Environmental Assessment Document

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

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 subproject that is the subject of this Environmental Examination.

3 Review and Approval Procedure

12. For Category B projects the Draft Environmental Status 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.

C Scope of Study

13. This is the IEE report for the Bundi sewerage and sanitation sectors. It discusses the generic 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 subproject, and 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 Bundi town. Only few households have individual septic tank. The disposal of waste and effluent of septic tank is through the open drains. Presently the open drains, which have been constructed by Municipal Board (MB), convey the sludge and sewage which lead to unhygienic and unsanitary conditions.

15. From the demand gap analysis it is concluded that there is a need for a comprehensive scheme of proper collection and treatment and disposal of sewage in Bundi town. Significant land areas will be required for installation of the sewage treatment plant (STP) and there is low availability for this in Bundi thus the Municipal Board recommends waste stabilization pond (WSP) technology to be developed.

B. Location, Size and Implementation Schedule

16. The subproject is located in Bundi, the headquarters town of Bundi District, in the southeastern 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 would be buried within or alongside roadways. A new outfall sewer will be buried alongside the road. There will be a new Sewage Treatment Plant (STP) of 8 million liter per day (MLD) capacity to be built on

[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

44 *bigha* (approximately 11 hectares) of government land. **Figure 2.2** shows the proposed trunk and outfall sewers, **Figure 2.3** shows the location of STP, and **Figure 2.4** shows environmental features in and around STP.

17. Detailed design will begin in the second quarter of 2008 and should 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 to 2 years, so all work should be completed by the middle of 2010.

C. Description of the Subproject

1. Existing Situation Assessment

18. Presently, there is no sewerage system in Bundi and the only source of night soil disposal is through septic tanks and public conveniences. Sullage from the houses flows through the roadside drains into *nallas* (primary drainage channels) and thus polluting watercourses leading to the river. This creates unhygienic environmental conditions.

2. Subproject Description Including Detailed Scope

19. The general topography of the town is undulating and located on hilly terrain. The ground level varies between 248 to 310 meters (m). Natural slope of ground is from north to south or southeast. Based on the topography, Bundi town is divided in two sewerage zones – Zone 1 and Zone 2. The whole of Zone 1 drains southward; while Zone 2 slopes towards south east. Zone 1 is substantially larger and comprises of 30 municipal wards while Zone 2 has 10 wards. Zone 1 consists of older portions of the town and is much densely populated. Under the subproject, sewerage intervention is considered in Zone 1 and sewage is designed to be transmitted to a sewage treatment plant (STP) to be located in south of the town, where enough land is available not only for the present requirement; but also future expansion.

20. The Zone 1 area has a total land area of 1,580 hectares and divided into 30 wards. As of 2001, the population is 66,352. In this subproject, the trunk main and civil structures of inlet pump house were designed to cover the 30 wards (1 to 26, 36 & 38 to 40). The house connection with laterals were designed for 15 wards (4, 5, 11 to 15, 18, 19, 25 & 26 are fully covered and 16, 27, 29 & 31 are partially covered). The estimated population to be benefited is 28,562 people covering an area of 462 hectares. The other 15 wards would be connected to the sewage through existing roadside drains which will be properly intercepted and included in the network.

21. The collection system is designed for wastewater volume to be generated for the projected population of 2041. Per capita wastewater generation is considered as 80% of the net water supply of 135 liters per capita per day (lpcd). Peak factor has been considered to design the sewer lines. Minimum velocity of 0.6 meter per second (m/s) to achieve self cleansing and maximum velocity of 2.5 m/s to avoid possible scouring have been considered for design purposes. For all the component designs standard design criteria and practices have been adopted. Minimum cover is 0.9m. Provision of manholes at suitable intervals is also considered.

22. The proposed sewage treatment plant (STP) will have a capcity of 8 MLD and will use the waste stabilisation pond (WSP) process. The sewer network includes a sewage pumping station, 2.56 kilometer (km) of outfall sewer line, 26.21 km trunk and lateral sewers, and 5,634 house service connections (HSC). There will be 4 to 6 HSCs connected to each manhole.

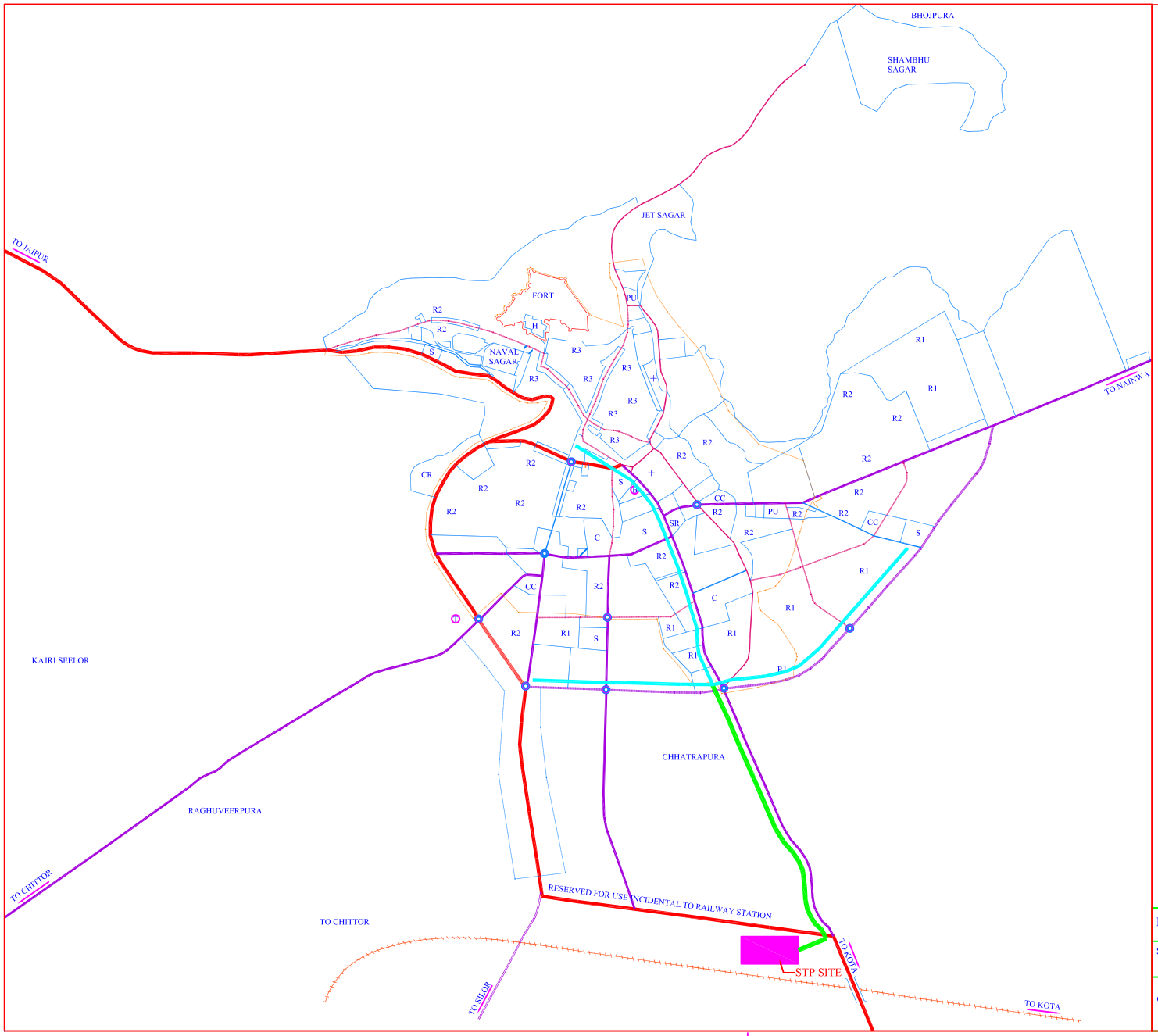
Provisions for 1,000 road side chambers have also been made which, if required, shall be used in wide roads or ease in constructions and maintenance. **Table 2.1** shows the nature and size of the various components of the subproject. The three main elements are: (i) provision of a network to collect sewage from different parts of the town; (ii) construction of a trunk sewer to transport waste to the STP; and (iii) a new STP to treat sewage to Indian standards. The descriptions shown in **Table 2.1** are based on the present proposals, which are expected to be substantially correct, although certain details may change as development of the subproject progresses.

23. The network pipes will be of reinforced cement concrete (RCC), and will be located along sidewalks and streets, in the government-owned right-of-way (ROW). The secondary and tertiary network that will collect sewage from individual houses will be pipes of small diameter and will be located in shallow trenches (average - 1.5 m in depth). The 2.56 km outfall sewer will also be of RCC pipes and will convey sewage from STP.

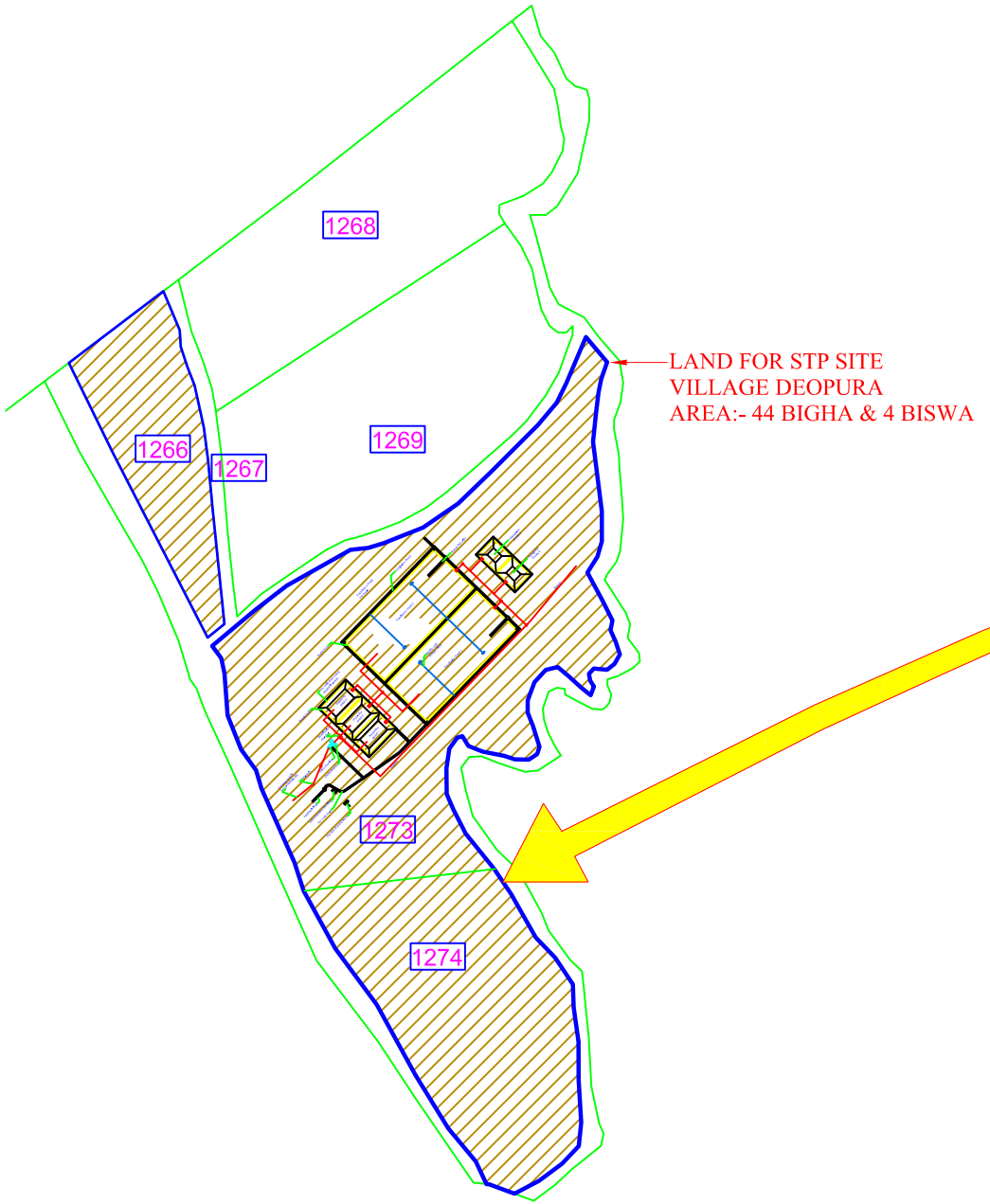
Table 2.1: Improvements in Sewerage Infrastructure Proposed in Bundi

