

Government of Rajasthan
Asian Development Bank

Technical Assistance

Project Number: 40031

India: Rajasthan Urban Sector Development Investment Program (RUSDIP)

INITIAL ENVIRONMENTAL EXAMINATION (DRAFT)

ALWAR: SEWERAGE AND SANITATION SUBPROJECT

September 2008

CONTENTS

I. INTRODUCTION	1
A. Purpose of the report	1
B. Extent of IEE study	1
II. DESCRIPTION OF THE PROJECT	3
A. Type, Category and Need	3
B. Location, Size and Implementation Schedule	3
C. Description of the Sub-project	4
III. DESCRIPTION OF THE ENVIRONMENT	10
A. Physical Resources	10
B. Ecological Resources	13
C. Economic Development	13
D. Social and Cultural Resources	15
IV. ENVIRONMENTAL IMPACTS AND MITIGATION: INFRASTRUCTURE CONSTRUCTION	17
A. Screening out areas of no significant impact	17
B. Sewage Treatment Plant	18
C. Sewerage Network and Trunk Sewer	20
V. ENVIRONMENTAL IMPACTS AND MITIGATION: OPERATION AND MAINTENANCE	26
A. Screening out areas of no significant impact	26
B. Operation and maintenance of the improved sewerage system	26
C. Environmental impacts and benefits of the operating system	27
VI. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN	29
VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN	30

A. Summary of environmental impacts and mitigation measures	30
B. Institutional arrangements for project implementation	30
C. Environmental Monitoring Plan	35
D. Environmental management and monitoring costs	36
VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE	41
A. Project stakeholders	41
B. Consultation and disclosure to date	42
C. Future consultation and disclosure	42
IX. FINDINGS AND RECOMMENDATIONS	43
A. Findings	43
B. Recommendations	46
X. CONCLUSIONS	46
APPENDIX -1 Rapid Environmental Assessment (REA) Checklist	47
Appendix -2: Proceedings of City Level Consultation Meeting	51

TABLES

Table 1: Improvements in sewerage infrastructure proposed in Alwar.....	8
Table 2: Ambient air quality in Alwar (Annual Average 2005).....	10
Table 3: Groundwater quality in Alwar, 2004-2005.....	12
Table 4: Fields in which construction is not expected to have significant impacts.....	17
Table 5: Fields in which operation and maintenance of the completed sewerage system is not expected to have significant impacts.....	25
Table 6: Environmental impacts and mitigation for the Alwar Sewerage Subproject.....	30
Table 7: Environmental Monitoring Plan.....	35
Table 8: Environmental management and monitoring costs.....	38

FIGURES

Figure 1: Map showing the location of the project.....	5
Figure 2: Existing sewerage system and proposed new sewer layout and trunk main routing.....	6
Figure 3: Location of Sewage Treatment Plant	7
Figure 4: Sewage Treatment Plant layout.....	7
Figure 5: Average annual rainfall in Alwar 1990-2004.....	10
Figure 6: Current land use in Alwar Town.....	13

PHOTOGRAPHS

Photo 1: RCC Sewers.....	44
Photo 2: Bharatpur Road	44
Photo 3: Proposed STP site near Agyara dam.....	44
Photo 4: Proposed STP site surroundings.....	44
Photo 5: Typical STP pond.....	44
Photo 6: Siliserh Dam and lake	44
Photo 7: Polluted lake south of Alwar.....	45
Photo 8: Jaisamandh Dam.....	45
Photo 9: Shops in Alwar town.....	45
Photo 10: Piped water supply in Alwar	45
Photo 11: Roadside drains in Alwar.....	45
Photo 12: Roads in the outskirts of Alwar.....	45
Photo 13: Road near the centre of Alwar.....	46
Photo 14: Alwar Fort.....	46
Photo 15: Alwar City Palace.....	46
Photo 16: Agyara Dam surroundings.....	46
Photo 17: Grazing in and around STP site.....	46
Photo 18: Agricultural land outside Alwar	46
Photo 19: Encroachments into ROW in Alwar.....	47
Photo 20: Backhoe digger constructing a trench.....	47

Photo 21: Digging a trench by hand.....	47
Photo 22: Crane for pipeline laying.....	47
Photo 23: Hand-held Pneumatic drill for cutting concrete roads	47

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 will be implemented over a five year period beginning in late 2007, and will be funded by a loan via the Multitranche 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. Alwar, Jaisalmer and Jhalawar/Jalarpatan are the towns chosen to benefit from the first tranche of RUSDIP investment.

