is not farmed and there are no industries or permanent housing in the vicinity so there should be no impact on income-generating activities.

90. The only aspect of the work that has any economic implications is the transportation of waste material from the site to locations where it can be put to beneficial use as recommended above. This will require a large number of truck movements, which could disrupt traffic near the site and particularly in Sawai Madhopur if such vehicles were to enter the town. The transportation of waste will be implemented by the Construction Contractor in coordination with the town authorities, and the following additional precautions should be adopted to avoid effects on traffic:

- Planning transportation routes so that heavy vehicles do not enter Sawai Madhopur town and do not use narrow local roads, except in the immediate vicinity of delivery sites; and

- Scheduling transportation activities to avoid peak traffic periods.

### 5. Social and Cultural Resources

91. Although the STP will be built on an uninhabited and un-used site, with no permanent residential areas nearby, there is a risk that the work could damage social and cultural resources, so careful mitigation and strict adherence by the Executing Agency and Contractor will be necessary.

92. Rajasthan is an area with a rich and varied cultural heritage that includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. Given that this particular location is uninhabited and shows no sign of having been used to any extent in the past, then it could be that there is a low risk of such impacts. Nevertheless this should be ascertained by consulting the appropriate authorities, and appropriate steps should be taken according to the nature of the risk. This should involve:

- Consulting historical and archaeological authorities at both national and state level to obtain an expert assessment of the archaeological potential of the site;

- Selecting an alternative location if the site is considered to be of medium or high risk;

- Including state and local archaeological, cultural and historical authorities and interest groups in consultation forums as project stakeholders so that their expertise can be made available to the project; and

- Developing a protocol for use by the Contractor in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. This should involve having excavation observed by a person with archaeological field training, stopping work immediately to allow further investigation if any finds are suspected, and calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

93. There are no modern-day social and cultural resources (such as schools and hospitals) within 500 m of the site, and no areas that are used for religious or other purposes, so there is

no risk of other impacts on such community assets. The distance of Temple is 180 m from the center of site. But this is a small structure & there is no worship or prayer offered.

94. Finally, there could be some short-term socio-economic benefits from the construction work if local people are able to gain employment in the construction workforce. To ensure that such gains are directed towards communities most directly affected by this part of the scheme, the Contractor should be required to employ at least 50% of the STP labor force from communities within a radius 2 km from the site, if sufficient people are available.

## C. Sewerage Network and Trunk Sewer

### 1. Construction Method

95. Provision of a sewerage system in part of the town will involve construction of:

- Secondary and tertiary networks that will collect sewage from individual houses. These pipes will be of small diameter (200 to 600 mm) and will be located in shallow trenches (approx. 1.5 m in depth); and

- The trunk sewer/ outfall sewer will also be of RCC pipes and will convey sewage from the secondary network to the STP These pipes will be 800 mm in diameter

96. These two elements of the project involve the same kinds of construction and will produce similar effects on the environment, so their impacts are considered together.

97. Most pipes will be buried in trenches immediately adjacent to roads, in the un-used area within the ROW, alongside the edge of the tarmac. The trunk main and secondary network will be located alongside main roads, where there is generally more than enough free space to accommodate the pipeline. However in parts of the tertiary network where roads are narrow, this area is occupied by drains or the edges of shops and houses etc., so the trenches may have to be dug into the edge of the road.

98. Trenches will be dug by backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed nearby, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by crane or using a small rig. After the pipes are joined, loose soil will be replaced back into the trench, and the surface layer will be compacted by hand-operated compressor.

99. Pipes are normally covered by 1.2 m of soil, and a clearance of 100 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will therefore be quite large, a maximum of 2.3 m deep and 1.2 m wide for the trunk main, and a minimum of 1.5 m deep and 0.4 m wide for the tertiary network.

100. At intervals, small chambers (capacity of 1 to 2 $m^3$) will be created to allow inspection and clearance of blockages and sediment during operation. These will be excavated by backhoe and hardcore and concrete (mixed on site) will be tipped in to form the base. Brick sides will then be added by masons by hand, and the top will be sealed at ground level by a metal manhole cover.

101. As noted above, some of the narrower roads are constructed of concrete and have no available space at the edge because of the presence of drains, or shop- and house-fronts

encroaching into the ROW. In these places it may be necessary to break open the surface of the road using hand-held pneumatic drills, after which the trench and pipeline will be constructed as described above. On completion a concrete layer will be re-applied to the surface to repair the road.

### 2. Physical Resources

102. Construction of trenches will have similar physical impacts to the excavation work at the STP, although their extent and significance will be different because trenches are linear structures and the network is located in the town. Since length of the trunk main is not much the generation of waste will be less. Although this is <10% of the quantity produced at the STP it is still a significant amount of waste, and in this case there are additional considerations because piles of soil could impede traffic and other activities in the town (see below) and dust could affect inhabitants during dry weather. These impacts should be mitigated by applying the same measures as at the STP site to minimize waste and dust, and there will need to be some additional precautions to control dust. The Contractor should:

- Contact the town authorities to find beneficial uses for the waste material, such as in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas;

- Remove waste material as soon as it is excavated (by loading directly into trucks), to reduce the amount stockpiled on site;

- Use tarpaulins to cover loose material when transported from the site by truck; and

- Cover or water stockpiled soil to reduce dust during windy weather.

103. The other important physical impact associated with large-scale excavation (effects on surface and groundwater drainage) should not be an issue in this case because of the very low rainfall in this area and the very low water table. In addition the Contractor will almost certainly conduct all excavation in the dry season, to avoid the difficult working conditions during the monsoon.

104. The physical impacts of trenching will also be reduced by the method of working, whereby the network and trunk sewer will probably be constructed by small teams working on short lengths at a time, so that impacts will be mainly localised and short in duration. Physical impacts are also mainly temporary as trenches will be refilled and compacted after pipes are installed, and any disturbed road surfaces will be repaired. Because of these factors and the mitigation measures proposed above, impacts on the physical environment are not expected to be of major significance.

### 3. Ecological Resources

105. Ranthambore Tiger Reserve and National Park are located in the town, so the sewer network development should have to design without any ecological disturbances. Roadside trees should not be removed unnecessarily to build the trenches, and to mitigate any such losses the Contractor should be required to plant and maintain three new trees (of the same species) for each one that is removed. Care will be taken to avoid air/noise pollution as well as avoid dumping excavated materials in the forest area.

### 4. Economic Development

106. As the network and trunk sewer pipelines will all be conducted within the ROW of existing roads (either adjacent to the road, or beneath the road surface in narrower streets) there will be no need to acquire land, so there should be no direct effect on the income or assets of landowners, or the livelihoods of tenants.

107. There could be some economic impacts however, if the presence of trenches, excavated material, workers and machinery discourage customers from visiting shops and businesses adjacent to network construction sites, and the businesses lose income as a result. These losses will be short in duration as work at any one site should be completed in a week or less. However the loss of income could be significant for small traders and other businesses that exist on low profit margins. These impacts should therefore be mitigated by:

- Leaving spaces for access between mounds of excavated soil, and providing footbridges so that pedestrians can cross open trenches;
- Increasing the workforce in these areas to ensure that work is completed quickly; and
- Consulting affected businesspeople to inform them in advance when construction activities will occur.

108. ADB policy on Involuntary Resettlement requires that no-one should be worse off as a result of an ADB-funded project, and a separate Resettlement Plan and Resettlement Framework have been prepared to examine these issues and provide appropriate mitigation. This establishes that, in addition to the above practical measures to reduce the economic impact of the construction work, owners and tenants of affected businesses will also be compensated in cash for any income they lose.

109. Excavation could also damage existing infrastructure, in particular storm drains and water supply pipes, both of which are located alongside roads in the town. It will be particularly important to avoid damaging existing water pipes as these are mainly manufactured from Asbestos Cement (AC), which can be carcinogenic if inhaled, so there are serious health risks for both workers and the public (see below). It will be important therefore to avoid these impacts by:

- Obtaining details from the Municipal Council of the nature and location of all infrastructure, and planning the sewer networks so that all such sites are avoided; and
- Integrating the construction of the various Sawai Madhopur subprojects (in particular water supply and sewerage) so that different pipelines are located on opposite sides of the road wherever feasible, and roads and inhabitants are not subject to repeated disturbance by trenching in the same area for different purposes.

110. Transport is another type of infrastructure that will be affected by some of the work, as in the narrower streets there is not enough space for excavated soil to be piled off the road. As noted above the road itself may also be excavated in places where there is no available land alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road

may need to be closed for short periods. The Contractor should therefore plan this work in conjunction with the town authorities and the police force, so that work can be carried out during periods when traffic is known to be lighter, and alternative routes and diversions can be provided where necessary. The Contractor should also increase the workforce in areas such as this, so that the work is completed in the shortest possible time.

111. It is inevitable that there will be an increase in the number of heavy vehicles in the town (particularly trucks removing waste and delivering pipes and other materials to site), and this could disrupt traffic and other activities, as well as damage fragile buildings if vibration is excessive. These impacts will therefore need to be mitigated by:

- Careful planning of transportation routes with the municipal authorities to avoid sensitive areas as far as possible, including narrow streets, congested roads, important or fragile buildings and key sites of religious, cultural or tourism importance; and

- Scheduling the transportation of waste to avoid peak traffic periods, the main tourism season, and other important times.

**5. Social and Cultural Resources**

112. As was the case with the STP site, there is a risk that sewer construction, which involves extensive disturbance of the ground surface, could damage undiscovered archaeological and/or historical remains, or even unknown sites. The risks are in fact considerably higher in this case, because such artifacts are more likely to occur in areas that have been inhabited for a long period. Mitigation measures include:

- Consulting national and state historical and archaeological authorities to assess the archaeological potential of all construction sites;

- Selecting alternative routes to avoid any areas of medium or high risk;

- Including state and local archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise; and

- Developing a protocol for use in conducting all trenching, to recognize, protect and conserve any chance finds.