Infrastructure	Function	Description	Location
Trunk/lateral (secondary) sewers and tertiary network and house connection	Different diameters. of sewer network to connect with outfall sewer	26.21 km of trunk and laterals sewers (200 to 1000mm dia pipe) 5,634 house service connections (110 to 160 mm diameter uPVC pipe	All around the town (Zone 1)
Sewage Treatment Plant (STP) Construction of Terminal Pumping station near STP	For treatment of raw sewage For final discharge	8 MLD STP (WSP process) which includes 2 anaerobic ponds, 2 facultative stabilization ponds, 1. pump sump , 1 inlet chamber, 1 grit chamber,, 1 screen channel, 1 outlet chamber	44 *bigha* (approximately. 11 hectares) land allotted at Deopura near right Main Canal under Khasra no. 1266 (6 *bigha* or approximately. 1.5 hectares), Khasra no. 1273 (26 *bigha* or approximately. 6.5 hectares) and Khasra no. 1274 (12 *bigha* or approximately 3 hectares)
Outfall Sewer	For STP outfall	2.56 km outfall sewer (1000 mm diameter pipes)	Deopura

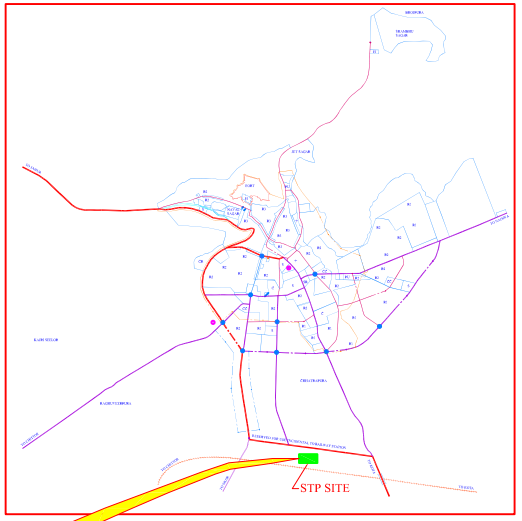
Rajasthan Urban Sector Development Investment Program ADB TA 4814-IND	Govt of Rajasthan Asian Development Bank
Bundi Regional Map	



RUSDIP(BUNDI)	RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM	
SECTOR:-	TITLE:- OUTFALL/TRUNK SEWER	
CONTENT:- CLIP DRAWING	DRAWING NO. RUSDIP/BUD/01	R0
	DRAWN BY:- R.KRISHNA	APPROVED BY:-
	DATE:- MAR-2008	SCALE:- NOT TO SCALE



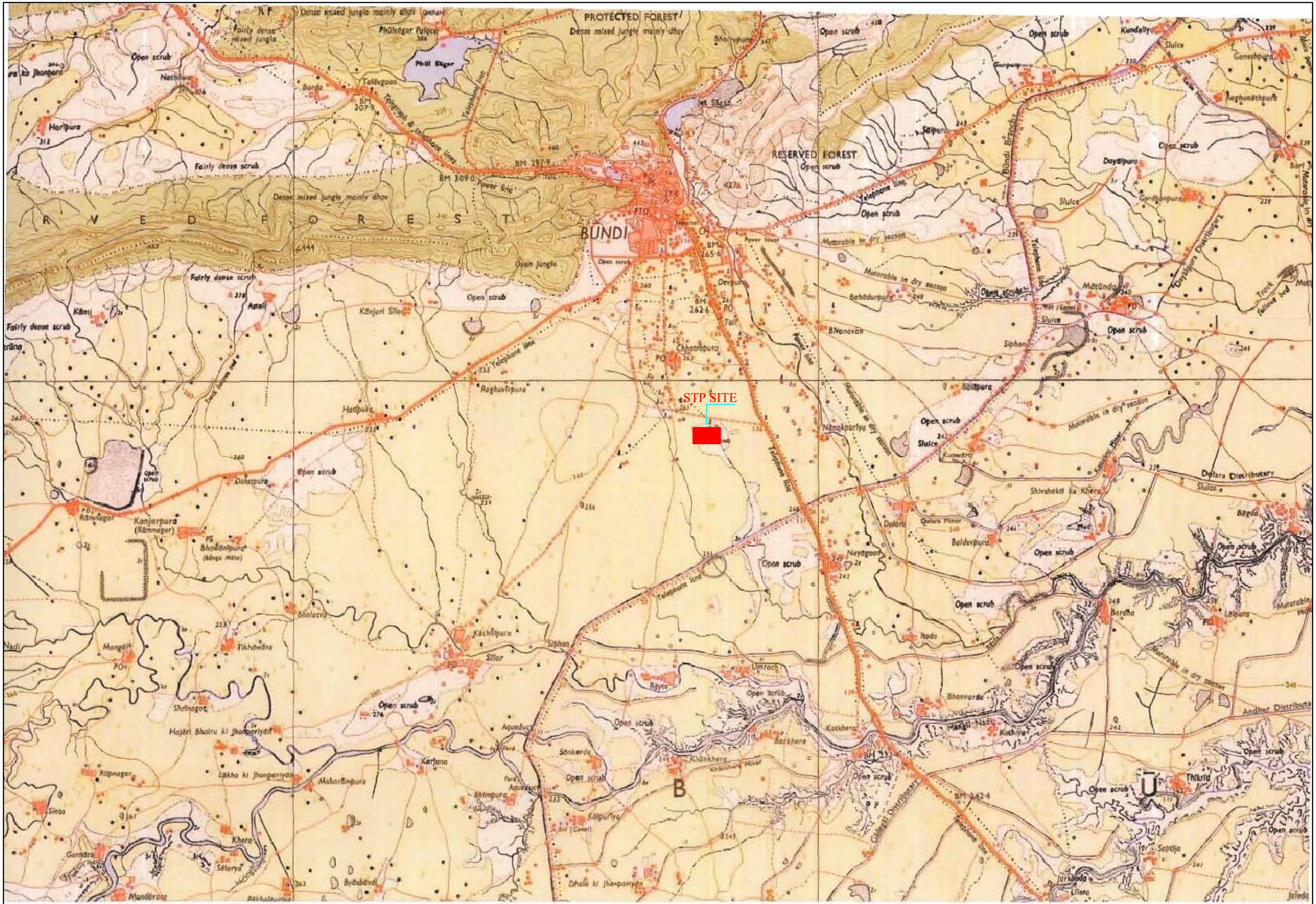
LAND FOR STP SITE
VILLAGE DEOPURA
AREA:- 44 BIGHA & 4 BISWA



LEGEND:-

- RAILWAY STATION AND YARD
- NATIONAL HIGHWAY/ BYE PASS
- STATE HIGHWAY
- SUB ARTERIAL ROADS
- ROAD JUNCTIONS
- MUNICIPAL LIMIT
- STP SITE (1273)

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


STP SITE
BUNDI
PROTECTED FOREST
RESERVED FOREST
Dense mixed jungle mainly dhov
Phul Sagar
Open scrub
Fairly dense scrub
Telephone line
Power line
Motorable in dry season
Dolara Distributary
Bundi Branch
Open jungle
Haripura
Raghuvirpura
Chhatrapura
Devpura
Talav
Siphon
Sluice
Kachhipura
Stlor
Umrach
Rayta
Mangli Nadi
Dolara
Baldevpura
Nayagaon
Bhanvarda
Thikrid
Kanjarpura
Ramnagar
Dolatpura
Aqueduct
Dhola ki Jhonpariyan
Mandavara

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

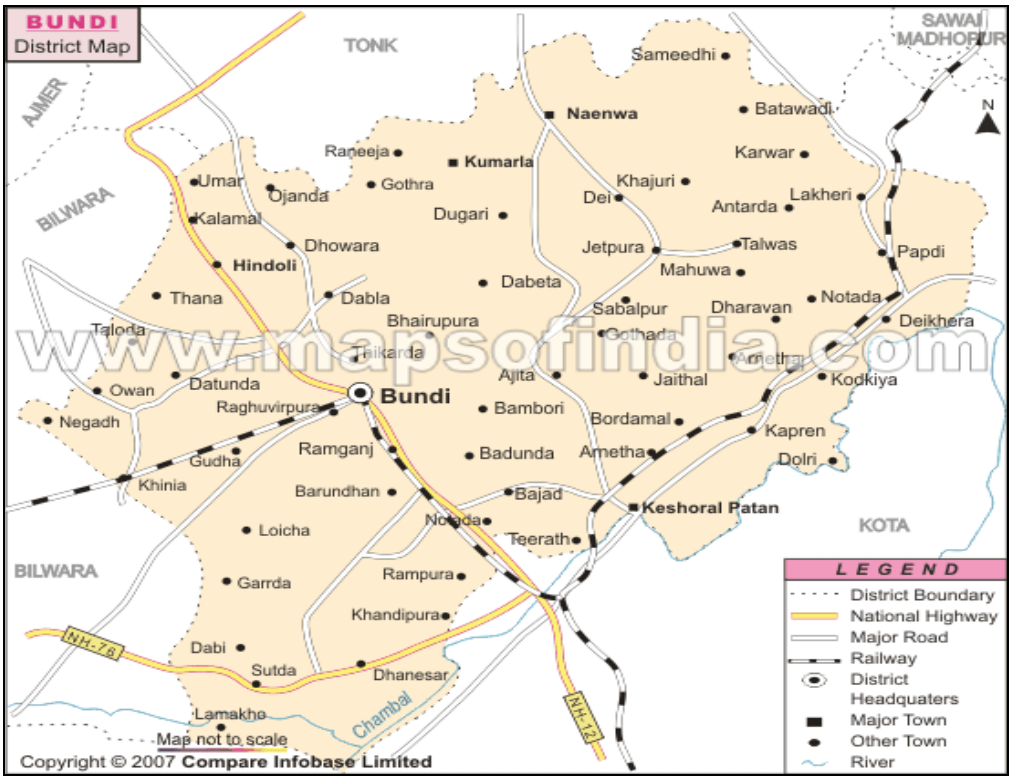
1. Location

24. The Urban Agglomeration (UA) of Bundi district is located in the southeast region of Rajasthan and lies at a distance of 206 km from Jaipur and 36 km away from Kota. It is bound in the north by Tonk, in the west by Bhilwara and on the south-west by Chittorgarh districts. The river Chambal forms the southern and eastern boundaries separating the Bundi and Kota territories. The southern tehsils of Bundi forms a wedge between Bhilwara and Kota and also touches Chittorgarh district.

25. Bundi is a small town with rustic setting that stands on the foothills of the Aravali Mountains. Bundi is very famous for its *baoris* (waterworks or stepwells), *havelis* (Rajasthani houses), temples and *chhatris* (elevated, dome-shaped pavilions) with carved pillars. The mural adorned palaces, the forts and the monuments tell tales about the glorious past of the town. A picturesque lake where the entire town and the palaces get reflected in the lake adds a stunning quality to the place.

26. In the past, a tribe called *Meena* inhabited this region and Bundi derived its name from the tribe' chieftain's name - Bunda Meena. In the 12th century Bundi came under the dominion of the Chauhans and reached its highest glory in the medieval times. The glory of Bundi declined with the Mughal rule and later became an independent state. District map of Bundi is shown in **Figure 3.1.**

Figure 3.1: District Map of Bundi



2. Topography, Natural Hazard and Drought

27. Bundi town lies in low risk zone (II). The area is less prone to earthquakes as it is located on comparatively stable geological plains based on evaluation of the available earthquake zone information. **Figure 3.2** depicts the earthquake zones of Rajasthan. **Figure 3.3** shows natural hazard zones of the Bundi district.

28. Low rainfall coupled with erratic behavior of the monsoon in the State makes Rajasthan the most vulnerable to drought. Based upon the discussion with PHED officials the water table in the town continuously decreases by 2-3 meter on an annual basis combined with significant drawdown conditions.