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, 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 for the first tranche of funding were assessed by 13 Initial Environmental Examination (IEE) Reports and 3 Environmental Reviews, prepared according to ADB Environment Policy (2002) and Environmental Assessment Guidelines (2003). This document is the IEE report for the Alwar Sewerage and Sanitation Subproject.

B. Extent of 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 that 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 classed this program as Category B and following normal procedure for MFF loans has determined that one IEE 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 categorised as A or B depending on the scale of the project and the nature of its impacts.

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

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

11. The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification is solid waste management, where EC is required for all Common Municipal Solid Waste Management Facilities (facilities that are shared by more than one town)¹. EC is thus not required for the sewerage and sanitation sub-project that is the subject of this IEE.

3. Review and Approval Procedure

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

4. Scope of Study

13. This is the IEE for the Alwar Sewerage and Sanitation Subproject. It discusses the environmental impacts and mitigation measures relating to the location, design, construction and operation of all physical works proposed under this subproject. It is one of 18 documents describing the environmental impacts and mitigation of all subprojects proposed in Tranche 1. These were prepared in January and February 2007 by one International and one Domestic Environmental Specialist via inputs of two and three months respectively.

II. DESCRIPTION OF THE PROJECT

A. Type, Category and Need

14. This is a sewerage and sanitation sub-project, and as explained above it 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 sub-project is needed because the present sewerage system is inadequate for the needs of the growing population. Less than 10% of the population (in two newly-built colonies) is connected to sewer, and there is no wastewater treatment so raw sewage is discharged to *nallahs* (natural or man-made drainage channels). In the rest of the town sewage is discharged to septic tanks or surface water drains via illegal connections. This is one of a series of subprojects designed by the RUSDIP that are intended to raise the standards of the municipal infrastructure and services of Alwar and the other urban centres to those expected of modern Asian towns.

B. Location, Size and Implementation Schedule

15. The sub-project is located in Alwar, the headquarters town of Alwar district, in the north-east of Rajasthan in north-western India (Figure 1). The infrastructure will extend throughout

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 (February 2007)

many parts of the town, where pipes for new secondary and tertiary sewer networks will be buried within or alongside roadways. A new trunk sewer will extend for 15 km east of the town, where it will be buried alongside the Bharatpur Road. This will lead to a new Sewage Treatment Plant (STP), to be built on 32.65 ha of government land opposite Agyara Dam (Figure 2).

16. Detailed design began in the year 2007 and completed middle of 2008. Construction of all elements will begin in end of 2008, and the treatment works will be built in around 8 months. Construction of the trunk sewer and networks will take up to 1½ years, so all work should be completed by the middle of 2010.