113. Sewer construction will also disturb some modern-day social and cultural resources, such as schools, hospitals, temples, and sites that are of interest to tourists. Impacts will include noise, dust, and interrupted access for pedestrians and vehicles, and in cases where pneumatic drills are used to break the surface of concrete roads, there could be a risk of damage from vibration. Mitigation will therefore be needed to protect these resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended above, including:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;

- Limiting dust by removing waste soil quickly, covering and watering stockpiles, and covering soil with tarpaulins when carried on trucks;

- Increasing the workforce in sensitive areas to complete the work quickly;

- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses); and

- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

In addition the EA and Contractor should:

- Consult municipal authorities, custodians of important buildings, cultural and tourism authorities, and affected communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

114. There is invariably a safety risk when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to produce and implement a site Health and Safety Plan, and this should include such measures as:

- Excluding the public from the site;

- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment;

- Health and Safety Training for all site personnel;

- Documented procedures to be followed for all site activities; and

- Documentation of work-related accident.

115. An additional, particularly acute health risk presented by this work derives from the fact that, as mentioned above, the existing water supply system comprises mainly AC pipes, so there is a risk of contact with carcinogenic material if these pipes are uncovered in the course of the work. Precautions have already been introduced into the design of the project to avoid this, of which the most important is that:

- The locations of all new infrastructures will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

116. Given the dangerous nature of this material for both workers and the public, additional precautions should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. The design consultant should therefore develop a protocol to be applied in any instance that AC pipes are found, to ensure that appropriate action is taken. This

should be based on the approach recommended by the United States Environmental Protection Agency (USEPA)[4], and amongst other things, should involve:

- Training of all personnel (including manual laborers) to enable them to understand the dangers of AC pipes and to be able to recognize them in situ;
- Reporting procedures to inform management immediately if AC pipes are encountered;
- Development and application of a detailed Health and Safety procedure to protect both workers and citizens. This should comply with national and international standards for dealing with asbestos, and should include:
  - Removal of all persons to a safe distance;
  - Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material; and
  - Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

117. There could again be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to communities that are affected by the work, the Contractor should be required to employ at least 50% of his labor force from communities in the vicinity of construction sites. Creating a workforce from mainly local people will bring additional benefits by avoiding problems that can occur if workers are imported; including social difficulties in the host community and issues of health and sanitation in poorly serviced temporary camps.

## VI. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: OPERATION AND MAINTENANCE

### A. Screening Out Areas of No Significant Impacts

118. Although the sewerage system will need regular maintenance when it is operating, with a few simple precautions this can be conducted without major environmental impacts. There are therefore several environmental factors which should be unaffected once the system begins to function. These are identified in Table 6.1 below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

**Table 6.1: Fields in which Operation and Maintenance of the Completed Sewerage System is not Expected to have Significant Impacts**

| Field | Rationale |
|---|---|

[4] In the USA, standards and approaches for handling asbestos are prescribed by the Occupational Health and Safety Administration (OHSA) and the Environmental Protection Agency (EPA) and can be found at http://www.osha.gov/SLTC/asbestos

| | |
|---|---|
| Climate, topography, geology, seismology | There are no known instances where the operation of a relatively small sewerage system has affected these factors |
| Fisheries & aquatic biology | Fishery is in local pond, which are away from the project site |
| Wildlife, forests, rare species, protected areas | Ranathambore Tiger Reserve and National park are located about 7 km from project site and no activity will be permitted within these protected areas. |
| Coastal resources | Sawai Madhopur is not located in a coastal area |

119. These environmental factors have thus been screened out presently but will be assessed again before starting of operation and maintenance activities.

## B. Operation and Maintenance of the Improved Sewerage System

120. The new sewerage system will collect and treat all surface water, domestic wastewater and sewage produced by 40% of the town, and the remainder of the inhabited area and future expansion will be served by additional sewers provided via subsequent tranches of funds. Although treatment will not be to the standards of more developed countries, the technology is approved by the Central Public Health and Environmental Engineering Organization (CPHEEO) and Pollution Control Board attached as **Appendix 2**, and the discharge after treatment will comply with Indian wastewater standards (**Table 6.2**).

**Table 6.2: Waste Water Quality Discharge Standards**

| SL.no | Parameter | Standards | | | |
|---|---|---|---|---|---|
| | | **Inland surface water** | **Public sewers** | **Land irrigation** | **Marine/coastal areas** |
| (a) | | (b) | (c) | | (d) |
| 1. | Colour and odour | remove as far as practicable | | | |
| 2. | Suspended solids mg/l. max. | 100 | 600 | 200 | (a) For process waste water100<br>(b) For cooling water effluent 10% above total suspended matter of influent. |
| 3. | Particle size of suspended solids | shall pass 850 micron IS Sieve | | | (a)Floatable solids, max. 3mm.<br>(b)Settable solids (max 850 micron) |
| 4. | pH value | 5.5. to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 |
| 5. | Temperature | shall not exceed $5^0$C above the receiving water temperature | | | shall not exceed $5^0$C above the receiving water temperature |
| 6. | Oil and grease, mg./l, max. | 10 | 20 | 10 | 20 |
| 7. | Total residual chlorine, mg/l. max. | 1.0 | | | 1.0 |
| 8. | Ammonical nitrogen (as N.) mg/l max | 50 | 50 | | 50 |
| 9. | Total Kjeldahl Nitrogen (as $NH_3$) mg/l. max | 100 | | | 100 |
| 10. | Free ammonia (as $NH_3$), mg/l.max | 5.0 | | | 5.0 |
| 11. | Biochemical | 30 | 350 | 100 | 100 |

| SL.no | Parameter | Standards | | | |
|---|---|---|---|---|---|
| | | Inland surface water | Public sewers | Land irrigation | Marine/coastal areas |
| | oxygen demand (3 days at $27^0$C), mg/l. max. | | | | |
| 12. | Chemical oxygen demand, mg/l, max. | 250 | | | 250 |
| 13. | Arsenic (as As) mg/l, max. | 0.2 | 0.2 | 0.2 | 0.2 |
| 14. | Mercury (As Hg), mg/l, max. | 0.01 | 0.01 | | 0.01 |
| 15. | Lead (as Pb) mg/l, max | 0.1 | 1.0 | | 2.0 |
| 16. | Cadmium (as Cd) mg/l. max | 2.0 | 1.0 | | 2.0 |
| 17. | Hexavalent chro-mium (as Cr. +6). mg/l, max | 0.1 | 2.0 | | 1.0 |
| 18. | Total Chromium (as Cr) mg/l, max | 2.0 | 2.0 | | 2.0 |
| 19. | Copper (as Cu) mg/l, max | 3.0 | 3.0 | | 3.0 |
| 20. | Zinc (as Zn) mg/l, max | 5.0 | 15 | | 15 |
| 21. | Selenium (as Se) mg/l, max | 0.05 | 0.05 | | 0.05 |
| 22. | Nickel (as Ni) mg/l, max | 3.0 | 3.0 | | 5.0 |
| 23. | Cyanide (as CN) mg/l, max | 0.2 | 2.0 | 0.2 | 0.2 |
| 24. | Fluoride (as F) mg/l, max | 2.0 | 15 | | 15 |
| 25. | Dissolved phosphates (as P) mg/l, max | 5.0 | | | |
| 26. | Sulfide (as S) mg/l, max | 2.0 | | | 5.0 |
| 27. | Phenolic compounds (as $C_6H_5OH$) mg/l, max | 1.0 | 5.0 | | 5.0 |

121. The sewer pipes will not function without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning the sewers, including buckets and winches to remove silt via the inspection manholes, diesel-fuelled pumps to remove blockages, and tankers to transport the waste hygienically to the STP.

122. Piped sewers are not 100% watertight and leaks can occur at joints. Any repairs will be conducted by sealing off the affected sewer and pumping the contents into tankers, after which the faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Trenches will be dug around the faulty section and the leaking joint will be re-sealed, or the pipe will be removed and replaced.

123. At the STP sewage sludge will need to be removed from the active treatment ponds every four or five years. This is a simple process that does not require a Sludge Management

Plan. Ponds are allowed to dry out naturally and the solid sludge is removed by manual digging. 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 and farmers are normally allowed to remove the dry material for application to their land.

## C. Environmental Impacts and Benefits of the Operating System

### 1. Physical Resources

124. The provision of an effective sewerage system in 40% of the town should improve the physical appearance and condition of the town area that will no longer be discharged to the *nallahs*. This measure and the fact that there will be fewer septic tanks and less sewage discharged to drains, should also improve the appearance of the town and the quality of surface water drainage and groundwater. Clearly there will be further significant improvements once the whole town is connected to sewer via the future funding.

125. There could also be small-scale physical benefits from the operating STP if the sewage sludge that is removed periodically from the treatment ponds is provided to farmers and applied to fields, as it will improve soil structure and fertility. There could be a useful cost-recovery element if a system was established to sell this material to farmers, so this should be considered by the EA.

126. There are also certain environmental risks from the operating system, most notably from leaking sewer pipes as untreated faecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the Government Agency (GA) responsible for operating the sewerage system establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe, the work will follow the same procedure as occurred when the infrastructure was provided. However the impacts should be much less significant as the work will be infrequent, and will affect individual small locations for short periods only. Work will not be conducted during rainfall so there will be no effect on drainage, and the excavated soil will be replaced in the trench so there will be no waste. Physical impacts should thus be negligible.

127. Treated effluent from an STP is often discharged to a nearby water body, which may then become contaminated by the high levels of nitrate, phosphate and organic matter in the effluent. As there is a *nallah* (natural or man-made drainage channel) in the vicinity of the proposed STP site, effluent may be discharged into this channel, which may then pollute surface and groundwater and present a risk to the health of humans and animals if it is consumed via well water. The nallah ultimately discharges to an irrigation canal. Before discharging the treated effluent testing will be done. This can be avoided by developing a system to sell the treated wastewater to farmers (delivered by tanker) to irrigate their fields. This would provide water and plant nutrients and thus improve agricultural productivity and farm incomes, as well as allowing further cost-recovery by the EA. This should be operated in conjunction with a scheme to sell inert sewage sludge as a farm fertilizer as recommended above, and some of the capacity building and training provided by the project should focus on providing the GA with the skills to operate these measures. This should be preceded by rigorous bacteriological tests to confirm that the treatment methods render all dried sludge and effluent

free from enteric bacteria and pathogens, so that it is safe to humans, animals and crops. This water can also be discharged into ponding system developed specifically for aqua-culture if the potential exists.