Figure 3.2: Earthquake Zones of Rajasthan

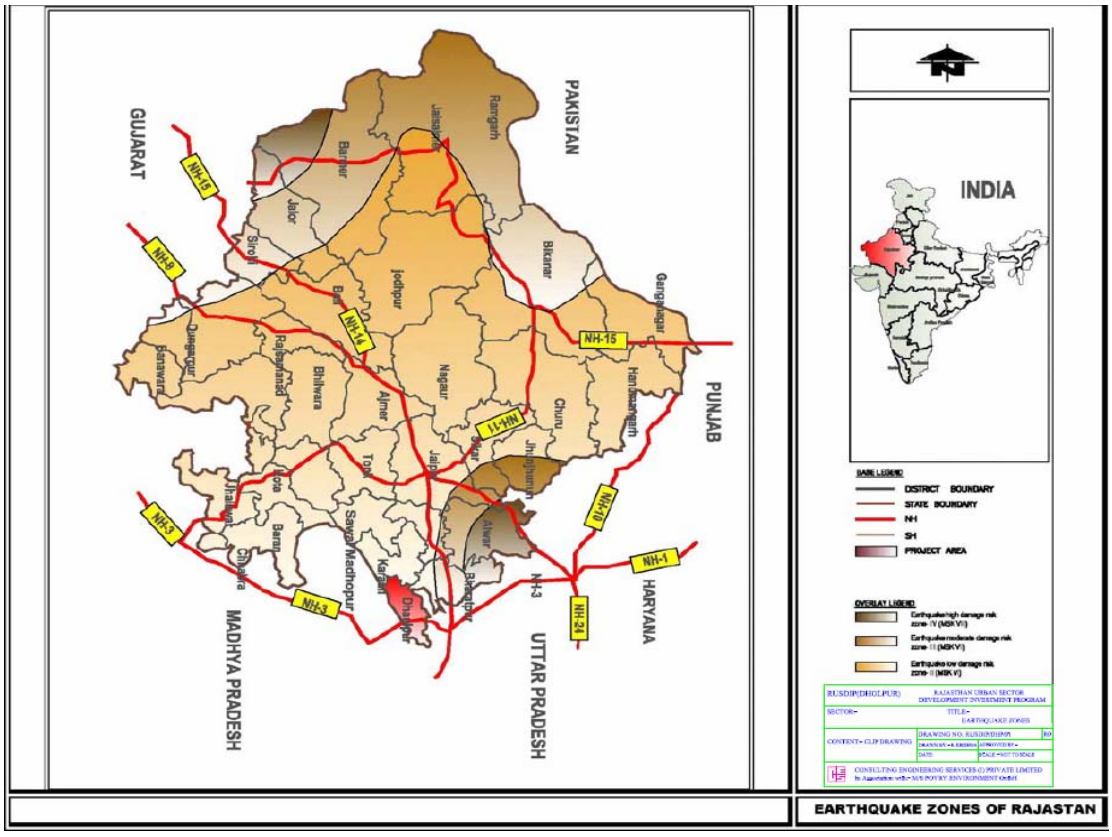
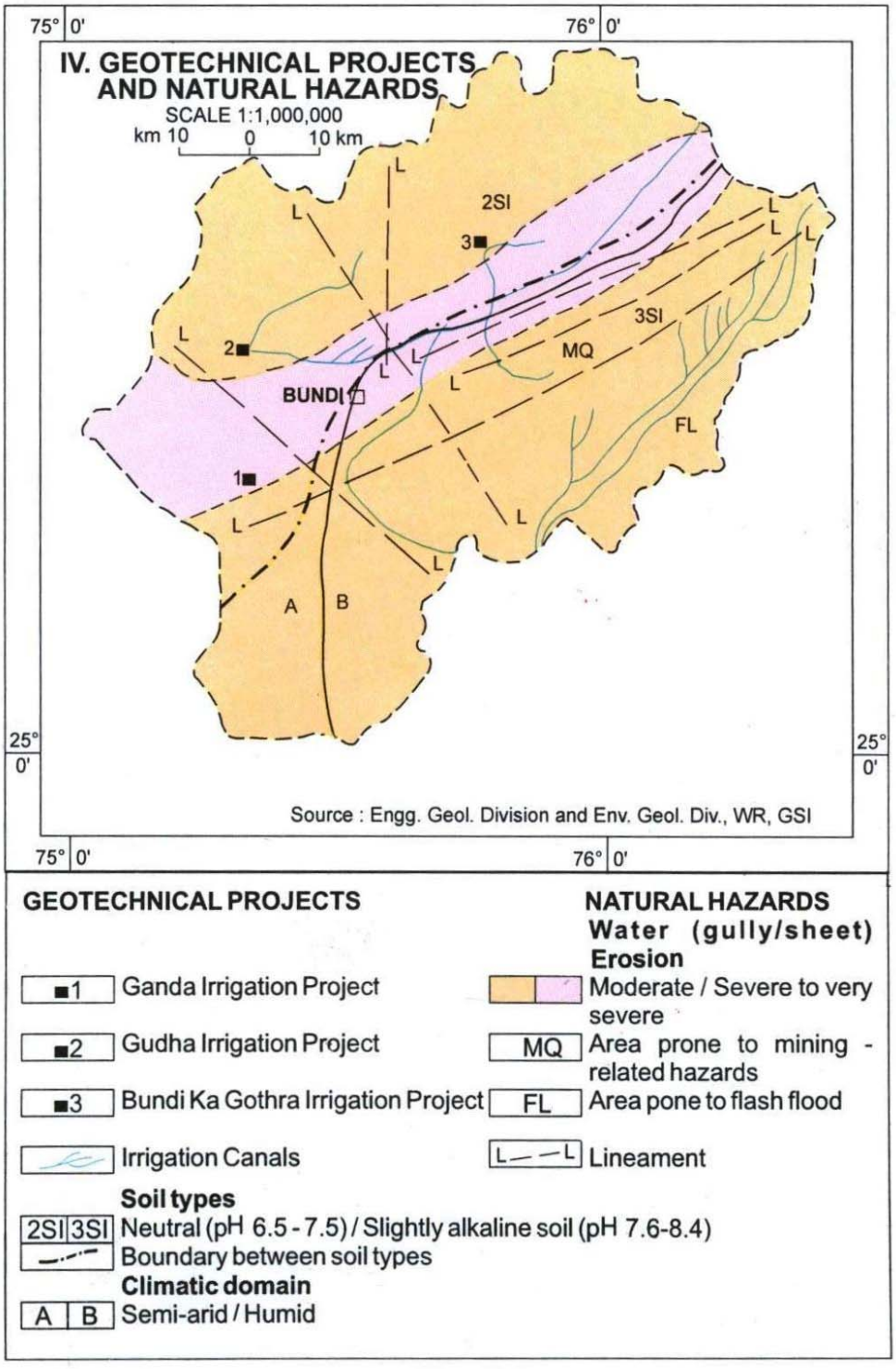


Figure 3.3: Natural Hazard Map of Bundi



Source: GSI Resource map

3. Geology, Geomorphology, Mineral Resources and Soil

29. Limestone is the most important mineral of the district. Deposits have been located near Bundi, Lakheri, and Satur. Limestone occurs sandwiched between the Ganurgarh Shale and the Lower Bhander Sandstone. An indicated reserves of 850 million tons with 42.73% calcium oxide (CaO) has been estimated. Glass sand occurrences are located near Barodia and Satur. Barytes near Umar occurs as small veins at the contact of limestone and schist. Minor occurrence of copper near Barodiya, marble at Umar and iron near Manak Chawk have also been reported. Geology and mineral map of the district is shown in **Figure 3.4** and geomorpholigal map of the district is depicted in **Figure 3.5.**

30. Soil of the region falls within low rainfall zone of 650-1000 mm. The soil is generally black of alluvial origin, clay loam with saline ground water. **Table 3.1** shows nutrient level in the Bundi soil including area coverage of saline and sodic soil. The nutrient status of the Bundi soil is graded as medium to high level.

Table 3.1: Fertility Status – Major Nutrients and Problematic Soils of Bundi District

	Nutrient			Saline Soil (hectares)	Sodic or Alkali (hectares)
	Nitrogen	**Phosporus**	**Potassium**		
Status	M	M	H	6009	9229

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

4. Climate

31. The district is generally dry except during the monsoon or winter rains. Maximum temperature is 42.6 degrees celsius Minimum temperature is 29.7 degrees celsius. Normal annual rainfall in the district is 76.41 cms.

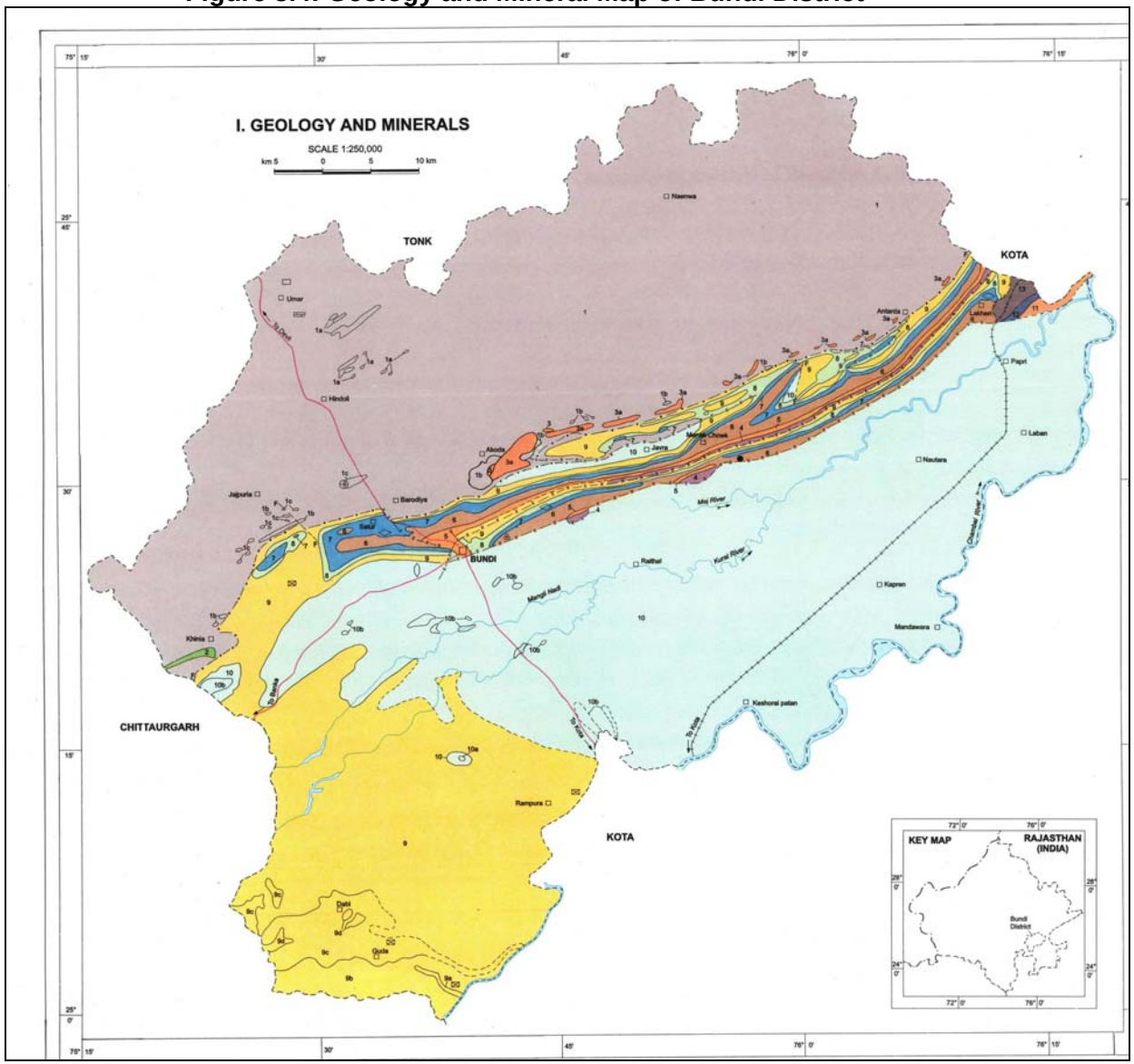
32. The rainfall over Bundi is scanty and is concentrated over four month i.e. from June to September. The rains are erratic and so is the distribution of the rainfall. However agriculture and the animal wealth are dependent on rains to large extent. Seasonal Rainfall data for the recent year (2005-2006) is shown in **Table 3.2. Figure 3.6** shows yearly variation (1997-2007) of rainfall at Bundi.

Table 3.2: Rainfall at Bundi in Recent Years (2005 to 2006)

Months	**Rainfall (mm)**
June	52
July	213
August	19.8
September	240
October	0
November	0
December	0
January	0
February	0
March	20
April	0
May	4
Monsoon Rainfall	**524.8**
Non monsoon rainfall	**24**
Annual Rainfall	**548.8**

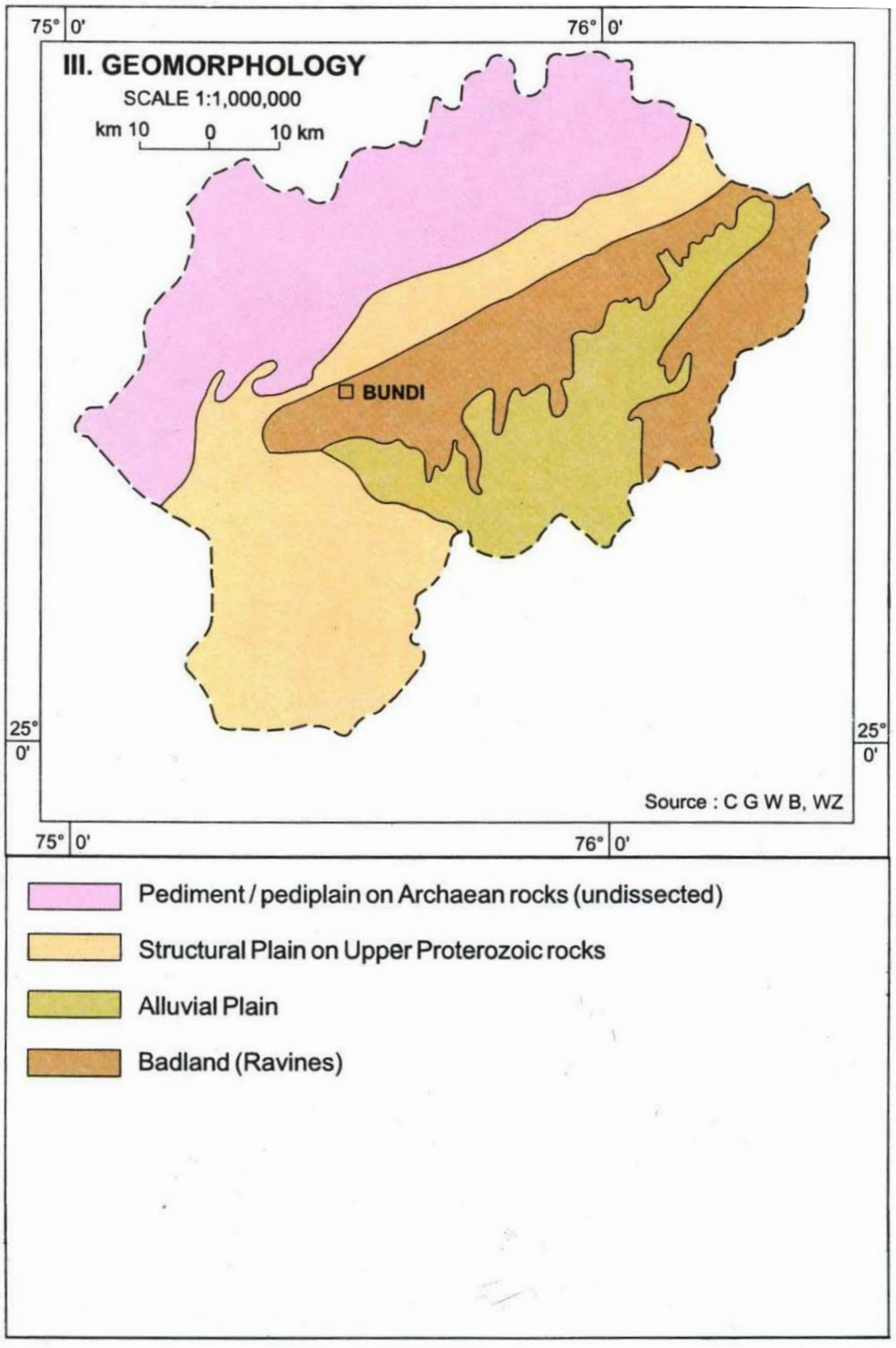
(Source: Irrigation Department, Govt. of Rajasthan)