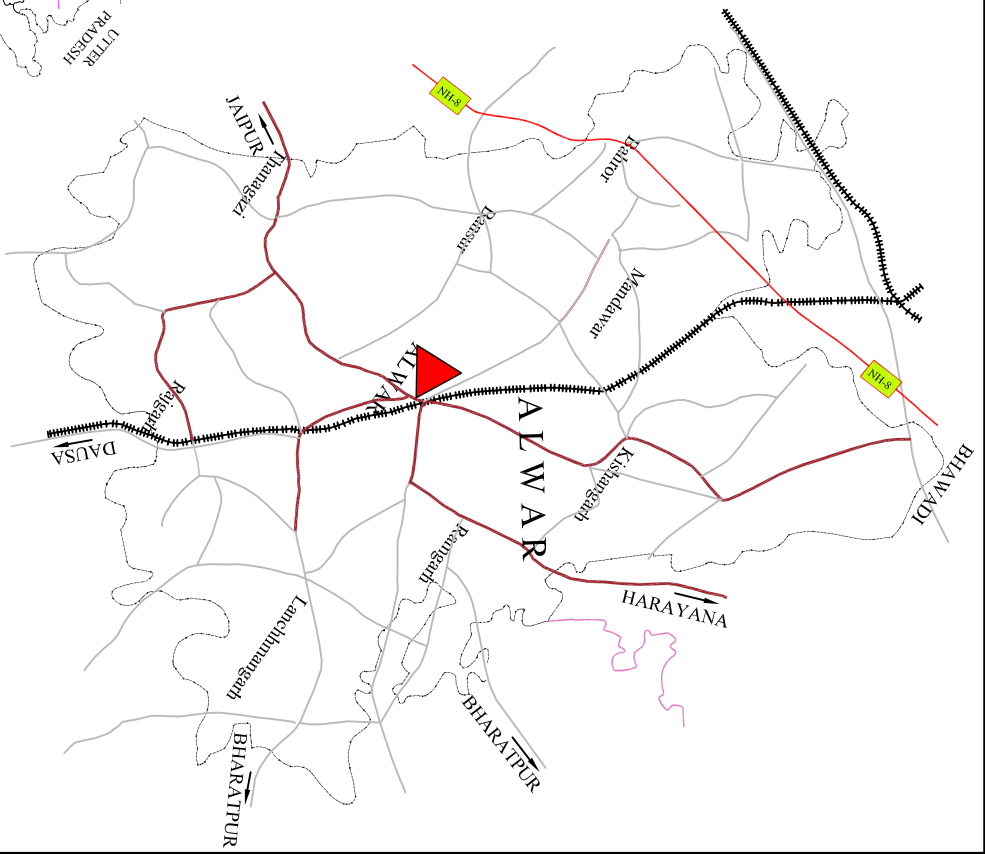
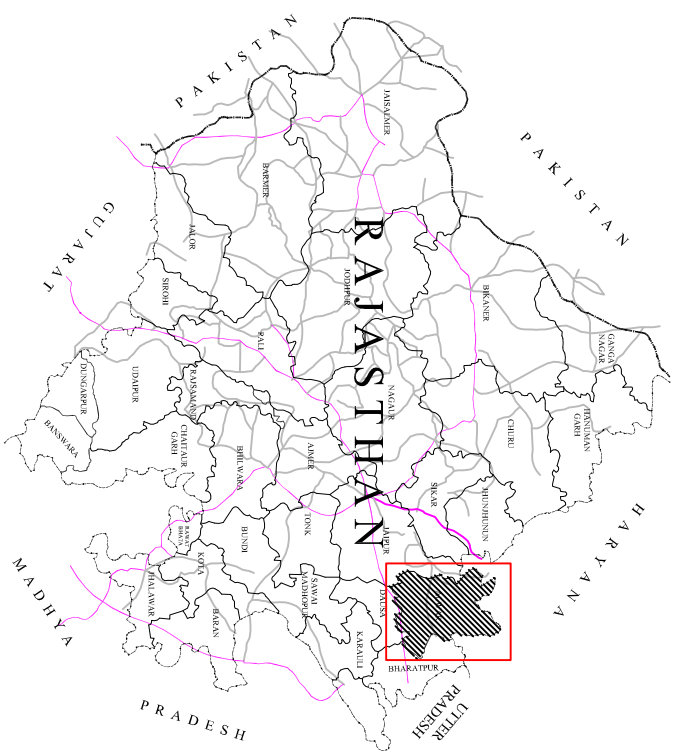
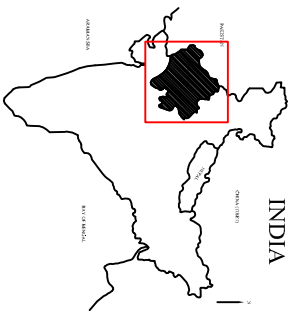
C. Description of the Sub-project

17. Table 1 shows the nature and size of the various components of the subproject. As indicated above there are three main elements: provision of a network to collect sewage from three new colonies and the two colonies already provided with sewerage; a trunk sewer to transport waste to the STP; and a new STP to treat sewage to Indian legal standards. The descriptions shown in Table 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, particularly in the detailed design stage. It should also be noted that at this stage the infrastructure has been designed to determine overall feasibility and budget costs.

18. The network pipes will be of Reinforced Cement Concrete (RCC), and will be located alongside roads and streets, in the government-owned Right of Way (RoW). The 12 km tertiary network will collect sewage from individual houses in three colonies that have a sufficient water supply, in Shantikunj and areas known as Scheme 2 and Scheme 3 (Figure 2). These pipes will be of small diameter (200 and 350 mm) and will be located in shallow trenches (ca 1.5 m in depth). The 9 km secondary network (lateral sewers) will transport sewage from these areas and the two colonies that already have a sewerage system (Shiva-ji Park and Ambedekar Colony), and pipes will be larger (500 mm in diameter) and located in deeper trenches (ca 2 m).