128. In WSP technology the odour will be minimized by development of greenbelts in and around the STP. The financial provision has been considered for development of greenbelt.

### 2. Ecological Resources

129. Although the new sewerage system will improve the environment of the town, there are unlikely to be significant ecological benefits as there are no natural habitats or rare or important species. If effluent from the STP was discharged into the nearby *nallah* there could be some small ecological benefits as marsh plants and animals will colonize the small wetland that is likely to be formed. However the risks of contaminating groundwater are more significant, so it would be more appropriate to forego this ecological gain in favor of the better disposal method suggested above, whereby the effluent is supplied to farmers to irrigate and fertilize their fields or the treated water is discharged into water ponding system which can be developed by the project.

130. Since no work permitted within or near the protected area, so any repairs or maintenance work can be conducted without ecological impacts.

### 3. Economic Development

131. Although repairs to the sewer network could result in shops losing some business if access is difficult for customers whilst the work is carried out, any losses will be small and short-lived and will probably be at the level of normal business fluctuations. It should therefore not be necessary to compensate for such losses. Nevertheless simple steps should be taken to reduce the inconvenience of the works, including:

- Informing all residents and businesses about the nature and duration of any repair work well in advance so that they can make preparations if necessary;
- Requiring contractors employed to conduct these works to provide wooden walkways across trenches for pedestrians and metal sheets where vehicle access is required; and
- Consulting the local police regarding any such work so that it can be planned to avoid traffic disruption as far as possible, and road diversions can be organized if necessary.

132. As noted above, a by-product of the scheme could be to provide economic improvements in the agricultural sector if sewage sludge and treated wastewater provide farmers with a safe and affordable source of organic fertilizer, and crop yields increase as a result. The completed scheme should also contribute to improvements in environmental and community health in the town (discussed below), which could provide some knock-on benefits to business from healthier workers and consumers.

### 4. Social and Cultural Resources

133. Although there is a high risk of excavation in the town discovering material of historical or archaeological importance, there will be no need to take precautions to protect such material when areas are excavated to repair leaks in the sewer network, as all work will be conducted in trenches that have already been disturbed when the infrastructure was installed.

134. Repair work could cause some temporary disruption of activities at sites of social and cultural importance such as schools, hospitals, temples, etc, so at these locations the same precautions as employed during the construction period should be adopted. These include:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- Completing work in these areas quickly;
- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required; and
- Consulting municipal authorities, custodians of important buildings, cultural and tourism authorities, and local communities to inform them of the work in advance, and avoid sensitive times, such as religious and cultural festivals.

135. The responsible authorities will employ local contractors to conduct repairs of the sewer network, and contractors should be required to operate the same kinds of Health and Safety procedures as used in the construction phase to protect workers and the public. This should include application of the asbestos protocol if any AC pipes are encountered.

136. The use of local contractors will provide economic benefits to the companies and the workers they employ. There is however little prospect of directing these benefits to persons affected by any maintenance or repair works as contractors will utilize their existing workforce. To provide at least some economic benefits to affected communities, unskilled persons employed to maintain and operate the STP should be residents of the neighboring area.

137. For maintaining security in and around the STP arrangement of fence/ boundary is taken into consideration

138. The citizens of the town will be the major beneficiaries of the new sewerage system, as human waste from those areas served by the new network will be removed rapidly and treated to an acceptable standard. This should improve the environment of these areas, and in conjunction with the development of other infrastructure (in particular water supply), should deliver major improvements in individual and community health and well-being. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

## VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

## A. Summary of Environmental Impacts and Mitigation Measures

139. **Table 7.1** lists the potential adverse impacts of the Sawai Madhopur sewerage subproject as identified and discussed in Sections IV, V and VI, and the mitigation proposed to reduce these impacts to acceptable levels. The table also shows how the mitigation will be implemented, who will be responsible, and where and when the mitigation activities will take place. The mitigation program is shown as the quarter of each year in which each activity will occur. The final column assesses whether the proposed action will successfully mitigate the impact (shown as 0), and indicates that some of the measures will provide an additional benefit (shown as +).

## B. Institutional Arrangements for Project Implementation

140. The main agencies involved in managing and implementing the subproject are:

- LSGD is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan.

- The Implementing Agency (IA) is the Project Management Unit of the ongoing RUIDP, which will be expanded to include a broader range of skills and representation from the Urban Local Bodies (ULB, the local government in each town). Assigned as the RUSDIP Investment Program Management Unit (IPMU), this body will coordinate construction of subprojects across all towns, and ensure consistency of approach and performance.

- The IPMU will be assisted by Investment Program Management Consultants (IPMC) who will manage the program and assure technical quality of design and construction; and Design and Supervision Consultants (DSC), who will design the infrastructure, manage tendering of Contractors and supervise the construction process.

- Investment Program Implementation Units (IPIU) will be established in seven zones across the State to manage implementation of subprojects in their area. IPIUs will be staffed by professionals seconded from government departments (PHED, PWD), ULBs, and other agencies, and will be assisted by consultants from the IPMC and DSC as necessary.

- The IPMU will appoint Construction Contractors (CC) to build elements of the infrastructure in a particular town. The CCs will be managed by the IPIU, and construction will be supervised by the DSC.

- LSGD will be assisted by an inter-ministerial Empowered Committee (EC), to provide policy guidance and coordination across all towns and subprojects. The EC will be chaired by the Minister of Urban Development and LSG, and members will include Ministers, Directors and/or representatives of other relevant Government Ministries and Departments.

- City Level Committees (CLCs) have also been established in each town, chaired by the District Collector, with members including officials of the ULB, local representatives of state government agencies, the IPIU, and local NGOs and

CBOs. The CLCs will monitor project implementation in the town and provide recommendations to the IPIU where necessary.

141. **Figure 7.1** shows institutional responsibility for implementation of environmental safeguard at different level.

**Figure 7.1: Institutional Responsibly- RUSDIP**

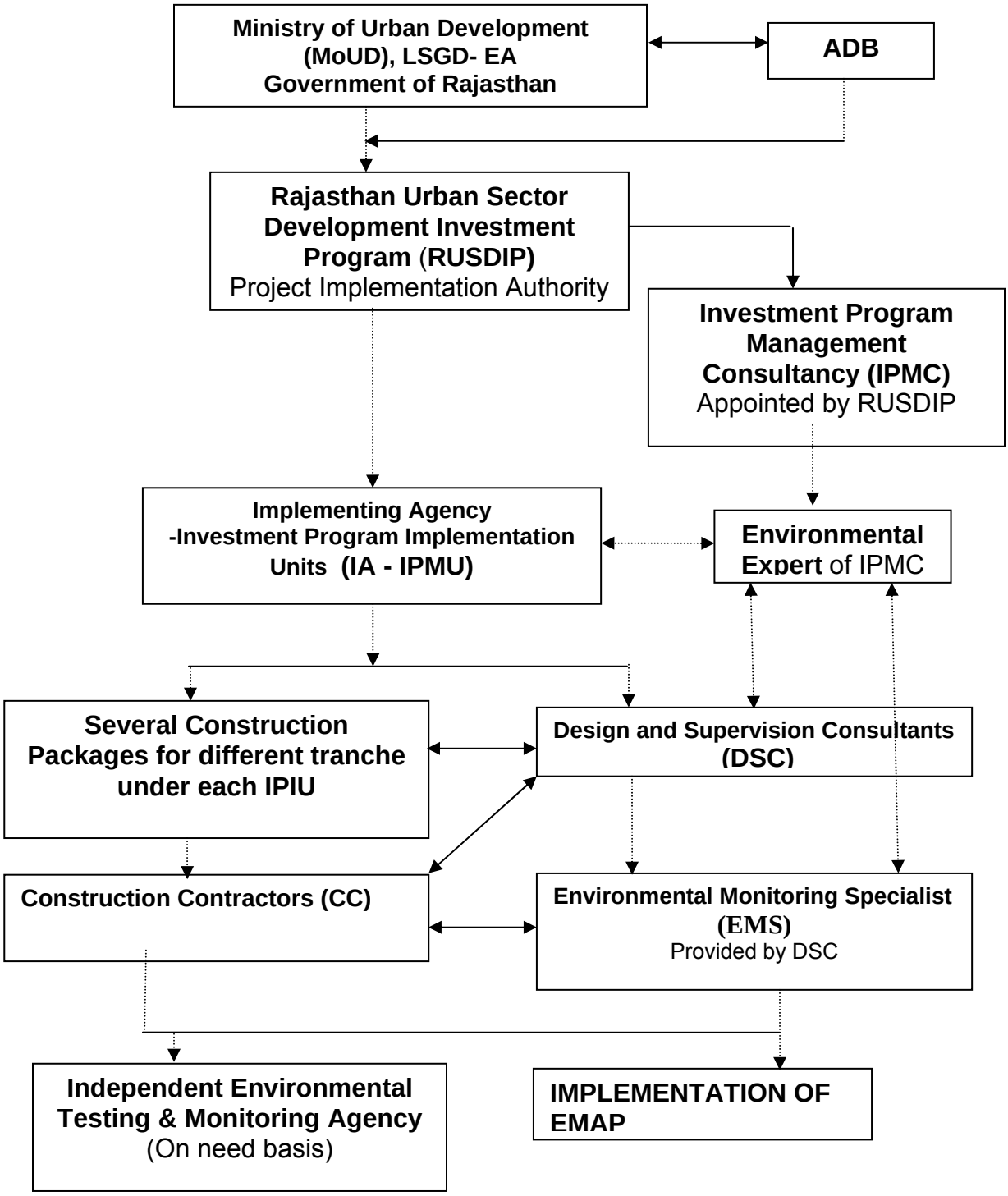


**Table 7.1: Environmental impacts and mitigation for the Sawai Madhopur Sewerage Subproject**
**(Black = continuous activity; Grey = intermittent)**