Figure 3.4: Geology and Mineral Map of Bundi District



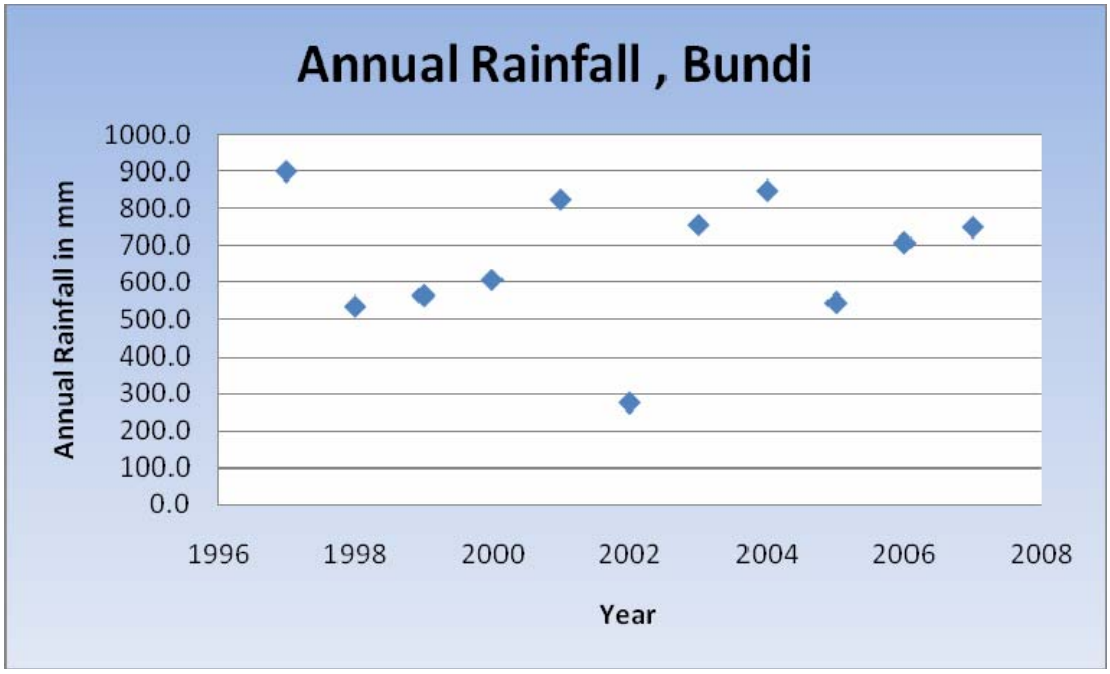
Source: GSI Resource Map

Figure 3.5: Geomorphology of Bundi District



Source: GSI Resource Map

Figure 3.6: Rainfall at Bundi during 1997 to 2007



Source: Deputy Director Hydrology Water Resources, Jaipur

5. Air Quality

33. There are no data on ambient air quality of Bundi town, which is not subject to monitoring by the Rajasthan State Pollution Control Board (RPCB) because there are no major industries located here. Traffic is the significant pollutant in Bundi, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). The nearest station is located at Kota (46 km from Bundi). The ambient air quality data is depicted in **Table 3.3.**

Table 3.3: Ambient Air Quality in Kota (Annual Average, 2004; units in µg/m3)

Monitoring Station	Land use	SOx	NOx	RSPM	SPM
Kota Residential, Rural and others area	Residential	7.95	22.85	121	272
NAAQ Standard	*Residential*	*60*	*60*	*60*	*140*
Kota Industrial area	Industrial	9.66	24.21	132	323
NAAQ Standard	*Industrial*	*80*	*80*	*120*	*360*

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter
Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

6. Surface Water

34. There is no water quality monitoring station at Bundi. The nearest monitoring station is at the Chambal River which is located 46 km from Bundi. The monitoring is being carried out by RPCB. The data on dissolved oxygen, pH, biological oxygen demand (BOD), and electrical

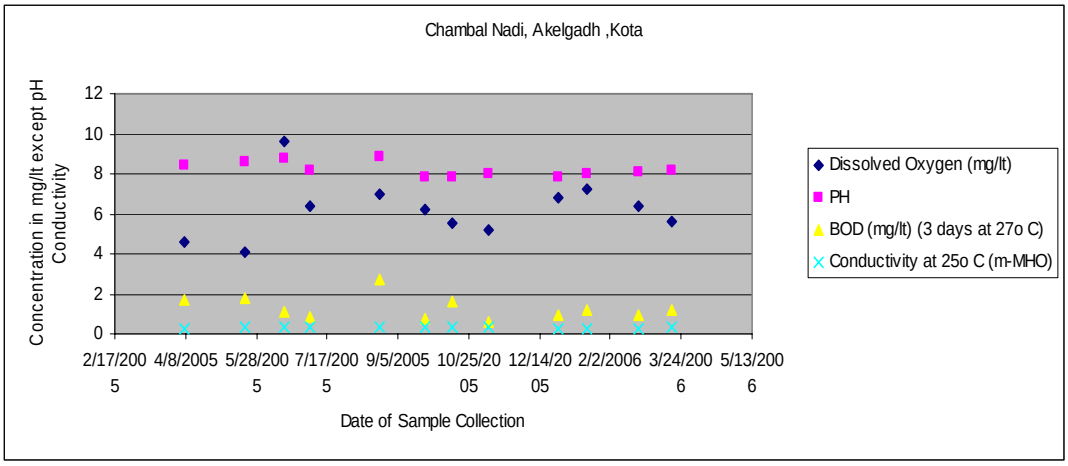
conductivity is given in **Table 3.4**. **Figure 3.7** shows variation of water quality in different locations of Chambal River.

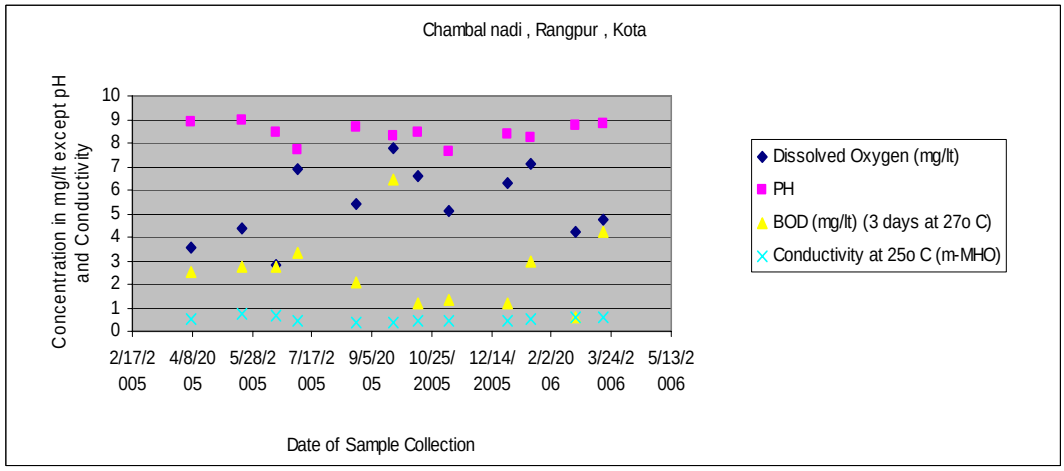
Table 3.4: Chambal River Water Quality at Different Locations

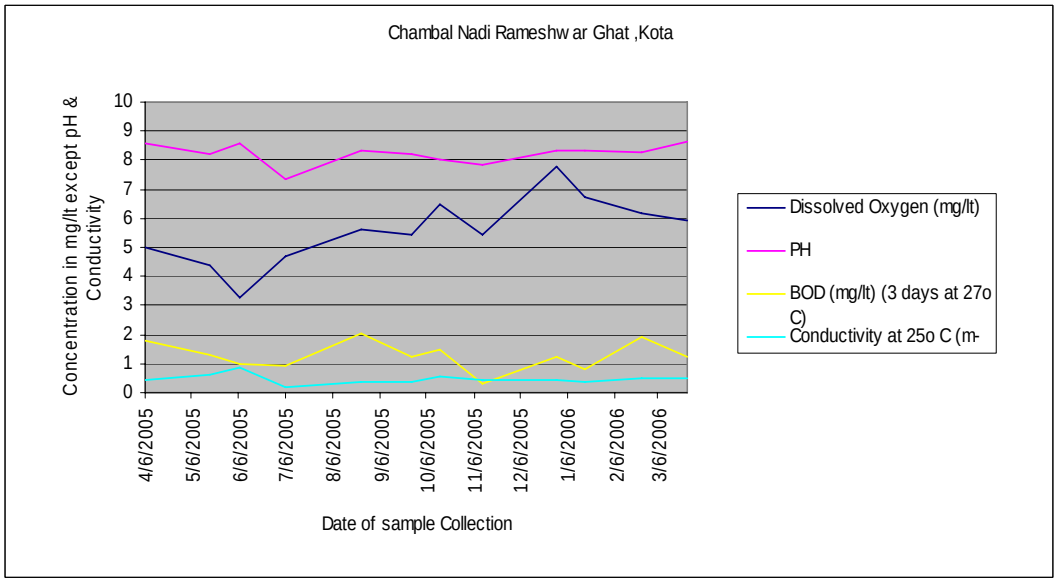
Location	Date of Sample Collection	Dissolved Oxygen (mg/L)	pH	BOD (mg/L) (3 days at 27o C)	Conductivity at 25^{o} C (micro mhos)
Chambal Nadi Akelgarh , Kota	4/7/2005	4.6	8.42	1.66	0.26
	5/20/2005	4.05	8.59	1.76	0.33
	6/17/2005	9.61	8.78	1.09	0.33
	7/5/2005	6.38	8.17	0.88	0.3
	8/23/2005	6.97	8.83	2.69	0.3
	9/24/2005	6.2	7.86	0.74	0.3
	10/13/2005	5.57	7.81	1.58	0.3
	11/8/2005	5.2	8.02	0.6	0.3
	12/27/2005	6.8	7.86	0.95	0.26
	1/16/2006	7.2	8.03	1.2	0.27
Chambal Nadi Rangpur , Kota	4/7/2005	3.59	8.92	2.53	0.51
	5/20/2005	4.4	8.94	2.73	0.75
	6/17/2005	2.82	8.47	2.74	0.68
	7/5/2005	6.89	7.7	3.36	0.47
	8/23/2005	5.38	8.7	2.1	0.4
	9/23/2005	7.75	8.28	6.41	0.35
	10/13/2005	6.62	8.42	1.16	0.42
	11/8/2005	5.12	7.65	1.36	0.45
	12/27/2005	6.3	8.37	1.15	0.44
	1/16/2006	7.1	8.21	3	0.5
	2/22/2006	4.2	8.76	0.6	0.59
	3/17/2006	4.72	8.79	4.24	0.61
Chambal Nadi , Rameshwar Ghat, Kota	4/6/2005	4.97	8.6	1.79	0.46
	5/18/2005	4.4	8.22	1.32	0.63
	6/6/2005	3.26	8.58	0.99	0.84
	7/6/2005	4.7	7.37	0.92	0.17
	8/24/2005	5.63	8.34	2.06	0.35
	9/26/2005	5.46	8.18	1.21	0.34
	10/14/2005	6.51	8.04	1.47	0.53
	11/11/2005	5.44	7.83	0.28	0.46
	12/29/2005	7.8	8.35	1.25	0.42
	1/17/2006	6.7	8.32	0.8	0.35
	2/23/2006	6.2	8.25	1.9	0.48
	3/24/2006	5.92	8.62	1.24	0.51

Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

Figure 3.7: Variation of water quality parameters



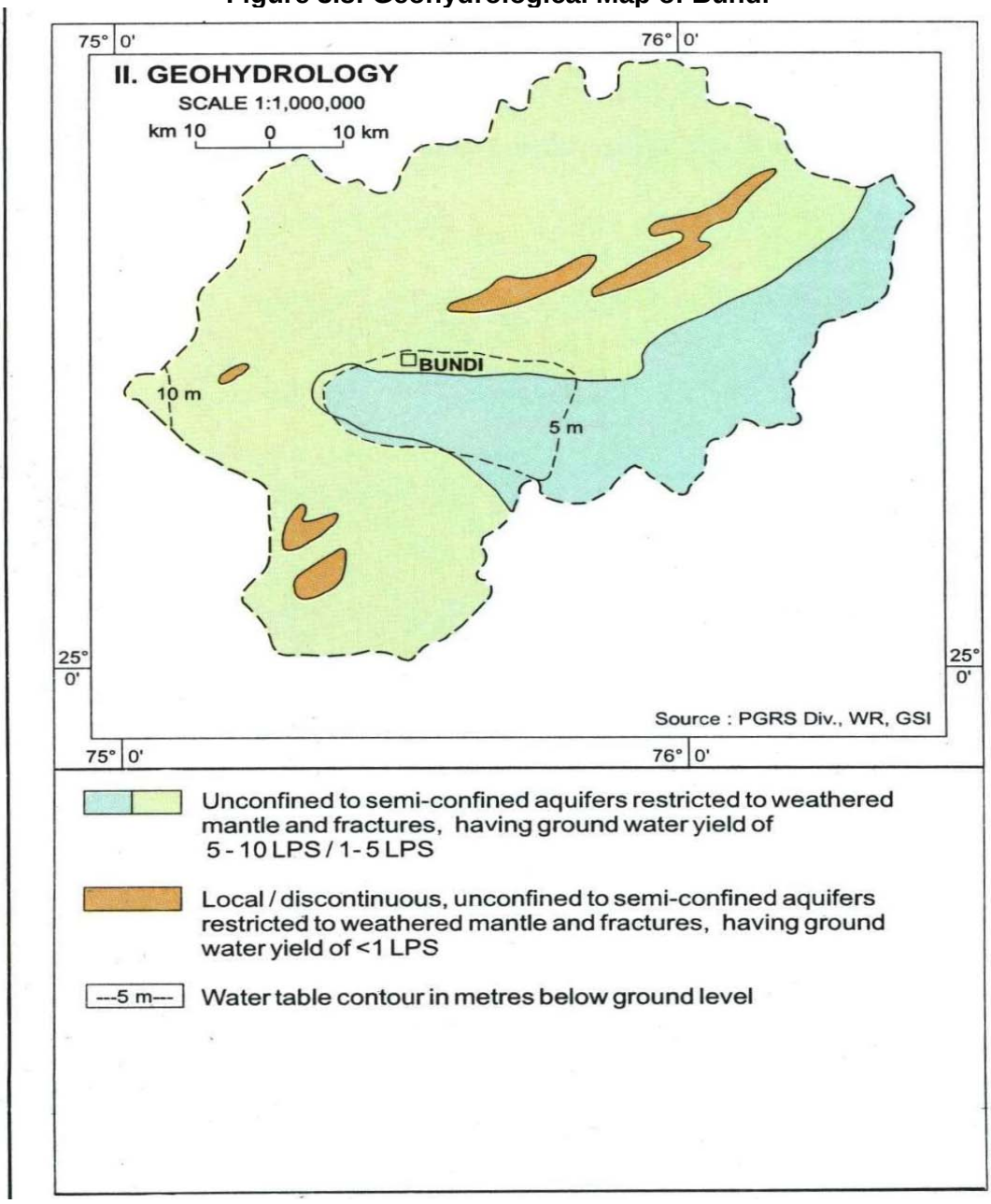




7. Geohydrology and Groundwater

35. Geohydrological map of the Bundi district is shown in **Figure 3.8.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into groups on the basis of their degree of consolidation and related parameters. On an average, 90% of the district area covered with unconfined to semi confined aquifers restricted to weathered mantle and fractures, having ground water yield of 5 to10 liters per second.

Figure 3.8: Geohydrological Map of Bundi



36. There are number of National Hydrographic monitoring stations of Central Ground Water Board in and around Bundi. Fluctuation of ground water level is shown in **Table 3.5.** In most of the cases ground water table ranged between 5 to 20 m below ground level (bgl).

Table 3.5: Number and Percentage of National Hydograph Network Station (Bundi) with Water Fluctuation Range

Period	No of Wells Analysed	Range		0-2 m		2-5 m		5-10 m		10-20m		20-60m		>60 m	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Jan-06	13	0.39	19.18	2	15.38	3	23.08	5	38.46	3	23.08	0	0	0	0
Nov-05	15	1.17	19.44	3	20	6	40	2	13.33	4	26.67	0	0	0	0
Aug-05	14	1.36	18.67	2	14.29	4	28.57	5	35.71	3	21.43	0	0	0	0
May-05	11	3.1	18.68	0	0	2	18.18	5	45.45	4	36.36	0	0	0	0

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

37. The Central Ground Water Board carried out chemical testing of water from tubewells. The average concentrations of major constituents are shown in **Table 3.6**.

Table 3.6: Ground Water Quality in and around Bundi

Parameters	**Maximum Level**	**Minimum Level**	**Standard of Drinking water (IS: 10500: 1991)**	
			Desirable limit (mg/l)	**Maximum Permissible limit (mg/l)**
pH	8.24	7.71		
EC (micro-mhos/cm at 25 °C)	5550	525		
Cl (mg/l)	1576	57	250	1000
SO_4(mg/l)	737	7	200	400 (if Mg does not exceeds 30 ppm)
NO_3(mg/l)	196	0	-	100
PO_4(mg/l)	0.5	0.1		
Total Hardness(mg/l)	2040	170	300	600
Ca(mg/l)	480	28	75	200
Mg(mg/l)	204	7.3	30	100
Na(mg/l)	552	28	-	-
K(mg/l)	17	0.78	-	-
F(mg/l)	2.5	1.0	1.0	1.5
Fe(mg/l)	10.45	0.15	0.3	1.0
SiO_2(mg/l)	40	13		
TDS (mg/l)	3608	341	500	2000

Note: Total – 10 nos. samples Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

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

38. Supply water quality as measured by Public Health Dept. is shown below. It is noted that ground water is potable for drinking purpose.

Table 3.7: Present Supply Water Quality at Bundi

Population	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
65,047	80	Ground	100	0	4	9	0.12	0.46	400	860	2	25

(All values in mg/l unless stated otherwise)
CWR = clear water reservoir; F = fluoride, TDS = total dissolved solids, NO_3 = nitrates, mg/l = milligrams per liter

B. Ecological Resources

39. The urban area in Bundi is surrounded by land that was converted for agricultural use many years ago. There is no remaining natural habitat in the town, where the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects). There is no protected area nearby the subproject site.

40. There are reserve forest areas in the north and north-east of Bundi, and although protected from building and most other types of activity, these contain little of ecological interest. Vegetation is sparse and comprises mainly domesticated species, and the fauna is also very limited. There are fishes in most of the rivers and irrigation tanks outside the towns, but no aquatic areas are protected; rahu (*Labeo rohita*) and sanwal are the most common fish species.

C Economic Development

41. Occupational Structure: In 1971, the participation ratio of workers was 26.57% which increased to about 27.1 % by 1981. Being the district head quarter, service sector is the most important sector of employment, employing about 37.4 % of total workers. Bundi has also a number of industrial units which are agro-based and about 24.5 % of workers are employed under this sector. Trade and commerce is the other important sector providing employment to about 19.66 % workers.

Table 3.8: Occupational Structure

Occupation	Persons	% of Total Workers
Agriculture	490	5.33
Live Stock ,Forestry, Mining and Quarrying	274	3.00
House Hold Industry	913	9.96
Other than House Hold	1329	14.50
Construction	450	4.90
Trade and Commerce	1802	19.66
Other Services	481	5.25
	3426	37.40
Total	**9165**	**100%**

42. Power Status of the Area: There is no power generation unit at Bundi. The consumption of electricity by different sectors is shown in **Table 3.9**.

Table 3.9: Consumption of Electricity in Million Kwh (2003-04)

District	Domestic	Non-Domestic (Commercial)	Industrial			Public Lighting	Public Water Works
			Small	Medium	Large		
Bundi	28.093	7.033	4.165	3.168	44.947	1.062	7.513

43. Land Use: Municipal area of Bundi encompasses 20.23 sq. km. About one fifth of the land area is urbanized and the rest consists of hills, water bodies and agricultural land. Even within a contiguous urbanized area, only 65% is developed and the remaining are water bodies, agricultural land, and pockets of vacant land. About 44% of developed area is under residential use and 23% under public and semi-public. The high percentage of public and semi-public uses is due to spacious parade and play fields attached to schools. **Table 3.10** shows land use percentage of developed and urbanized areas of Bundi. **Figure 3.9** shows proportion of land use of Bundi developed area. **Figure 3.10** depicts land use map of the entire district.

Table 3.10: Existing land Use of Bundi

Sl.No	Use	Area in Acres	% of Developed Area	% of Urban Area
1	Residential	310	44	28
2	Commercial	60	8.6	5.5
3	Industrial	35	5	3
4	Governmental	20	3	2
5	Recreational	20	3	2
6	Public and Semi public	160	22.8	14.5
7	Circulation	95	13.6	8.5
8	Agricultural	120		10.5
9	Water Body	85		7.5
10	Other Vacant	205		18.5
Total Urbanized Area		1110		100

Figure: 3.9: Land Use Bundi Developed Area

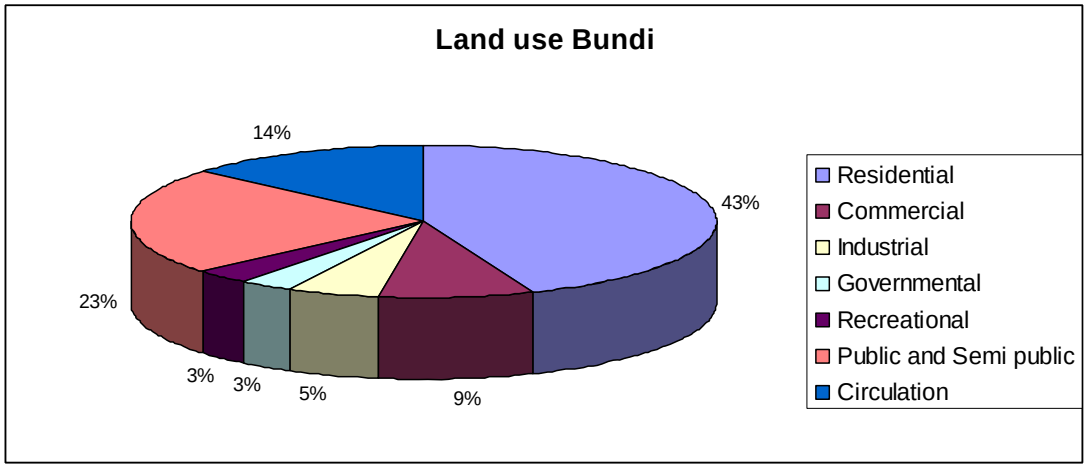
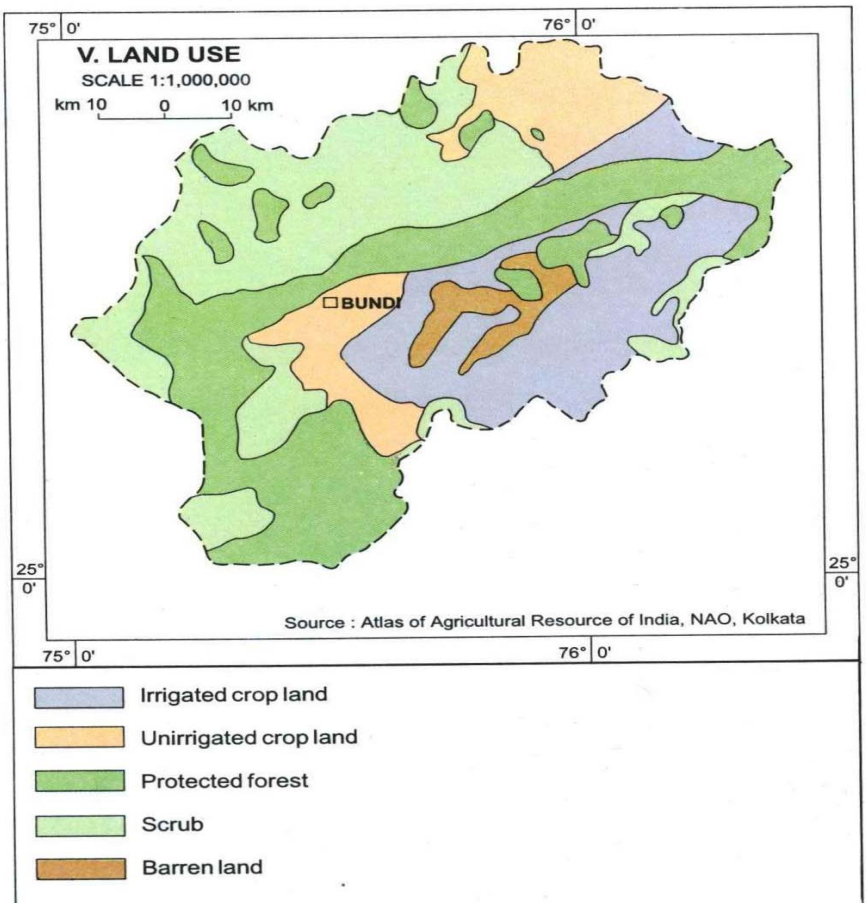


Figure 3.10: Land Use Map of Bundi District



44. Chainage-wise land use in and around the sub –project site is shown in **Appendix-1.** It is noted that along the raising main and distribution areas the major land use is the agriculture. In some cases commercial and open areas are noted. There is no major impact anticipated on residential areas and religious places. Details are discussed in Social impact assessment report.