19. The 18 km trunk sewer will also be of RCC pipes (Photo 1), and will convey sewage from the secondary network to the STP at Agyara Dam. These pipes will be 800 -1200 mm in diameter and will be located alongside the Bharatpur Road (Figure 2, Photo 2), in a 2.3 m trench.

21. The STP will be built on 32.65 ha of unused Government land immediately east of Agyara Dam (Figure 3, Photo 3 and Photo 4), and will consist of two rows of equally sized ponds (approximately 50 x 100 m and 2-3 m in depth) dug into the soil, each with slightly sloping sides and a flat bed (conceptual layout is shown in Figure 4 and Photo 5). RCC pipe-work and one or two pumping stations will also be built on the site, which will be surrounded by a security fence when completed. As per EARF the site selected for Sewage treatment Plant is more than 500 m away from any inhabitant area



Rajasthan Urban Sector
Development Investment Program
ADB TA 4814-IND

Alwar Regional Setting Map

LEGEND:-

- International Boundary
- State Boundary
- District Boundary
- National Highway
- Other road
- Railway
- District Headquarter
Program Town

OVERLAY LEGEND:-

GOVT. OF RAJASTHAN
ASIAN DEVELOPMENT BANK

DRAWN:-	CHECKED:-
DATE:-	APPROVED:-
SCALE:-	

Figure :-



**RAJASTHAN URBAN SECTOR
DEVELOPMENT INVESTMENT PROGRAM
(ADB TA 4814 - IND)**

ALWAR Sewerage System

LEGEND:

- Municipal Boundary
- Physical Barrier
- State Highway
- Major Roads
- Railway Track

OVERLAY LEGEND:

- Trunk Main Routing
- Sewage Treatment Plant
- Existing Sewerage Network
- Proposed Sewerage Network

GOVT. OF RAJASTHAN
ASIAN DEVELOPMENT BANK

DRAWN:	CHECKED:
DATE:	APPROVED:
SCALE:	