| Potential Negative Impacts | Sig | Dur | Mitigation Activities and Method | Responsibility | Location | 2008 | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| **Construction: Sewage Treatment Plant** | | | | | | **D** | **D** | **3** | **4** | **1** | **2** | **3** | **Op** | [5] |
| Excavation will produce large amounts of waste soil | M | P | Find beneficial uses for waste soil in construction, land raising and infilling of excavated areas | Contractor | All sites | | | | | | | | | + |
| Stockpiled soil could create dust in windy weather | M | T | Remove soil as soon as it is excavated, spray with water | Contractor | All sites | | | | | | | | | 0 |
| Dust could also be produced when soil is transported | M | T | Use tarpaulins to cover dry soil when carried on trucks | Contractor | | | | | | | | | | 0 |
| Rain and ground water could collect in excavated areas | M | T | Conduct all excavation in the dry season | Contractor | All sites | | | | | | | | | 0 |
| | | | Pump out groundwater & provide to farmers for irrigation | Contractor | STP site | | | | | | | | | + |
| Some trees will need to be removed from the site | M | P | Only remove trees if it cannot be avoided | Contractor | All sites | | | | | | | | | 0 |
| | | | Plant and maintain three trees for every one removed | | | | | | | | | | | 0 |
| Traffic may be disrupted by trucks carrying waste soil | M | T | Plan routes to avoid Sawai Madhopur Town and narrow local roads | Contractor | From STP site | | | | | | | | | 0 |
| | | | Schedule transportation to avoid peak traffic periods | | | | | | | | | | | 0 |
| Ground disturbance could damage archaeological and historical remains | S | P | Request state and local archaeological authorities to assess archaeological potential of proposed STP site | DSC | All sites | | | | | | | | | 0 |
| | | | Select alternative if site has medium-high potential | DSC | | | | | | | | | | 0 |
| | | | Include state and town historical authorities as project stakeholders to benefit from their expertise | LSGD | | | | | | | | | | 0 |
| | | | Develop and apply protocol to protect chance finds (excavation observed by archaeologist; stop work if finds are suspected; state authority to plan appropriate action) | DSC and Contractor | | | | | | | | | | + |
| Economic benefits if local people are employed in Contractor's workforce | M | T | Contractor should employ at least 50% of workforce from communities in vicinity of | Contractor | All sites | | | | | | | | | + |

Sig = Significance of Impact (NS = Not Significant; M = Moderately Significant; S = Significant). Dur = Duration of Impact (T = Temporary; P = Permanent)
D = Detailed Design Period; Op = Period when infrastructure is operating
[5] This column shows impacts remaining after mitigation: 0 = zero impact (impact successfully mitigated); + = positive impact (mitigation provides a benefit)
* Mitigation of these impacts will be provided through a separate Resettlement Plan, see Section VII.B

| Potential Negative Impacts | Sig | Dur | Mitigation Activities and Method | Responsibility | Location | 2008 | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | STP site | | | | | | | | | | | |
| Unauthorized access to the site can cause accidents | M | T | Contractor should provide fencing, security personnel and signages | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | 2008 | | | | 2009/10 | | | | |
| | | | | | | D | D | 3 | 4 | 1 | 2 | 3 | 4 | |
| **Construction: Sewerage Network and Trunk Sewer** | | | | | | | | | | | | | | |
| Trenching will produce additional amounts of waste soil | M | P | As above: find beneficial uses in construction or infill | Contractor | All sites | | | | | | | | | + |
| Disturbance to Tiger Reserve due to blasting, air pollution, water table disturbance due to digging | M | T | No blasting, avoidance of disturbance of aquifer, forest for firewood by workmen, no air pollution/blowing of soil in high winds, no dumping of muck near protected area | Contractor, RUIDP | All Sites | | | | | | | | | 0 |
| Waste soil may create dust when stored or transported | M | T | As above: remove waste soil as soon as it is excavated | Contractor | All sites | | | | | | | | | 0 |
| | | | As above: cover soil with tarpaulins on trucks | | | | | | | | | | | 0 |
| | | | Cover or damp down stored soil in dry weather | | | | | | | | | | | 0 |
| Trees may be removed along pipeline routes | M | P | As above: avoid removing trees, plant 2 for every 1 cut | Contractor | All sites | | | | | | | | | 0 |
| Shops may lose income if customers' access is impeded | M | T | Leave spaces for access between mounds of soil | Contractor | Network sites | | | | | | | | | 0 |
| | | | Provide bridges to allow people/vehicles to cross trench | Contractor | | | | | | | | | | 0 |
| | | | Increase workforce in these areas to finish work quickly | Contractor | | | | | | | | | | 0 |
| | | | Inform shopkeepers of work in advance | LSGD | | | | | | | | | | 0 |
| | | | *Compensate businesses for lost income | LSGD | | | | | | | | | | 0 |
| Trenching could damage other infrastructure | S | P | Confirm location of infrastructure and avoid these sites | DSC | Network sites | | | | | | | | | 0 |
| | | | Locate water and sewer pipes on opposite sides of roads | DSC | | | | | | | | | | 0 |
| Roads/people may be disturbed by repeated trenching | M | T | Integrate subprojects to conduct trenching at same time | DSC/LGD | Network | | | | | | | | | 0 |
| Traffic will be disrupted if lack of space means that dug soil has to be placed on the road, and/or sewers have to be located in the road itself | M | T | Consult authorities – work in light traffic periods | Contractor | Network sites | | | | | | | | | 0 |
| | | | Ensure police provide diversions when necessary | Contractor | | | | | | | | | | 0 |
| | | | As above: increase workforce to finish this work quickly | Contractor | | | | | | | | | | 0 |

| Potential Negative Impacts | Sig | Dur | Mitigation Activities and Method | Responsibility | Location | 2008 | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Traffic, people and activities could be disrupted by trucks carrying waste soil or delivering materials to site | M | T | Plan routes to avoid narrow streets, congested roads, important/fragile buildings, key religious and tourism sites | Contractor | Network sites | | | | | | | | | 0 |
| | | | Plan work to avoid peak traffic and main tourism season | | | | | | | | | | | 0 |
| Major risk that ground disturbance in town could damage archaeological and historical remains | S | P | As above: ask authorities to assess potential of all sites | DSC | All sites | | | | | | | | | 0 |
| | | | As above: alternative sites where risk is high/medium | DSC | | | | | | | | | | 0 |
| | | | As above: include state/local authorities as stakeholders | LSGD | | | | | | | | | | 0 |
| | | | As above: apply protocol to protect chance finds | DSC/CC | | | | | | | | | | + |
| Sites of social/cultural importance (schools, hospitals, temples) may be disturbed by noise, dust, vibration and impeded access | M | T | Identify buildings at risk from vibration damage and avoid using pneumatic drills nearby | Contractor | Network sites | | | | | | | | | 0 |
| | | | As above: remove waste quickly, cover/spray stockpiles, cover soil when carried on trucks | | | | | | | | | | | 0 |
| | | | As above: increase workforce to finish work quickly | | | | | | | | | | | 0 |
| | | | As above: use bridges to allow access (people/vehicles) | | | | | | | | | | | 0 |
| | | | Use modern vehicles/machinery & maintain as specified | Contractor | All sites | | | | | | | | | 0 |
| | | | Consult relevant authorities, custodians of buildings, local people to address issues & avoid work at sensitive times | Contractor | Network sites | | | | | | | | | 0 |
| Workers and the public are at risk from accidents on site | M | T | Prepare and implement a site Health and Safety Plan that includes measures to: | Contractor | All sites | | | | | | | | | 0 |
| | | | - Exclude the public from site; | | | | | | | | | | | 0 |
| | | | - Ensure that workers use Personal Protective Equipment | | | | | | | | | | | 0 |
| | | | - Provide Health & Safety Training for all personnel; | | | | | | | | | | | 0 |
| | | | - Follow documented procedures for all site activities; | | | | | | | | | | | 0 |
| | | | - Keep accident reports and records. | | | | | | | | | | | 0 |
| Existing water supply system uses AC pipes, a material that can be carcinogenic if inhaled as dust particles | S | T | Design infrastructure to avoid locations of AC pipes | DSC | Network | | | | | | | | | 0 |
| | | | Train all construction personnel in dangers of AC pipes and how to recognise them in situ | Contractor | All sites | | | | | | | | | 0 |