45. Commerce, Industry and Agriculture: There are few industries located in and around Bundi town, these are as follows:

- Number of Large and Medium Scale Units: 5
- Number of Small Scale Units: 2,211
- No of Industrial Areas: 5 (located in Baswari-Govindpur, Bundi by-pass, Bundi-Nainwa Road, Bundi Chittorgarh, and Indergarh.
- Main Existing Industries: general engineering, oil milling, oil refinery, paper, *poha* making, portland cement manufacturing, rice milling, stone cutting and polishing, and sugar refining

46. In and around the Bundi town area, about 80% of lands used for agricultural purposes. Crop production statistics as depicted in **Table 3.11.** It also indicates that there are more crop production at *Rabi* season in compared to *Kharif* season.

Table 3.11: Crop Production In and Around Bundi

Type of Crops	Under Rabi Crops 2003-04 (Production in tons)	Under Kharif Crops 2003-04 (Production in tons)
Cereals	266,735	116,963
Pulses	11,928	18,652
Food Grains	278,663	135,615
Oilseeds	67,361	70,437
Others	11,287	50,205
Total	**357,311**	**256,257**

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

47. Water Supply: The present service level of Bundi is less than 135 lpcd. The water supply of Bundi town is sourced partly from tube wells and partly from Mangli river. The major shortcoming of Bundi water supply is inadequate water source and deficiency in storage. 60% of the population is supplied with water through pipes and partly from public stand posts and hand pumps.

48. Sewerage and Sanitation: The municipal drains are mostly open and overflowing into Latic *nalla* causing problems specially during rainy reason. Sullage from households and toilets often flows to drains causing unsanitary conditions. Only 50-60 % of the households reportedly has septic tanks and soaks well as the system of sewerage disposal. The remaining accounted for cases of 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 Municipal Board and discharge to open spaces, agricultural lands in an indiscriminate manner. Slum areas were also not equipped with requisite sanitation resulting in open defecation.

49. Drainage: Due to scanty rains in the region, natural drainage system has not been developed. In Bundi 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 with total length of 128 km in Bundi has been identified under three broad categories as follows: (i) open *pucca* (115.2 km) (ii) closed drains (6.4 km), and (iii) open drain *kutchha* (6.96 km):.

50. Industrial Effluents: Industries exist under Rajasthan State Industrial Development & Investment Corporation Ltd (RIICO), which are outside the town area and small amount of effluent disposed scattered in local *nallahs*. As reported by the local municipal council, the responsibility of effluent disposal is under RIICO's own and could not be connected to the proposed sewer network. The individual industry should treat their effluent to bring it to the required standard before final disposal.

51. Solid Waste: 20 tons of solid waste is collected daily. In addition to household (domestic) solid waste, the main waste generation sources in the town are vegetable and fruit markets, commercial and institutional establishments including hotels and eateries, construction activities, and other tourism related activities. The solid waste generated is transported to garbage dumping site. The Municipal Board has engaged one loader and three tractors and four private tractors for collecting and transporting the solid waste material. The capacity of 7 tractors

is approximately 10 cubic meter (m^3). The waste material is lifted by loaders and put on trolley for transportation to disposal site.

52. Transportation: Bundi is well connected to all the cities within Rajasthan. There are buses and tourist taxis available from Jaipur and Kota. **Table 3.12** provides a breakdown of road surface composition in Physical growth of the town 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 3.12: Road Surface Composition

Surface Type	Total (km)
Concrete	64.83
Black Topped	21.61
Water-Based Macadam	19.49
Others/Earthern	2.16
Total	**108.09**

Source: Bundi Public Works Department

D. Social and Cultural Resources

53. Population**:** The population of Bundi town has increased rapidly during the past 50 years. The town has a population of 22,697 in 1951 which has gone up to the present population of 88,871 (2001 census). Thus the population has increased more than 3.5 times during the periodwith an annual growth rate of 3.34%.The density of population in Bundi town currently at 3,905 persons per square km. The density has rapidly grown in the last 50 years. Projected population of Bundi town is given in **Table 3.14.**

54. Literacy Rate: The current level of literacy in Bundi is placed at 55.57 % (71.68 for Male and 37.79 % for Female) on comparison with the state average of 38.55% (54.99% for male and 20.44% for female), the Bundi town literacy levels are superior.

55. Sex Ratio: The sex ratio for Bundi town has been estimated at 893 per thousand male for the year 2001 census.

Table 3.14: Projected Population

Year	Population
2001	88,871
2011	114,963
2021	149,206
2031	193,546
2041	250,611

56. There are good educational facilities in Bundi district, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 933 primary schools, 89 secondary and higher secondary schools, 2 general degree colleges, and 3 industrial training institutes (ITI). **Table 3.15** shows education facility in the district.

Table 3.15: Educational Facility of Bundi District

Educational Institutes	(No.)
Primary Schools	933
Middle Schools	341
Higher Secondary and Secondary Schools	89
Degree Colleges	2
Special Commercial Schools	3
ITI	3

57. There are 1 general hospital, 1 tuberculosis hospital, and 1 primary health center in Bundi town.

Table 3.16: Medical facilities in Bundi urban

	Facilities	Number
1	Hospital and Community Center	1
2	TB Hospital	1
3	Primary Health Sub Center	1
4	Total	3

58. The Bundi district of Rajasthan has been an important tourist destination for both the foreign and domestic tourists. The place offers a unique culture with baoris, palaces & forts, lakes and the beautiful natural surroundings. The apparent tourism potential of this place inspired many to organise fairs and festivals to give a boost to the tourism resources. Efforts were made for vital efforts to streamline tourism and make it an important agent for the growth and development of this area.

59. 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. The Bundi palace, built of locally quarried stone, presents one of the finest examples of Rajput architecture. Intricately carved brackets, pillars and balconies and sculpted elephants are used liberally. Of special interest here are the Diwan-I-Am, Hathi Pol and the Naubat Khana. Also located in the palace is the famous Chitra Shala which provides a colourful glimpse of history - the walls and ceiling of this palace are completely covered with paintings of the Bundi school. Hunting and court scenes, festivals, processions, animal and bird life and scenes from Lord Krishna's life are still in very good condition. Bundi has other palaces and hunting lodges like the Phool Sagar Palace, Sukh Mahal and Shikar Burj. Each palace has its own historical importance Phool Sagar houses a collection of murals: done by the Italian prisoners of war who were held here; Sukh Niwas Palace evokes memories of Rudyard Kipling who not only stayed here but is believe to have found inspiration for his famous work Kim from the scenes that he saw here. Kshar Bagh, though not a palace, is interesting for its locations as well as the carvings on the 66 royal cenotaphs.

60. Bundi is also known for its *baories* or step-wells. Unique to Rajasthan and Gujarat, the step-wells served as water reservoirs for the months of summer when there was a scarcity of drinking water. At one time, there were over 50 such wells in Bundi but most of them have suffered the ravages of time. One very good example still to be found in the heart of the town is called *Raniji-ki-Baori*. It has exquisitely carved pillars and ornate archways - even the simple function of drawing water from the well became a special occasion for the womenfolk, they dressed up in their finery to visit these elaborate structures. On the road to Kota is a splendid

17th century monument - the 84-pillared *chhatri* still in extremely good condition and worth a visit.

61. Bundi has moderate tourist inflows with main attractions being Ratan –Daulat , Chhatra Mahal , Chitra Shala, Char Bhujaji , Jain Temple at Naharji Ka Chauhatta, Laxminath Temple in Sadar Bazar, Damdame ki Maszid. The details tourist approaches to this town during last five years are as below.

Table: 3.17: Tourist inflow at Bundi

Year	Domestic Tourist	Foreigner	Total
1997	2661	421	3082
1998	11333	3818	15151
1999	29293	10342	39635
2000	30433	10568	41001
2001	20911	4334	25245
2002	11811	4000	15811
2003	17041	6916	23957
2004	14296	5516	19812
2005	21582	7866	29448

IV. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN

62. 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.

63. 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.

64. 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 localised 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 the routine nature of the impacts means that most can be easily mitigated; and

- In one of the major fields 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

65. 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 and streets. Areas outside the town will also be affected, by construction of the trunk sewer and STP.

66. However 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 localized and short in duration; and
- The overall construction programme will be relatively short for a project of this nature, and is expected to be completed in 2 years.

67. 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.

68. These environmental factors have thus been screened out presently but will be assessed again before implementation.

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	There is no wildlife or rare or endangered species in the town or on the government owned areas outside the town on which facilities will be built
Coastal resources	Bundi is not located in a coastal area
Population and communities	Construction will not affect population numbers, location or composition But after finalization of alignment the actual impact can be assessed

69. Rapid Environmental Impact Assessment checklist along with mitigation measures is given in **Appendix 2.**

B. Sewage Treatment Plant

1. Construction Method

70. Work components of STP involve

- A series of oxygenation and waste stabilisation ponds, each approximately 50 x 100 m and 2 to 3 m in depth;
- Pump stations and pipes with valves to transfer material between ponds; and
- An outfall to discharge the treated wastewater.

71. Although the site is fairly large the construction will be straightforward, 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 poly-ethylene (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.

72. 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 trench.

73. 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

74. 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.

75. Ponds will be dug on around 80% of the site, and if these are excavated to a depth of 2.5 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.

76. 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

77. As per proposal, there are no expected ecological impacts. There are few 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

78. 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 goats, 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 housing in the vicinity so there should be no impact on income-generating activities.

79. 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 lorry movements, which could disrupt traffic near the site and particularly in Bundi if such vehicles were to enter the town. The transportation of waste will be implemented by the Construction Contractor in liaison 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 Bundi 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

80. Although the STP will be built on an uninhabited and un-used site, with no 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 (EA) and Contractor will be necessary.

81. 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 recognised and measures are taken to ensure they are protected and conserved. This should involve hHaving 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 ensuring its removal or protection in situ.

82. 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.

83. 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 of 2 km from the site, if sufficient people are available.

C. Sewerage Network and Trunk Sewer

1. Construction Method

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

- The secondary and tertiary network will collect sewage from individual houses. Pipes will be of small diameter (200 to 600 mm) and will be located in shallow trenches (average- 1.5 m in depth).

- The trunk sewer will also be of RCC pipes and will convey sewage from the secondary network to the STP. These pipes will be 600 and 1000 mm in diameter

- 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 1000 mm in diameter

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

86. 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.

87. 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 shovelled back into the trench, and the surface layer will be compacted by hand-operated compressor.

88. 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.

89. 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.

90. 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

91. 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.

92. 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.

93. 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

94. There are no significant ecological resources in or outside the town (protected areas or rare or important species or habitats), so construction of the network and trunk sewer should have no ecological impacts. However 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.

4. Economic Development

95. 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.

96. 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 work will occur.

97. 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.

98. 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 Bundi 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.

99. 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.

100. 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

101. 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 artefacts are more likely to occur in areas that have been inhabited for a long period. The preventative measures described in Section IV.B.5 will thus need to be employed and strictly enforced. These are:

- 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 recognise, protect and conserve any chance finds (see Section V.B.5 for details).

102. 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 (such as the fort and City Palace complex). 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.

103. 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.

104. 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 accidents.

105. 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.

106. 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)[2], and amongst other things, should involve:

- Training of all personnel (including manual labourers) to enable them to understand the dangers of AC pipes and to be able to recognise them in situ;
- Reporting procedures to inform management immediately if AC pipes are encountered; and
- Development and application of a detailed H&S 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;
  - Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

107. 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, as suggested in Section B.5, the Contractor should be required to employ at least 50% of his labour 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.

[2] 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

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

A. Screening Out Areas of No Significant Impact

108. 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 (see below). There are therefore several environmental sectors 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. Presently most of the subproject components are in design stage.