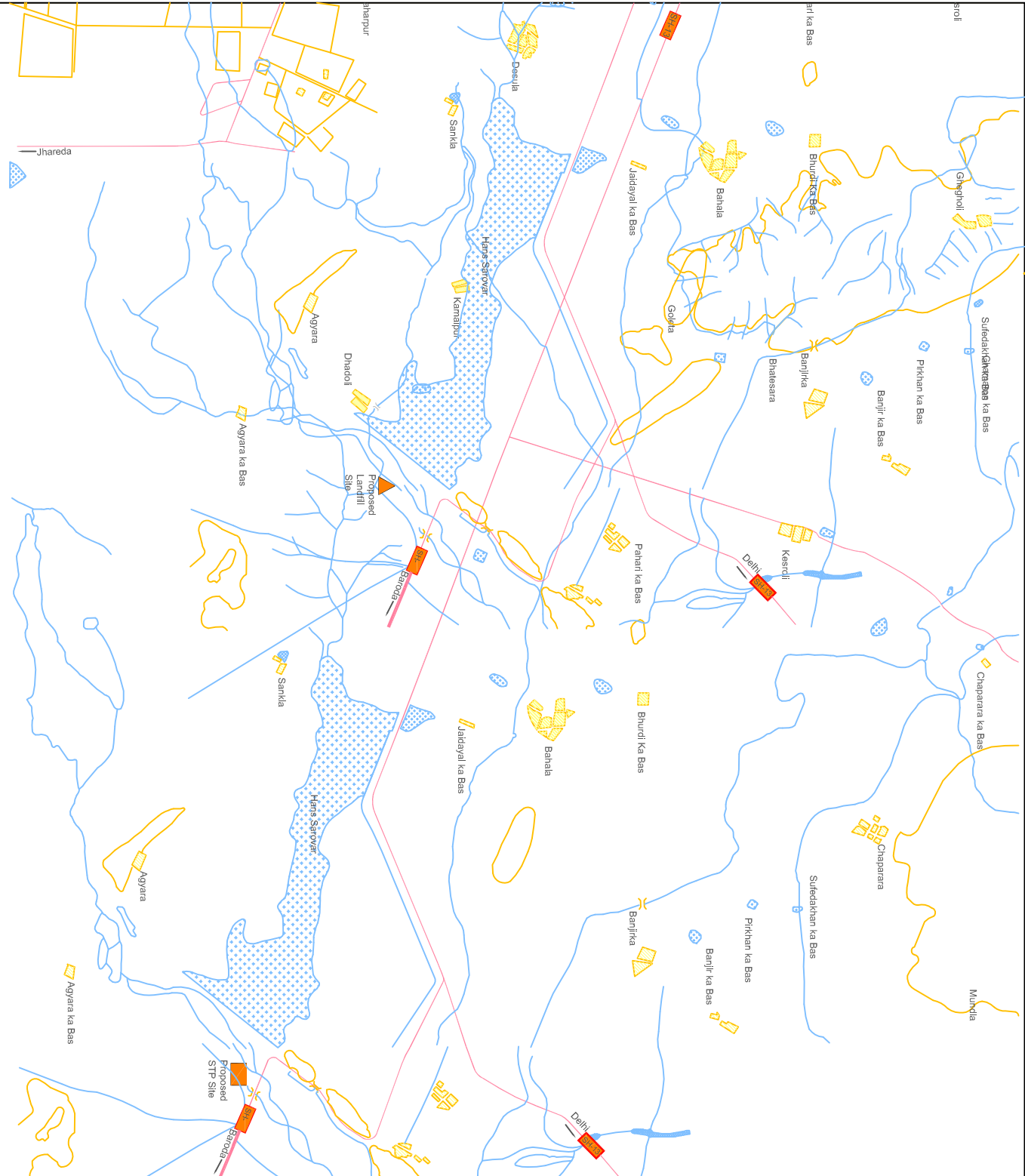
Alwar
Site Location Plan

LEGEND:-

- Forest
- Habitation
- Water Bodies
- State Highway
- National Highway
- Other Roads