| Potential Negative Impacts | Sig | Dur | Mitigation Activities and Method | Responsibility | Location | 2008 | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Develop and apply protocol if AC pipes are encountered. This should include: | DSC and Contractor | Network sites | | | | | | | | | 0 |
| | | | - immediate reporting of any occurrence to management | Contractor | Network sites | | | | | | | | | 0 |
| | | | - removal of all persons to a safe distance | | | | | | | | | | | 0 |
| | | | - use of appropriate breathing apparatus and protective suits by workers delegated to deal with AC material | | | | | | | | | | | 0 |
| | | | - safe removal and long-term disposal of AC material | | | | | | | | | | | + |
| Trenching on concrete roads using pneumatic drills will cause noise and air pollution | M | T | use high screens (sheet fending) in those areas to reduce noise pollution | Contractor | All sites | | | | | | | | | 0 |
| Economic benefits for people employed in workforce | M | T | As above: 50% of workforce from affected communities | Contractor | All sites | | | | | | | | | + |
| **Operation and Maintenance** | | | | | | | | | | | | | | |
| Leaking sewers can damage human health and contaminate soil and groundwater | M | T | Detect and repair sewer leaks rapidly and effectively | GA | Network sites | | | | | | | | | 0 |
| Sludge is removed from treatment ponds every 5 years | S | T | Dry sludge and test for absence of bacteria & pathogens | GA | STP | | | | | | | | | 0 |
| | | | Sell dried sludge to farmers to fertilize land | | | | | | | | | | | + |
| Shops may lose small amounts of income if customers' access is impeded by network repair works | S | T | As before: inform shopkeepers of work in advance | GA | Network sites | | | | | | | | | 0 |
| | | | As before: provide walkways and bridges for vehicles | OMC | | | | | | | | | | 0 |
| | | | As before: request police to divert traffic if necessary | OMC | | | | | | | | | | 0 |
| Sites of social/cultural importance may be disturbed by noise, dust, vibration, impeded access for short time during network repairs | S | T | As before: avoid using drills/trucks near fragile buildings | OMC | Network sites | | | | | | | | | 0 |
| | | | As before: finish work quickly in sensitive areas | OMC | | | | | | | | | | 0 |
| | | | As before: provide walkways and bridges for vehicles | OMC | | | | | | | | | | 0 |
| | | | As before: consult authorities and communities, inform them of work in advance, avoid sensitive periods | GA | | | | | | | | | | 0 |
| Health and safety of workers & the public could be at risk from repair work and AC pipes of old water supply system | M | T | Prepare and operate H&S plan with same measures as used in construction phase | OMC | All sites | | | | | | | | | 0 |
| | | | Apply previously-developed protocol to protect all persons if AC pipes are encountered | | | | | | | | | | | 0 |

| Potential Negative Impacts | Sig | Dur | Mitigation Activities and Method | Responsibility | Location | 2008 | | | | 2009 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local people will benefit if employed by project | M | P | STP workers should be residents of neighboring areas | GA | STP | | | | | | | | | + |
| Insufficiently treated water will be discharged to water | M | T | Periodic monitoring of treated wastewater quality | GA | STP | | | | | | | | | |
| | | | Provision of a water quality laboratory | GA | STP | | | | | | | | | |

142. Resettlement issues will be coordinated centrally by a Resettlement Specialist within the IPMU, who will ensure consistency of approach between towns. A local Resettlement Specialist will also be appointed to IPIUs of zones in which there are resettlement impacts and they will prepare and implement local Resettlement Plans following the framework established in Tranche 1.

143. Environmental issues will be coordinated by an Environmental Specialist within the IPMU/IPMC, who will ensure that all subprojects comply with environmental safeguards. An Environmental Monitoring Specialist (EMS) who is part of the DSC team will implement the Environmental Monitoring Plan from each IEE (see below), to ensure that mitigation measures are provided and protect the environment as intended. Domestic Environmental Consultants (DEC) will be appointed by each IPIU to update the existing IEEs in the detailed design stage, and to prepare IEEs or EIAs for new subprojects, where required to comply with national law and/or ADB procedure.

## C. Environmental Monitoring Plan

144. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors (CC) employed to build the infrastructure during the construction stage, or the O&M Contractors employed to conduct maintenance or repair work when the system is operating. Responsibility for the relevant measures will be assigned to the Contractors via the contracts through which they are appointed (prepared by the DSC during the detailed design stage), so they will be legally required to take the necessary action. There are also some actions that need to be taken by LSGD in their role as project proponent, and some actions related to the design that will be implemented by the DSC.

145. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. This will be conducted by a qualified Environmental Monitoring Specialist (EMS) from the DSC. The EMS will be responsible for all monitoring activities and reporting the results and conclusions to the IPMU, and will recommend remedial action if measures are not being provided or are not protecting the environment effectively. The EMS may be assisted by environmental specialists in particular technical fields, and junior or medium-level engineers who can make many of the routine observations on site. Post-construction monitoring will be conducted by the relevant Government Agency (GA) to whom responsibility for the infrastructure will pass once it begins to operate[6].

146. **Table 7.1** shows that most of the mitigation measures are fairly standard methods of minimising disturbance from building in urban areas (maintaining access, planning work to avoid sensitive times, finding uses for waste material, etc), and experienced Contractors should be familiar with most of the requirements. Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. There will also be some surveys of residents, as most of the measures are aimed at preventing impacts on people and the human environment.

147. **Table 7.2** shows the proposed Environmental Monitoring Plan (EMP) for this subproject, which specifies the various monitoring activities to be conducted during all phases. Some of the

[6] In the operational period some infrastructure will be the responsibility of the Municipal Boards/Councils, whilst others will be the responsibility of the appropriate branch of the State government (such as PWD, PHED, etc)

measures shown in **Table 7.1** have been consolidated to avoid repetition, and there has been some re-ordering to present together those measures that relate to the same activity or site. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring). It does not show specific parameters to be measured because as indicated above, most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers.

148. Given the scale of the investment in providing the infrastructure, LSGD will also wish to conduct monitoring during the operational period to ensure the correct functioning of the STP and confirm the long-term benefits of the scheme. There will also be bacteriological surveys when the STP is operating, to ensure the safety of dried sludge and treated effluent before sale to farmers to fertilize and irrigate fields. **Table 7.2** shows that these long-term surveys will monitor:

- the chemical and bacteriological quality of treated STP effluent;
- the bacteriological content of dried sewage sludge; and
- the health of the population and the prevalence of diseases of poor sanitation.

149. An accredited consulting laboratory/ pollution control board will be appointed to collect and analyze samples of treated effluent and dried sludge once per month for the first five years of operation of the STP. A domestic Social Studies Consultant appointed by executing agency will be appointed to monitor public health and the incidence of disease, once per year over the same five year period, after collecting baseline data during the construction period.

## D. Environmental Management and Monitoring Costs

150. 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. Regardless of this, any costs of mitigation by the contractors (those employed to construct the infrastructure or the local companies employed to conduct O&M when the system is operating) are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of LSGD will be provided as part of their management of the project, so this also does not need to be duplicated here. Costs of compensating shopkeepers for loss of business income during the construction period (**Table 7.1**) are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

151. The remaining actions in the Environmental Management Plan are:

- The environmental monitoring during construction, conducted by the EMS;
- The long-term post-construction surveys that will be commissioned by LSGD.

152. These have not been budgeted elsewhere, and their costs are shown in **Table 7.3,** with details of the calculations shown in footnotes beneath the table. The figures show that the total cost of environmental management and monitoring for the project as a whole (covering design, 2 years of construction and the first five years of operation) is INR 2.45 million, ie US$ 56,980.

## Table 7.2: Environmental Monitoring Plan

| Mitigation Activities and Method | Location | Responsible for Mitigation | Monitoring Method | Monitoring Frequency | Responsible for Monitoring |
|---|---|---|---|---|---|
| **PLANNING, LOCATION AND DESIGN** | | | | | |
| Recycle system to ensure water is treated completely | STP | GA | Site observation | Monthly | EMS |
| **CONSTRUCTION** | | | | | |
| Find beneficial uses for waste soil (construction, land raising, infill) | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Remove waste soil as soon as it is excavated and spray with water | All sites | Contractor | Site observations | Weekly | EMS |
| Use tarpaulins to cover soil when transported on trucks | All sites | Contractor | Site observations | Weekly | EMS |
| Avoid Sawai Madhopur town and narrow local roads when transporting soil | From STP | Contractor | Observations off site; CC record | Weekly | EMS |
| Avoid transporting soil during peak traffic periods | From STP | Contractor | Observations on and off site | Weekly | EMS |
| Cover or damp down stockpiled soil in dry weather | Inhabited areas | Contractor | Site observations | Weekly | EMS |
| Conduct all excavation work in the dry season | All sites | Contractor | Site observations | Monthly | EMS |
| Pump groundwater from excavated areas and provide to farmers | STP site | Contractor | Site observations; farmer survey | Monthly | EMS |
| Leave spaces for access between mounds of soil | Network sites | Contractor | Site observations | Weekly | EMS |
| Provide bridges to allow people & vehicles to cross open trenches | Network sites | Contractor | Site observations | Weekly | EMS |
| Only remove trees if it cannot be avoided | All sites | Contractor | Site observations | Weekly | EMS |
| Plant and maintain two trees for every one removed | All sites | Contractor | Observations on/off site; CC records | Monthly | EMS |
| *Compensate businesses for lost income | Where required | LSGD | Shopkeeper survey; LSGD record | As needed | IMA[7] |
| Increase workforce in inhabited areas to finish work quickly | Network sites | Contractor | Site observations; CC records | Monthly | EMS |
| Inform shopkeepers and residents of work in advance | Network sites | LSGD | Resident surveys; CC records | Monthly | EMS |
| Confirm location of infrastructure and avoid these sites | Network sites | DSC | Site observation; design reports | Monthly | EMS |
| Locate water and sewer pipes on opposite sides of roads | Network sites | DSC | Site observation; design reports | Monthly | EMS |
| Integrate subprojects to conduct trenching at same time | Network sites | DSC/LSGD | Site observation; design reports | Monthly | EMS |
| If work will affect traffic, conduct when traffic is light | Network sites | Contractor | Site observations; CC records | Monthly | EMS |
| Ensure police provide traffic diversions when required | Network sites | Contractor | Site observations; CC records | Monthly | EMS |
| Request archaeological authorities to assess potential of all sites | All sites | DSC | DSC records; design reports | As needed | EMS |
| Select alternatives if sites have medium or high potential | All sites | DSC | DSC records; design reports | As needed | EMS |
| Include state and town historical authorities as stakeholders | All sites | LSGD | CC records; observations at meetings | As needed | EMS |
| Develop and apply archaeological protocol to protect chance finds | All sites | DSC and CC | DSC and CC records; site observations | Weekly | EMS |
| Plan transport routes to avoid narrow streets, important or | Network sites | Contractor | Observations off site: CC record | Weekly | EMS |