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

Field	Rationale
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	The only local fishery is in local pond, which will not be affected
Wildlife, forests, rare species, protected areas	There are none of these features in or just outside the town
Coastal resources	Bundi is not located in a coastal area

109. These environmental factors have thus been screened out presently but will be assessed again before implementation.

B. Operation and Maintenance of the Iimproved Sewerage System

110. 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 3**, 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 (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. (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

SL.no	Parameter	Standards			
		Inland surface water	**Public sewers**	**Land irrigation**	**Marine/coastal areas**
5.	Temperature	shall not exceed 5^0C above the receiving water temperature			shall not exceed 5^0C 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 oxygen demand (3 days at 27^0C), mg/l. max.	30	350	100	100
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	1.0	5.0		5.0

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land irrigation	Marine/coastal areas
	compounds (as C_6H_5OH) mg/l, max				

111. 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.

112. 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.

113. 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

114. 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.

115. 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.

116. 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.

117. 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. 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.

118. 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

119. 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.

3. Economic Development

120. 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 organised if necessary.

121. 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

122. 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.

123. 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.

124. 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.

125. 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 neighbouring area.

126. 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

127. **Table 7.1** lists the potential adverse impacts of the Bundi 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 programme 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

128. 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.

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

Figure 7.1: Institutional Responsibly- RUSDIP

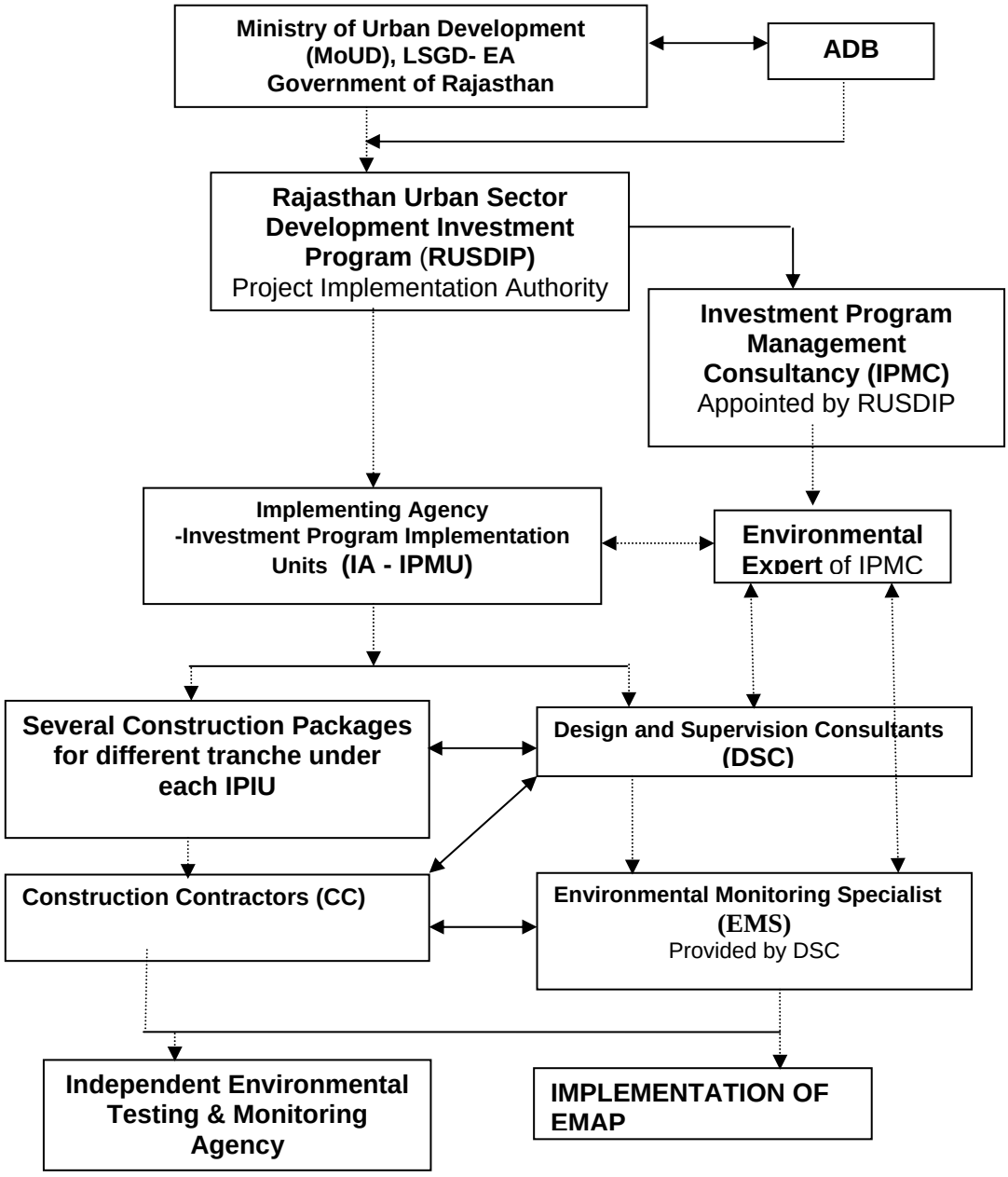


Table 7.1: Environmental impacts and mitigation for the Bundi Sewerage Subproject
(Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				[3]
Location and Design						D	D	3	4	1	2	3	Op	
Discharge of treated effluent to *nallah* could pollute surface & groundwater with nitrate, phosphate, etc Discharge of treated wastewater into drains which could be used for ponding systems	M	P	Conduct bacteriological tests to ensure safety of effluent	GA	STP									0
			Sell treated wastewater to farmers for irrigation Aquaculture to be introduced if water ponding systems are developed.											+
Construction: Sewage Treatment Plant														
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	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 two trees for every one removed											0
Traffic may be disrupted by lorries carrying waste soil	M	T	Plan routes to avoid Bundi Town and narrow local roads	Contractor	From STP site									0
			Schedule transportation to avoid peak traffic periods											0

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
[3] 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

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 STP site	Contractor	All sites										+
						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										+
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 3 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
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
			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
Local people will benefit if employed by project	M	P	STP workers should be residents of neighbouring areas	GA	STP									+
Insufficiently treated water will be discharged to water	M	T	Periodic monitoring of treated effluent	GA	STP									
			Provision of a water quality laboratory	GA	STP									

130. 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.

131. 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

132. **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.

133. 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[4].

134. **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.

135. **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

[4] 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.

136. 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;
- the health of the population and the prevalence of diseases of poor sanitation.

137. An accredited consulting laboratory will be appointed to collect and analyse 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 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

138. 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.

139. 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.

140. 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, 1 ½ years of construction and the first five years of operation) is INR 2.20 million, ie US$ 51,280.

Table 7.2: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
LOCATION AND DESIGN					
Sell treated wastewater to farmers for irrigation Use treated waste water for ponding systems for aquaculture	STP	GA	Site observation; farmer survey	Monthly	
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	All sites	Contractor	Site observations	Weekly	EMS
Use tarpaulins to cover soil when transported on trucks	All sites	Contractor	Site observations	Weekly	EMS
Avoid Bundi 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[5]
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 fragile buildings, religious and tourism sites	Network sites	Contractor	Observations off site: CC record	Weekly	EMS

[5] 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
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	STP	GA	Site observation; farmer survey	Monthly	
Inform shopkeepers and residents of work in advance	Network sites	GA	Resident surveys	Monthly	
Provide walkways and bridges for vehicles	Network sites	OM Contractor	Site observation; resident survey	Monthly	
Request police to divert traffic if necessary	Network sites	OM Contractor	Site observations	Monthly	
Avoid using drills or heavy vehicles near fragile buildings	Network sites	OM Contractor	Site observations	Monthly	
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	Bundi 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[6]	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[7]	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 cost including greenery development	Lump sum	250,000	250,000	250,000
TOTAL				2,205,000

E. Associated Facilities

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

142. If the 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.

143. Inappropriate waste water 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.

[6] Unit costs of domestic consultants include fee, travel, accommodation and subsistence
[7] 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

144. 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 will be provided and near sites where facilities will be built
- Owners and users of any land that is acquired along the 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 artifacts; and
- State and local tourism authorities.

145. 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

146. Some informal discussion was held with the local people during site visit.

- 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 within the village

147. 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 are shown in **Appendix 4.**

148. Major concerns were made on the necessity of adequate access road during the laying of sewer lines and the possible dust and noise problems during construction phase. Also some concerns made on the necessity of proper safety arrangements with first aid facility at construction site are envisaged. Hence necessary provisions shall be provided to avoid the traffic snarl during the construction.

C. Future Consultation and Disclosure

149. 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

150. 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.

151. 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.

152. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Bundi Sewerage and Sanitation Subproject. Potential negative impacts were identified in relation to construction and operation of the improved infrastructure, and the design and location 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.

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

154. 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.

155. 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.

156. 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; and

- Providing temporary structures to maintain access across trenches where required.

157. 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.

158. 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; and

- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognized, protected and conserved.

159. Special measures were also developed to protect workers and the public from exposure to carcinogenic asbestos fibers 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; and

- 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).

160. 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; and

- Ensure that people employed in the longer term to maintain and operate the new STP are residents of nearby communities.

161. 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.

162. 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; and

- Treated effluent from the STP is sold to farmers to fertilize and irrigate fields instead of being discharged into a nearby *nallah*.

163. 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.

164. 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.

165. 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.

166. **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).

167. 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

168. 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; and

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

X. CONCLUSIONS

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

170. The overall conclusion of both processes is that providing 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.

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

Appendix 1: Chainage Wise Land Use Status

Bundi Sewerage Subproject Area

Tab. No. 1. From NAVAL SAGAR to CIRCUIT HOUSE

S.No.	Chainage wise in Mts.	Right side	Left Side	Remarks
1	0-100	Market / shop	House / shop	Surang darwaga road (Naval Sagar)
2	100-200	Hotel/ house	House / shop	Surang darwaga road (Naval Sagar)
3	200-300	House / shop	House / shop	Nahar ka chohata road
4	300-400	Temple/ house/ shop	House / shop	Raghunath temple road
5	400-500	House / shop	House / shop	Raghunath temple road
6	500-600	Temple/ house/ shop	House / shop	Charbhuja mandir road
7	600-700	House / shop	House / shop	Seetla gate
8	700-800	House / shop/temple	House / shop	Seetla gate road
9	800-900	House / shop	House / shop	Sadar bazaar road
10	900-1000	House / shop	House / shop	Sadar bazaar road
11	1000-1100	House / shop	House / shop	Sadar bazaar road
12	1100-1200	Shop / hotel / house	House / shop	Chogan gate road
13	1200-1300	kund	Kund / open space	Nagar Sagar kund road
14	1300-1400	House / shop	House / shop	Kota road bazaar
15	1400-1500	House / shop	House / shop	Kota road bazaar
16	1500-1600	House / shop	House / shop	Kota road bazaar
17	1600-1700	Shop / house / office	House / shop / office	Bus stand road
18	1700-1800	House / shop/ bus stand	House / shop /hospital	Kota road
19	1800-1900	Temple / bus stand	hospital	Kota road
20	1900-2000	Court/ office / shop	House / shop/office	Kota road circuit house
21	2000-2100	ground	House / shop / talkies	Circuit house road
22	2100-2200	Shop / house	RTDC office / house	Kota road
23	2200-2300	Shop / house	Kotawali police / ground	Kota road
24	2300-2400	Shop / house	ground	Kota road
25	2400—2500	Shop / house/open space	ground	Kota road
26	2500-2600	Office / house	ground	Kota road
27	2600-2700	House / open space	Govt. collage	Kota road
28	2700-2800	Hostel / open space / colony	Govt. collage	Kota road
29	2800-2900	Hostel / open space / colony	Govt. collage	Kota road
30	2900-3000	House / shop	House / shop	Devpura kota road
31	3000-3100	House / shop	House / shop	Devpura kota road
32	3100-3200	Sadar thana (open space)	House / shop /school	Devpura kota road
33	3200-3300	House / shop	House / shop	Devpura kota road
34	3300-3400	House / shop	Open space	Devpura kota road
35	3400-3500	House / shop	Open space	Devpura kota road
36	3500-3600	House / agriculture land	Agriculture land	Devpura kota road
37	3600-3700	Open space	Open space	Rotary circle
38	3700-4000	Open space / agriculture land	Open space / agriculture land	Kota road railway bridge
39	4000-4100	agriculture land	Agriculture land	Kota road
40	4100-4300	agriculture land	Agriculture land	Kota road
41	4300-4500	Canal	Agriculture land	Way to STP site near canal

S.No.	Chainage wise in Mts.	Right side	Left Side	Remarks
42	450-4700	Canal / agriculture land	Agriculture land	Way to STP site
43	4700-4800	Canal / agriculture land	Agriculture land	Way to STP site
44	4800-5000	Canal / agriculture land	Forest nursery	Way to STP site
45	5000-5200	Canal / agriculture land	Forest nursery	Way to STP site
46	5200- STP site			

Tab. No. 2. From CIRCUIT HOUSE to NH-12 via AMBEDKAR CIRCLE

S.No.	Chainage wise in Mts.	Right side	Left Side	Remarks
1	0-200	Ground	House	Civil line road
2	200-300	Govt. school	House / shop	Civil line road
3	300-600	House / shop	Dawarika hotel / shop	Khoja gate road
4	600-800	House / shop / office	House / shop / office	Lanka gate road
5	800-900	House / icici bank	Open space / shop / house	Lanka gate road
6	900-1000	Jail road H / W	Open space	Lanka gate road
7	1000-1100	Shop / house	Shop / house	Mandi road
8	1100-1200	Shop / house	Shop / house / Mandi	Mandi road
9	1200-1400	Shop / house / Mandi	Shop / house / Mandi	Mandi road
10	1400-1700	Shop / house / Mandi	Open space	Mandi road
11	1700-1800	House / shop / open space	Open space	Way to NH-12
12	1800-1900	House / park (ESR)	Open space / shop	Way to Jaipur
13	1900-2000	Mandi	Open space	Jaipur road
14	2000-2100	Vikas Nagar	Open space/ shop	Jaipur road
15	2100-2200	Community centre	Open / shop	Jaipur road
16	2200-2300	Shop	Shop	Jaipur road
17	2300-2400	Shop / open space	Guru dawara	Jaipur road
18	2400-2500	Shop	Masjid	Jaipur road
19	2500-2700	Petrol pump	Open space / temple	Jaipur road
20	2700-2800	Central bank	Open space	Jaipur road
21	2800-2900	Motor market	Shop	Maji shaab kund road
22	2900-3000	Rice factory	Shop / house	Maji shaab kund road
23	3000-3100	SBI bank / house/ shop	House / shop	Maji shaab kund road
24	3100-3200	House/office / shop	House / shop	Maji shaab kund road
25	3200-3300	House / shop	House / shop	Maji shaab kund road
26	3300-3400	Majisahab kund	House / shop	Maji shaab kund road
27	3400-3500	Hanuman dhramshala	House / shop	Nagar Pallika road

Appendix 2: Rapid Environmental Assessment (REA) Checklist

Country/Project Title: Bundi Sewerage and Sanitation Subproject

Item	Screening Questions	Yes/No	Remarks
A	Is the project area …		
	• Densely populated	No	The proposed STP site is away from human settlements and only 2-3 houses present within 500 meters from its premises. The proposed collector and mains alignment is similar to that of any small urban area and adequate provisions have been incorporated in to the project design to mitigate those are unavoidable. Also the proposed project will improve the environmental conditions and quality of life in that area.
	• Heavy with development activities	No	Only agricultural activity is being carried out near the proposed project site.
	• Adjacent to or within to any environmentally sensitive area		
	▪ Cultural heritage site	No	There is no cultural heritage site present near the proposed STP site. Some of cultural assets in the form of religious places or historically important sites present in the project area are Taragarh fort, Bundi palace and Raniji-ki-baoli. However, these cultural heritage sites may not come within the project influence area and also utmost care will be provided to the nearby areas during constructional phase with adequate protection measures and by effectively implementing Environmental Management Plan.
	▪ Protected area	No	500 meters away from forest land
	▪ Wetland	No	There are no designated wetlands present in the project area.
	▪ Mangrove	No	There are no mangroves present near to the project area.
	▪ Estuarine	No	There is no estuarine area present near to the project area.
	▪ Buffer zone of protected area	No	The proposed project area doesn't come near any buffer zone of protected area.
	▪ Special area of protecting biodiversity	No	The proposed project doesn't falls within any special area for protecting biodiversity.
	▪ Bay	No	Not applicable
B	**Potential Environmental Impacts** Will the project cause…		
	• Impairment of historical/cultural monuments/areas and loss/damage to these sites?	No	There is no cause of impairment to historical/cultural monuments/areas and loss /damage to these sites and no cultural heritage site present near the proposed STP site. Some of cultural assets in the form of religious places or historically important sites present in the project area are Taragarh fort, Bundi palace and Raniji-ki-baoli. However, these cultural heritage sites may not come within the project influence area and also utmost care will be provided to the nearby areas during constructional phase with adequate protection measures and by effectively implementing Environmental Management Plan

Item	Screening Questions	Yes/No	Remarks
	• Interference with other utilities and blocking of access to buildings; nuisance to neighbouring areas due to noise, smell, and influx of insects, rodents, etc.?	Yes	The sewer pipeline alignment has been designed as a buried conduit and access across the ROW shall not be disturbed after completion of the works. Where pipe laying activities shall affect existing access roads, alternative crossings shall be provided during the construction period. Existing access roads shall be restored to their existing or better condition following completion of the pipeline operations.
	• Dislocation of involuntary resettlement of people	No	The site selection for STP and collector mains is devised in such a way to minimize land acquisition and avoid dislocation or resettlement of affected families. It is expected that the final alignment will not have substantial changes. If any changes are proposed, it has to be addressed and settled amicably.
	• Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	No	An adequate design criterion is adopted for the proper disposal of treated sewage as per CPCB/RPCB norms without causing any impairment to the downstream water quality
	• Overflows and flooding of neighbouring properties with raw sewage?	No	All sewer lines are designed for the year 2041 peak flow and however the flow is mainly depending upon the number of house service connections. Hence chances for overflowing into the neighbour properties are less.
	• Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers	No	The system is designed for the collection and treatment of domestic sewage only. It can be monitored periodically to avoid any illegal disposal of industrial waste into the system. Also In this proposed STP design, stabilization ponds consist of 2 anaerobic ponds and 2 facultative ponds. Two anaerobic ponds are provided considering both working in winter, whereas in summer one will be working and in other pond cleaning of sludge can be carried out. This can be done by dewatering, allowing it to dry and when it is fairly dried; it can be collected and hauled away. The collected sludge cakes can be disposed at the designated site or used as manure. A thin layer of sludge can be left on the bottom of the pond to help begin the biological processes when the pond is put into operation. Generation of sludge on facultative ponds will be very minimal and the period of cleaning will be once in 20 years.
	• Noise and vibration due to blasting and other civil works?	Yes	Generation of noise during construction will not exceed normal emissions for general building construction activities. The contractor shall ensure that there shall be no noise problem to the residents. Nevertheless, the contractor shall carry out noise measurements at frequencies and locations to be agreed with the employer's representative and carryout measures to control it whenever and wherever needed.
	• Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to works?	No	The sewer pipeline alignment has been designed as a buried conduit and hence chances for discharge of hazardous materials into sewers are less. Also regular monitoring programmes will be conducted.
	• Inadequate buffer zone around pumping and treatment plants to alleviate	No	Adequate buffer zones as per guidelines will be provided.

Item	Screening Questions	Yes/No	Remarks
	noise and other possible nuisances and protect facilities?		
	• Social conflicts between construction workers from other areas and community workers?	No	Only temporary settlement will be made. There is no permanent settlement and total project period is 30 months.
	• Road blocking and temporary flooding due to land excavation during the rainy season?	Yes	Access roads and alternative crossings shall be provided during the construction period.
	• Noise and dust from construction activities	Yes	There may be a moderate generation of noise and dust from construction activities, which will be mitigated by providing adequate measures during the constructional phase.
	• Traffic disturbances due to construction material transport and wastes?	Yes	There may be a moderate increase of traffic during the construction activities, which cannot be avoided. Also adequate measures will be taken to avoid traffic disturbances during the constructional phase.
	• Temporary silt runoff due to construction	No	There is no considerable runoff could be caused during the constructional activities.
	• Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	No	Hydro testing will be carried out to all sewer lines and manholes as per CPHEEO manual.
	• Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	No	Sewage will be disposed after proper treatment as per CPHEEO Manual guidelines.
	• Contamination of surface and ground waters due to sludge disposal on land?	No	The collected sludge cakes can be disposed at the designated site as per RPCB norms and also it can be used as manure.
	• 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	No	Ventilation shaft will be provided at the trunk main and adequate safety measures are incorporated in the system design.

Appendix 3

STP WSP 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 4: Public Consultation

SEWERAGE- BUNDI

1. PUBLIC CONSULTATION- ENVIRONMENT

Issues discussed

1. Awareness and extent of the project and development components
2. Benefits of Project for the economic and social Upliftment of Community
3. Labour availability in the Project area or requirement of outside labour involvement
4. Local disturbances due to Project Construction Work
5. Necessity of tree felling etc. at project sites
6. Water logging and drainage problem if any
7. Drinking water problem
8. Forest and sensitive area nearby the project site
9. Movement of wild animal within the village

Date & time of Consultation : 10. 05.08, 11.30 AM– 12.10 PM
Location : Shop, Near STP Site, NH – 12.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No. Bheru Ji temple located in that area.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	May some problem can be created.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Need to pave the road.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

1. Mr. Ramnath Ji, S/o Ganga nath Ji
2. Mr. Tejmal , S/o Ramnath Ji, Dalana

SEWERAGE- BUNDI

2. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 08.45 AM
Location : Village Near STP Site, Near NH – 12

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Adequate safety measures should be taken care and also first aid centre/ dispensary required near the site.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Need to pave the road
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

1. Mr. Ramlal
2. and other village persons near STP

SEWERAGE- BUNDI

3. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 10. 05.08, 03.15 PM

Location : Village, Near STP Site & NH – 12.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No temple presents in this area
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Adequate quantity is available but quality is not good.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Upgradation of road is required.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Need to pave the road.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Latore Ji

Devpura

SEWERAGE- BUNDI

4. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 08.30 AM
Location : Near STP Site village, Near NH – 12.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Adequate safety measures should be taken care and also first aid centre/ dispensary required near the site.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Need to pave the road.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED
Mr. Mangilal,
S/o Laxmi Prasad Ji,
Near STP site village.

SEWERAGE- BUNDI

5. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 09.15 AM

Location : Near STP Site village, Near NH – 12.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Adequate safety measures should be taken care and also first aid centre/ dispensary required near the site.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Need to pave the road.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Mukesh Ji

S/o Mr. Kishan Kumar Ji,

Near STP site village.

SEWERAGE- BUNDI

6. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 10. 05.08, 12.10 PM

Location : Opposite to STP Site

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No temple near by.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available
11	Access road to project site	Earthen Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Adequate safety measures should be taken care.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Link road should be paved and water should be provided for irrigation.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Avatar Singh Ji

S/o Mr. Gurudutt Singh Ji,

Opposite to STP site.

SEWERAGE- BUNDI

7. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 12.15 PM

Location : Kaja gate, Civil Line – Gayatri Nagar

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No temple near by.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Link road should be paved and water should be provided for irrigation.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Nveen Kumar

Local Resident

Gayatri Nagar

SEWERAGE- BUNDI

8. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 02.30 PM
Location : Gurunanak Colony Road.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No temple near by
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available
11	Access road to project site	CC Road
12	Perception of villagers on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the village/ project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Sewerage problem should be solved.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED
Mr. Rameshwar
Local Resident
Gurunanak Colony Road

SEWERAGE- BUNDI

9. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 02.15 PM

Location : Gurunanak Colony Road.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Nilgai
4	Presence of historical/ cultural/ religious sites nearby	No temple near by.
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Potable water problem
9	Present solid waste collection and disposal problem	Yes. Several problems created due to lack of proper MSW management.
10	Availability of labor during construction time	Local labour available
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Dust and noise problem
14	Setting up worker camp site within the village/ project locality	Difficult due to space constraint.
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Sewerage system should be implemented.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	NA

NAME AND POSITION OF PERSONS CONSULTED

Mr. Tejmal Rawat
Local Resident
Gurunanak Colony

SEWERAGE- BUNDI

10. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 03.30 PM
Location : Lanka Gate Road, Taxi Stand.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No temple near by.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	NA
9	Present solid waste collection and disposal problem	Yes. Some problems faced due to lack of proper MSW management
10	Availability of labor during construction time	Local labor available
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate steps should be taken to control dust and noise problems.
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Sewerage system should be implemented.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED
Mr. Mangilal, Rameshwar
Local Resident

SEWERAGE- BUNDI

11. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 12.10 PM

Location : Balaji Road, near Nainwa Road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No temple near by.
5	Un favorable climatic condition	No
6	Occurrence of flood	No
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	NA
9	Present solid waste collection and disposal problem	No but some problems faced due to lack of proper MSW management
10	Availability of labor during construction time	Local labour available
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate steps should be taken to control dust and noise problems.
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Sewerage system should be implemented.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Essamudin
K Tailors

SEWERAGE- BUNDI

12. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 11.30 AM

Location : Indira Bazaar, Guru Nanak Colony Road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labour.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	Ganesh temple near by this area.
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	NA
9	Present solid waste collection and disposal problem	Yes. Some problems faced due to lack of proper MSW management
10	Availability of labor during construction time	Local labour available
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate steps should be taken to control dust and noise problems.
14	Setting up worker camp site within the project locality	Space available for camp
15	Safety of residents during construction phase and plying of vehicle for construction activities	Repair road after construction work.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Available full water
17	Requirement of enhancement of other facilities	Sewerage system should be implemented.
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Om Prakash

Local Resident