[7] Resettlement issues (asterisked) will be monitored by an Independent Monitoring Agency (IMA) established under the Resettlement Framework

| Mitigation Activities and Method | Location | Responsible for Mitigation | Monitoring Method | Monitoring Frequency | Responsible for Monitoring |
|---|---|---|---|---|---|
| fragile buildings, religious and tourism sites | | | | | |
| No air/noise pollution near protected Tiger Reserve, no sourcing of firewood from forest, no water from water sources, no dumping of muck in protected area | All sites | Contractor, LSGD | Observations on site | Weekly | EMA |
| Plan work to avoid peak traffic and main tourism season | Network sites | Contractor | Site observations; CC records | Monthly | EMS |
| Avoid using pneumatic drills near buildings at risk from vibration | Network sites | Contractor | Site observations; CC records | Weekly | EMS |
| Use modern vehicles and machinery and maintain as specified | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Consult authorities, custodians of buildings, communities: address key issues, avoid working at sensitive times | Network sites | Contractor | Site observations; CC records; resident surveys | Monthly | EMS |
| Prepare and implement a site H&S Plan (safety of workers/public) | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Exclude public from the site | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Ensure that workers wear Personal Protective Equipment | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Provide Health and Safety training for all personnel | All sites | Contractor | CC records; worker interviews | Monthly | EMS |
| Follow documented procedures for all site activities | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Keep accident reports and records | All sites | Contractor | CC records | Monthly | EMS |
| Design infrastructure to avoid known locations of AC pipes | Network sites | DSC | DSC records; design reports | As needed | EMS |
| Train all personnel in dangers and recognition of AC pipes | All sites | Contractor | Site observations; CC records | Monthly | EMS |
| Develop and apply protocol if AC pipes are encountered | All sites | DSC/CC | DSC & CC records; site observations | Weekly | EMS |
| If AC pipes are encountered, report to management immediately | All sites | Contractor | Site observations; CC records | Weekly | EMS |
| Remove all persons to safe distance | All sites | Contractor | Site observations; CC records | Weekly | EMS |
| Workers handling AC: wear breathing apparatus; protective suits | All sites | Contractor | Site observations; CC records | Weekly | EMS |
| All AC material must be removed and disposed of safely | All sites | Contractor | Observations on and off site; CC records | As needed | EMS |
| Employ at least 50% of workforce from communities near sites | All sites | Contractor | CC records; worker interviews | Monthly | EMS |
| **OPERATION AND MAINTENANCE** | | | | | |
| Detect and repair sewer leaks rapidly and effectively | Network sites | GA | Site observation; resident survey | Monthly | |
| Sell dried inert sludge to farmers to fertilize land , ponding of water to introduce aquaculture | STP | GA | Site observation; farmer survey | Monthly | |
| Inform shopkeepers and residents of maintenance work in advance | Network sites | GA | Resident surveys | Monthly | |
| Provide walkways and bridges for vehicles during maintenance activities | Network sites | OM Contractor | Site observation; resident survey | Monthly | |
| Request police to divert traffic during maintenance activities if necessary | Network sites | OM Contractor | Site observations | Monthly | |

| Mitigation Activities and Method | Location | Responsible for Mitigation | Monitoring Method | Monitoring Frequency | Responsible for Monitoring |
|---|---|---|---|---|---|
| Finish work quickly in sensitive areas | Network sites | OM Contractor | Site observations; OMC records | Monthly | |
| Consult communities, avoid working during sensitive periods | Network sites | GA | Site observation; resident survey | Monthly | |
| Prepare and operate H&S plan to protect workers and citizens | All sites | OM Contractor | Site observations; OMC records | Monthly | |
| Apply AC protocol to protect all persons if AC pipes encountered | All sites | OM Contractor | Site observations; OMC records | Monthly | |
| STP workers should be residents of neighbouring areas | STP | GA | Employer record; worker survey | Monthly | |
| **LONG-TERM SURVEYS** | | | | | |
| Survey of chemical and bacteriological quality of STP effluent | STP | GA | Water quality sampling/analysis | Monthly for 5 years | Consulting lab |
| Bacteriological surveys of dried STP sludge | STP | GA | Bacterial sampling/analysis | | Consulting lab |
| Survey of public health and incidence of water borne disease | Sawai Madhopur Town | GA | Hospital records; resident surveys | Annual for 6 years | Social studies consultant |

**Table 7.3: Environmental Management and Monitoring Costs (INR)**

| Item | Quantity | Unit Cost | Total Cost | Sub-total |
|---|---|---|---|---|
| **1. Implementation of EMP (2 years)** | | | | |
| Domestic Environmental Monitoring Specialist | 1 x 3 month | 130,000[8] | 390,000 | |
| Survey Expenses | Lumpsum | 100,000 | 100,000 | 490,000 |
| | | | | |
| **2. Survey of STP sludge and effluent (5 years)** | | | | |
| Domestic Consultant | 5 x ½ month | 130,000 | 325,000 | |
| Sample Analysis | 5 x 20 | 3,500[9] | 350,000 | |
| Other Expenses | Lumpsum | 200,000 | 200,000 | 875,000 |
| | | | | |
| **3. Survey of public health (6 years)** | | | | |
| Domestic Consultant | 6 x ½ month | 130,000 | 390,000 | |
| Expenses | Lumpsum | 200,000 | 200,000 | 590,000 |
| | | | | |
| 4. Environmental mitigation and development of green belt around STP | Lumpsum | 400,000 | 400,000 | 400,000 |
| **5. Wild life warden for review of impact on Tiger Reserve** | Lump sum | 100,000 | 100,000 | 100,000 |
| **TOTAL** | | | | 2,455,000 |

## E. Associated Facilities

153. There are no upstream associated facilities in this subproject; however, the downstream users of treated water can be considered associated to the facility.

154. If the Sewage Treatment Plant's (STP's) treated waste water is drained into a nallah or discharged into boreholes, care must be taken to properly treat it before it is discharged otherwise the infusion of contaminated waters in the ground aquifers can render the water permanently unfit for human consumption.

155. Inappropriate wastewater disposal pollutes the receiving waters such as rivers, *nallahs*, water ponding systems for aquaculture and may render them unfit for abstraction and treatment if toxic in nature. These nallahs, rivers or farmers which "take away/use" this waste water are deemed to be end-users of the wastewater from the STP. Therefore before disposal, all Indian wastewater discharge standards must be met in full and proper records must be maintained.

[8] Unit costs of domestic consultants include fee, travel, accommodation and subsistence
[9] Cost of a standard bacteriological analysis (total and faecal coliforms, E.coli, enterococci, etc) is $90 (INR 3,500) per sample

# VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

## A. Project Stakeholders

156. Most of the main stakeholders have already been identified preliminary. If any other stakeholders that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:

- Residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements or new network will be provided and near sites where facilities will be built
- Owners and users of any land that is acquired along the outfall/ trunk main route;
- Custodians and users of socially and culturally important buildings in affected areas;
- State and local authorities responsible for the protection and conservation of archaeological relics, historical sites and artefacts;
- State and local tourism authorities.

157. Secondary stakeholders are:

- LSGD as the Executing Agency;
- Other government institutions whose remit includes areas or issues affected by the project (state and local planning authorities, Department of Public Health Engineering, Local Government Dept, Ministry of Environment and Forests, Roads and Highways Division, etc);
- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community in general; and
- The ADB, and Government of India, Ministry of Finance

## B. Consultation and Disclosure to Date

158. Some informal discussion was held with the local people during site visit. Issues discussed are:

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social upliftment of community

- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site
- Movement of wild animals if any nearby the project site

159. Local population is very much interested on the project and they will help project authorities in all aspects. Public consultation results specifically on environmental issues and summary of the consultation are also shown in **Appendix 3.**

## C. Future Consultation and Disclosure

160. LSGD will extend and expand the consultation and disclosure process significantly during implementation of RUSDIP. They will appoint an experienced NGO to handle this key aspect of the programme, who will conduct a wide range of activities in relation to all subprojects in each town, to ensure that the needs and concerns of stakeholders are registered, and are addressed in project design, construction or operation where appropriate. The programme of activities will be developed during the detailed design stage, and is likely to include the following:

- Consultation during detailed design:
    - Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary;
    - Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.
- Consultation during construction:
    - Public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started;
    - Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

- Project disclosure:
    - Public information campaigns (via newspaper, TV and radio) to explain the project to the wider town population and prepare them for disruption they may experience once the construction programme is underway;
    - Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Hindi;
    - Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and providing a mechanism through which comments can be made.

## IX. FINDINGS AND RECOMMENDATIONS

### A. Findings

161. The Project is designed to improve the quality of life of small town residents and enhance the small towns' roles as market, services, and manufacturing centers. . It has a strong community development focus reinforced by integrated poverty reduction, health and hygiene improvement investment projects. The towns' economies will benefit from enhanced productivity as a result of health improvement, time savings in collecting water, as well as from increased urban efficiency arising from improved roads, bridges, drainage, drinking water and sanitation. Residents in towns will also benefit from savings in health care costs.

162. During project design, community meetings were held with beneficiaries to discuss sanitation, poverty, resettlement, affordability issues, and environmental concerns. Socioeconomic surveys obtained information and individual views on current situations and future preferences. Potential environmental impacts of urban infrastructure improvements are mainly short-term during the construction period and can be minimized by the proposed mitigating measures and environmentally sound engineering and construction practices

163. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Sawai Madhopur Sewerage and Sanitation Subproject. Potential negative impacts were identified in relation to the design and location, construction and operation of the improved infrastructure, of the subproject. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. These include:

- Locating the trunk main and sewerage networks within the ROW of existing roads, to avoid the need to acquire land or relocate people;
- Locating sewers on unused land adjacent to roads wherever possible, to avoid damaging roads and disrupting traffic and other activities.

164. This means that the number of impacts and their significance has already been reduced by amending the design.

165. Changes have also been made to the location of elements of the project to further reduce impacts. These include:

- Locating the STP on government-owned land to avoid the need for land acquisition and relocation of people;
- Locating the trunk main in the ROW alongside the Road, to avoid acquiring agricultural land and affecting the livelihoods of farmers and farm workers.

166. Regardless of these and various other actions taken during the IEE process and in developing the subproject, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of the invasive nature of trenching work and the excavation of ponds at the STP site; because the sewer network is located in a town, some parts of which are densely populated; and because Rajasthan is an area with a rich history, in which there is a high risk that ground disturbance may uncover important remains. Because of these factors the most significant impacts are on the physical environment, the human environment, and the cultural heritage.

167. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

- Finding beneficial uses for waste material;
- Covering soil and sand during transportation and when stored on site;
- Planning work to minimize disruption of traffic and communities;
- Providing temporary structures to maintain access across trenches where required.

168. Although there will be no need to acquire land or relocate people, roadside businesses will lose some income as access will be difficult for customers when work is in their vicinity. ADB policy requires that no-one should be worse off as a result of an ADB-funded project, so these losses will be compensated through a Resettlement Plan and Framework prepared to comply with Bank policy on Involuntary Resettlement.

169. One field in which impacts are much less routine is archaeology, and here a series of specific measures have been developed to avoid damaging important remains. These include:

- Assessing the archaeological potential of all proposed construction sites, and selecting alternative locations to avoid any areas of medium or high risk;
- Including archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;
- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognised, protected and conserved.

170. Special measures were also developed to protect workers and the public from exposure to carcinogenic asbestos fibres in the event that Asbestos Cement pipes used in the existing water supply system are encountered accidentally during excavation work. These are to:

- Avoid all known sites of AC pipes when the locations of new infrastructure are planned in the detailed design stage;
- Train all construction personnel to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered;
- Develop and apply a protocol to protect workers and the public if AC pipes are encountered (including evacuation of the immediate area, use of protective equipment by workers, and safe removal and disposal of AC material).

171. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will:

- Employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain;
- Ensure that people employed in the longer term to maintain and operate the new STP are residents of nearby communities.

172. These and the other mitigation and enhancement measures are summarized in **Table 7.1,** which also shows the location of the impact, the body responsible for the mitigation, and the programme for its implementation.

173. On completion the sewerage system should operate with routine maintenance, which should not significantly affect the environment, providing certain pre-conditions are met. These are that:

- The operation and integrity of sewers are checked regularly and any leaks are repaired rapidly and effectively to avoid public health risks and contamination of land and water;
- Treated effluent from the STP is sold to farmers to fertilize and irrigate fields instead of being discharged into a nearby nallah.

174. The repair of sewers will have fewer environmental impacts than the original sewer construction as the work will be infrequent and will affect small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

175. Quality of effluent … laboratory analysis and recycle system

176. The regular removal of sludge from the treatment ponds should also have no environmental impacts, and if tests show that the drying procedure removes bacterial contamination the material should be sold to farmers to fertilize soil, as this will provide an environmental gain and some cost recovery. Treated wastewater can also be used for developing aqua-culture through establishment of ponding systems

177. The main impacts of the operating sewerage system will be beneficial as human waste from those areas served by the new network will be removed rapidly and treated to an acceptable standard. This will improve the environment and appearance of these areas, and the health and quality of life of the citizens. Diseases of poor sanitation should be reduced, which should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

178. **Table 7.1** also assesses the effectiveness of each mitigation measure in reducing each impact to an acceptable level. This is shown as the level of significance of the residual impact (remaining after the mitigation is applied). This shows that all impacts will be rendered at least neutral (successfully mitigated), and that certain measures will produce a benefit (in addition to the major benefits provided by the operating scheme).

179. Mitigation will be assured by a program of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. 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 IPMU. There will also be longer-term surveys to ensure the safety of sewage sludge and treated effluent for use in agriculture, and to monitor the expected improvements in the health of the population.

### B. Recommendations

180. There are two straightforward but essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. These are that LSGD should ensure that:

- All mitigation, compensation and enhancement measures proposed in this environmental status report (Table 7.1) are implemented in full, as described in the text above;

- The Environmental Monitoring Plan proposed in Section VI.C of this report is also implemented in full.

## X. CONCLUSIONS

181. The environmental status of the proposed improvements in sewerage and sanitation in Sawai Madhopur Town has been assessed. Issues related to Involuntary Resettlement were assessed by the process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

182. The overall conclusion of process is that provided the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be some small benefits from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the scheme is in operation.

183. There are no uncertainties in the analysis, and no further studies are required to comply with ADB procedure or national law.

## APPENDIX 1: Rapid Environmental Assessment Checklist

| Rapid Environmental Assessment (REA) Checklist | | | | | SEWERAGE TREATMENT |
|---|---|---|---|---|---|
| | | | | | |
| **Instructions:** | | | | | |
| ♦ | 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:** | | RUSIDP | | | |
| **Sector Division** | | SEWAGE TREATMENT - Sawai Madhopur | | | |

| SCREENING QUESTIONS | | | Yes | No | REMARKS |
|---|---|---|---|---|---|
| **A.** | **Project Siting** | | | | |
| Is the project area ……. | | | | | |
| ♦ | Densely populated? | | X | | STP site will be located in area which is a vacant lot. The sewer network and the trunk sewer will be located through out the built-up area of Sawai Madhopur town. The population density is 248 persons per square kilometer. |
| ♦ | Heavy with development activities? | | X | | |
| ♦ | Adjacent to or within any environmentally sensitive area | | | | |
| | ● | Cultural heritage site | | X | One famous Ganesh temple is located more than 5 km from project location (STP and sewerage network sites) The distance of Hiramanji Temple is 180 m from the center of site. But this is a small structure & there is no worship or prayer offered. |
| | ● | Protected Area | | X | Ranthambore Tiger Reserve/ National Park is located about 7 km from the STP site. Sewerage network and trunk sewers will not be constructed near protected area |
| | ● | Wetland | | X | There is no wetland system nearby the site |
| | ● | Mangrove | | X | There is no seashore nearby, thus mangrove population not expected |
| | ● | Estuarine | | X | There is no sea shore nearby |
| | ● | Buffer zone of protected area | | X | From center of the forest area project location is more than 12 km |
| | ● | Special area for protecting biodiversity | | X | Ranthambore tiger reserve is located about 7 km from the project site |
| | ● | Bay | | X | No bay nearby |

| SCREENING QUESTIONS | | Yes | No | REMARKS |
|---|---|---|---|---|
| **B.** | **Potential Environmental Impacts** | | | |
| Will the Project causes …….. | | | | |
| ♦ | Impairment of historical/cultural monuments/areas and loss/damage to these sites? | | X | The sewerage system is not impacting any such structures. The STP site far away from such sites . A Samadhi (memorial structure, 500 m away) has been found near the STP site . |
| ♦ | Interference with other utilities and blocking of access to buildings, nuisance to neighbouring areas due to noise, smell, and influx of insects, rodents, etc.? | X | | Construction activities for the sewer network and trunk sewer may interfere with access to buildings, shops, residences. However, these are temporary and necessary mitigation measures will be included the Contractor's Contract.<br><br>Smell during operation of the STP is expected due to the nature of the process. Direction of air flow and velocity will be considered in the detailed design. A greenbelt composed of plants and trees will be include to minimize smell nuisance.. |
| ♦ | Dislocation of involuntary resettlement of people | | X | STP has been proposed on government land and sewerage lines are not disturbing any private property |
| ♦ | Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage? | | X | Periodic water quality monitoring will be conducted to ensure treated wastewater complies with the standards. |
| ♦ | Overflows and flooding of neighbouring properties with raw sewage? | | X | Sewerage system has been designed considering the population growth. It has been designed to accommodate sewerage until year 2041. |
| ♦ | Environmental pollution due to inadequate sludge disposal of industrial waste discharges illegally disposed in sewers? | □ | X | The design of the subproject ensures no chance of contamination with industrial effluent. The sewerage network and trunk sewers are placed underground and close conduits. Nobody will be allowed to connect with the system with out permission of the Municipal Board. Even for domestic connection approval is required from the Municipal Board. |
| ♦ | Noise and vibration due to blasting and other civil works? | X | | Mitigation measures to be provided will be taken care in Environmental Management |

| SCREENING QUESTIONS | | Yes | No | REMARKS |
|---|---|---|---|---|
| | | | | Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented |
| ♦ | Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers? | | X | Confined underground domestic sewerage system. No chance for contamination |
| ♦ | Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisance, and protect facilities? | | X | STP site far away from settlement. All the pumps will be with in enclosure and STP will be surrounded by boundary. Adequate buffer zones (greenbelt) as per Ministry of Environment and Forest (MOEF) norms will be provided. |
| ♦ | Social conflicts between construction workers from other areas and community workers? | | X | Most of the worker will be from local area |
| ♦ | Road blocking and temporary flooding due to land excavation during the rainy season? | | X | Mitigation measures to be provided will be taken care in Environmental Management Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented. Construction work will not be carried out during rainy season. |
| ♦ | Noise and dust from construction activities? | X | | Mitigation measures to be provided will be taken care in Environmental Management Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented. |
| ♦ | Traffic disturbances due to construction material transport and wastes? | X | | Mitigation measures to be provided will be taken care in Environmental Management Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented. The Contractor will be required to submit a Traffic Management Plan |
| ♦ | Temporary silt runoff due to construction? | X | | Mitigation measures to be provided will be taken care in Environmental Management Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented. The Contractor will be required to submit a Traffic Management Plan |
| ♦ | Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system? | | X | All piping will be tested. Hydro-testing will be carried out for all materials. Maintenance of the system will be carried out periodically. The O&M will be done by a contractor in the first five years of operation and eventually will be turned over to the Municipal Board/ |

| SCREENING QUESTIONS | | Yes | No | REMARKS |
|---|---|---|---|---|
| | | | | PHED. |
| ♦ | Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water? | | X | Periodic monitoring of the treated wastewater will be conducted to ensure the discharge conforms to applicable standards. Other beneficial uses of the treated wastewater and sludge will be identified in close coordination with local authorities. |
| ♦ | Contamination of surface and ground waters due to sludge disposal on land? | | X | It will be disposed off in designated site. Other beneficial uses will be identified in coordination with local authorities |
| ♦ | 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? | | X | Ventilation Shaft will be provided at the trunk main. Regular health checkup of the workers necessary |

## APPENDIX 2: Sewage Treatment Process Technology

**(Approved by CPHEEO)**

**Waste Stabilization Pond:-**

Stabilization ponds are open, flow through earthen basins retaining the sewage comparatively long detention periods extending from a few to several days, during which period putrescible matter in the waste is stabilized in the pond through a symbiotic relation between bacteria and algae. They do not require skilled operational staff & their performance do not fluctuate from day to day.

The facultative pond functions aerobically at the surface while an aerobic condition prevails at the bottom. The aerobic layer act as a good check against odor evolution from the pond. The treatment effected by this type of pond is comparable to that of conventional secondary treatment process. The facultative pond is hence best suited and most commonly used for the treatment of sewage.

**Process Description:**

Waste stabilization pond is a process that will give desired results i.e. deliver a treated effluent' suitable for irrigation purpose (with nutrients and hygienically- safe). The process involves minimal mechanical and electrical equipment for screen, grit removal, flow measurement and minimal operation and maintenance. The routine maintenance will involve removal and disposal of screenings and grit; measurement of flow. Consumption of energy is minimal & O& M will only involve cutting of weeds, removing floating matter, repair of any damage to the embankments.

The waste stabilization pond system will include screen, grit chamber, flow Measuring arrangement, anaerobic pond and facultative pond will considerably reduce the area required. The effluent from the waste stabilization pond will contain algae which is a rich source of nutrients viz. Nitrogen (N), Phosphorous (P) and Potassium (K). The algae deposited on soil are used as organic manures enriching the soil with N, P, . K liberated from algal cells from bacterial action. A certain amount of nutrients in raw sewage, which have not been used for producing algal cells will also, be available in the treated sewage.

In properly designed, operated and maintained ponds, there will be no problem of odour, mosquito and fly nuisance.

The percentage. removal of indicator bacteria and pathogens is higher in case of waste stabilization ponds than in case of conventional treatment processes.

No sludge treatment is required to be provided as the sludge collected in the pond is well stabilized. The sludge can be withdrawn after sufficiently long intervals.

**THE TREATMENT PLANT SHALL CONSIST OF FOLLOWING UNITS**

- Main inlet chamber with distribution chamber
- Bar screen chamber with coarse screen with clear openings of 50mm width and bar screen with 15 mm width
- Grit Chambers The grit chambers shall be able to remove grit particles of size 0.15 mm
- Anaerobic ponds
- Facultative ponds
- Office Building cum laboratory

## APPENDIX 3: Public Consultation

## PUBLIC CONSULTATION- ENVIRONMENT

## (Sawai Madhopur- Sewerage and Sanitation)

**Issues discussed**

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social upliftment of community
- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site
- Movement of wild animal nearby the project site

**Date & Time of Consultation: 09 May 2008 at 11:45 AM**

**Location: Surwal Village**

**.Table: Issues of the Public Consultation- Design Phase**

| Sr. No. | Key Issues/Demands | Perception of community |
|---|---|---|
| 1 | Awareness of the project – including coverage area | Local persons know that STP work of government will be started shortly in their village |
| 2 | In what way they may associate with the project | The local persons want that each community labour should be engaged in STP work. People of the village are ready to work in STP |
| 3 | Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area | No forest land nearby |
| 4 | Presence of historical/ cultural/ religious sites nearby | One Samadhi, and one small Hiramanji temple located nearby the STP site |
| 5 | Un favorable climatic condition | The local labour want to work from morning to 2 pm particularly during hot summer period |
| 6 | Occurrence of flood | No flood problem at site.<br>Only during heavy rain at monsoon area flooded from local *nallah.* |
| 7 | Drainage and sewerage problem facing | No underground drainage sewerage system in the area |
| 8 | Present drinking water problem – quantity and quality | Local people drink water from government tube well.<br>Water from few old wells are also used for drinking. |
| 9 | Present solid waste collection and disposal problem | Solid waste collected and disposed in low land area |
| 10 | Availability of labour during construction time | No scarcity of labour in village |

| Sr. No. | Key Issues/Demands | Perception of community |
|---|---|---|
| 11 | Access road to project site | Bitumin road available |
| 12 | Perception of villagers on tree felling and afforestation | Small neem tree, babool trees and bushes available in the proposed area – few of them need to be fell before construction |
| 13 | Dust and noise pollution and disturbances during construction work | As per villagers pollution control system will be required during construction |
| 14 | Setting up worker camp site within the village/ project locality | Local labour will be work in project. No need to setting up worker camp. |
| 15 | Safety of residents during construction phase and plying of vehicle for construction activities | Villagers requested for safety measures by controlling vehicle movement at site |
| 16 | Conflict among beneficiaries down stream users – water supply project using of river water | Not applicable |
| 17 | Requirement of enhancement of other facilities | Yes they want development of road, market nearby their villages |
| 18 | Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation | No need of extra land. STP will be constructed in government land |

(Special note- Local cultivator required equal distribution of treated waste water for cultivation)

**NAME AND POSITION OF PERSONS CONSULTED**

Mr. Hartool, Farmer and labour
Mr. Ram Sahay, Labour
Mr. Ram Swroop, Labour, Farmer
Mr. Hari Ram, Labour, Farmer
Mr. Ram Karan, Farmer
Mr. Shibbo, Labour
Mr. Brij Mohan, labour
Mr. Ram Kumar, Labour
Mr. Mukesh, Farmer
Mr. Mehraj, Labour
Mr. Shiv Sankar, Labour

**PUBLIC CONSULTATION- ENVIRONMENT**

**Sub Project-: Sewerage ( Sawai Madhopur )**

**Date & time of Consultation :- 20 July 2008 at 10.30 AM**

**Location :- Tonk Bus Stand , Bajaria**

**Table: Issues of the Public Consultation- Design phase**

| Sr. No. | Key Issues/Demands | Perception of community |
|---|---|---|
| 1 | Awareness of the project – including coverage area | People are aware of the sewerage project. DSC consultant informed the People about the proposed projects and invest plan on different component of the project. People were also informed about the phase wise implementation schedule of the sub - projects.<br>IT was informed that in RUIDP Project there will be a |
| 2 | In what way they may associate with the project | • They demand that local people of the area should be engaged during implementation of the same.<br>• Local ward members should be informed during the implementation they will provide all types of |
| 3 | Presence of any forest, wild life or any sensitive / unique environmental | No sensitive area nearby<br>. |
| 4 | Presence of historical/ cultural/ religious sites | No historical or religious building comes on the alignment of the Sewerage lines and STP site |
| 5 | Un favorable climatic | May –to- June there is very hot season; otherwise the condition of climate is favorable for work. Local labour is ready to work in any climatic condition |
| 6 | Occurrence of flood | Due to poor drainage condition people suffer from water stagnancy in their area especially in the market area and road side areas. |
| 7 | Drainage and sewerage problem facing | Due to poor drainage condition people suffer from water stagnancy in the area and road side areas. |

| Sr. No. | Key Issues/Demands | Perception of community |
|---|---|---|
| 8 | Present drinking water problem – quantity and quality | People get water supply from PHED. Quantity is not sufficient and quality is not good – hard water with high TDS. To meet the demand local people exploring ground water through hand pumps and wells. |
| 9 | Present solid waste collection and disposal | Municipality takes care of the Solid waste collection, which is manually & disposed off in disposal site. |
| 10 | Availability of labour | Sufficient labour will be available in this area. |
| 11 | Access road to project | Road available. |
| 12 | Perception on tree felling and afforestation | It has been explained that during implementation of the Sewerage line and at STP site no tree is going to be affected. |
| 13 | Dust and noise pollution and disturbances during construction work | People are aware of the problem. It has been explained that as per Safeguard policy of the project for abatement of pollution control system to minimize it.<br>Vehicles movement will be controlled & appropriate measure will be taken to combat the same. |
| 14 | Setting up worker camp site within the village/ | Construction camp should be located away from the residential place. DSC consultant assured that camp will be located as per EMP of the project |
| 15 | Safety of residents during construction phase and plying of | People are aware of the problem. It has been explained that as per Safeguard policy of the project<br>vehicles movement will be controlled & appropriate measure will be taken to combat the same |
| 16 | Conflict among beneficiaries down stream users – water | • The benefits should be equally shared to others. They concern that if PHED Chambal water project is not implemented in time then RUIDP project will be of no use. |
| 17 | Requirement of enhancement of other facilities | Yes they Want. They want the conservation of the heritage structures, |
| 18 | Whether local people agreed to sacrifice their lands (cultivable or not) For beneficial project | Yes , people are ready to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation. |

**NAME AND POSITION OF PERSONS CONSULTED:**

Ahok Kr Jain : shopkeeper
Depak Sharma : Businessman
Pankaj Jain ; shopkeeper
Monu goyal : shopkeeper
Giriraj ji : shopkeeper
Inder Singh : shopkeeper
Sataya Narayan Sharma : shopkeeper
Sanjay Singh: shopkeeper
Sharan Agarwal : shopkeeper
Chandra Prakash: shopkeeper
Pijush Kumar : Driver
Sonu jain: shopkeeper
Siyaramji : daily Labour
Shahid Ali : Tailor
Abdul Rezzaq : tailor
Ramchandji: shopkeeper
Nayyar Mirza : shopkeeper
Hanuman Prasad ; driver

**Summary of out come:**

People are well aware about the project through different sources. As the project do not require any land acquisition and there is no permanent impact on the livelihood and other way people will get sewerage system so they are happy if project will be implemented. Some people are unhappy because the project is considering only 12 wards. They wanted to know the basis of the selection of the 12 wards. DSC consultant explained them that STP is for the entire town and for sewer line other wards will be taken up by Municipality under UIDSSMT. The project doesn't have any negative impact on the community. People are ready to extend all types of support to during execution of the project. They also want that water supply, sewerage, drainage and solid waste management projects should be taken up as early as possible.