OVERLAY LEGEND:-

- Proposed STP Site



GOVT. OF RAJASTHAN
ASIAN DEVELOPMENT BANK

DRAWN :- CHECKED :-

DATE :- APPROVED :-

SCALE :-

Figure :-



Alwar
Sewage Treatment Plant Layout

LEGEND:-

-  Anaerobic Pond
-  Facultative Pond
-  Proposed Area for future expansion

OVERLAY LEGEND:-

GOVT. OF RAJASTHAN
ASIAN DEVELOPMENT BANK

DRAWN :- CHECKED :-

DATE :- APPROVED :-

SCALE :-

Figure :-

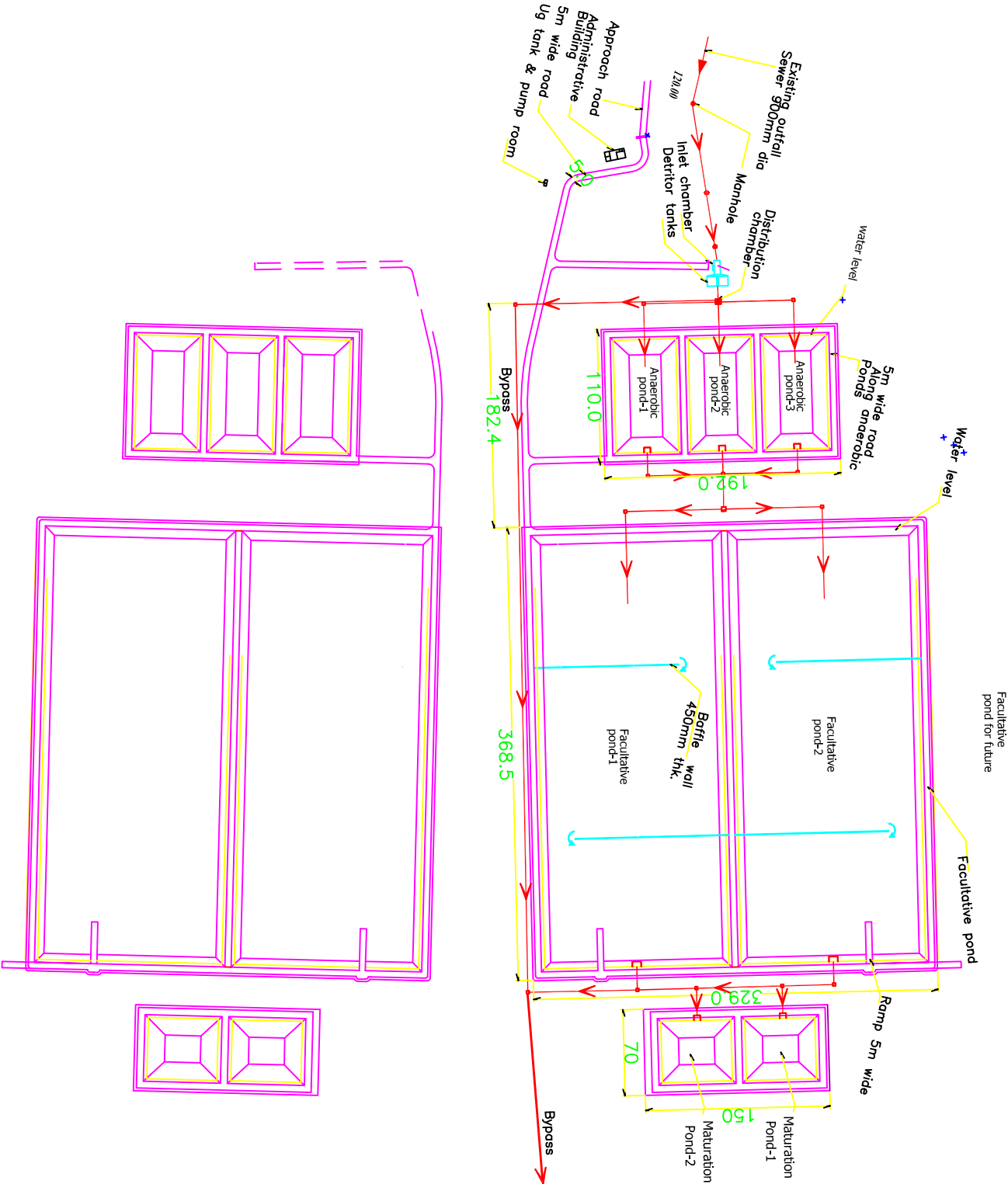


Table 1: Improvements in sewerage infrastructure proposed in Alwar (After revision of location)

Infrastructure	Function	Description	Change Location
Sewage Treatment Plant (STP)	Aerobic treatment of sewage according to Indian wastewater discharge standards	A series of oxidation ponds and waste stabilisation ponds, 2-3 m in depth, built in stages, to reach a total capacity of 50 MLD	On 32.65 ha of unused government-owned land, located on the eastern side of Agyara Dam. Initial planning indicates that site/shape/ dimensions are inadequate to fit various components of the proposed facultative ponds based STP. Later additional government land adjacent to earlier land is acquired to fulfil the requirement
Trunk Sewer and secondary sewers	Transport sewage from the town to the STP	18.05 km of Reinforced Cement Concrete (RCC) pipe 800 mm, 1000 mm, 1100 and 1200 mm diameter. Out of the total trunk length 1.5 km is proposed to lay by trenchless method	Buried in a trench in the Right of Way (ROW) alongside the existing Bharatpur Road. Planning has been done for trunk sewer through reservoir/ dam bund. But considering safeguard issue <i>planning has been rejected</i>
Tertiary Sewer Network	Collect sewage from three colonies that do not have a sewerage system at present	Approx. 12 km of RCC pipe (9 km of 200 mm diameter; 3 km of 350 mm diameter)	Buried in shallow trenches alongside lanes and roads in three colonies that have a good water supply
Remodelling of effluent disposal drain	Discharge of treated effluent from STP Due to poor water carrying capacity of drain, flooding is common during rain , and therefore remodelling of drain will be beneficial for farmers. There will also be benefits due to available of treated water for irrigation	Initially it is planned to discharge treated effluent in a small natural drain flowing near the site. The water will be utilized for irrigation when required or will flow down to Ruparel river, about 5 km from the STP site. The drain carries runoff and as well as Agyara Dam discharges / overflows. Owing erratic rainfall and no flow from the drain , the drain is mostly dry except during short period of monsoon . The drain is not very well defined , and the surrounding farmers levelled the drain banks/ beds and utilize for cultivation.	Near STP site- drain will be constructed – additional component which planned later to take care runoff water from dam, flood water and to take effluent water from STP Drains located within the ROW, no land acquisition required Proposed drain- 1.9 km (1.3 km within STP site and 0.6 km within SW landfill site), depth of the drain 1.6 m and width 3 m. As per design the volume of the proposed drain is sufficient to carry flood water

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

22. Alwar is located in the north-eastern part of Rajasthan, between the longitudes of 76° 35' to 76° 40' East, and latitudes of 27° 30' 20" to 27° 36' 30" North (Figure 1). The town is in the foothills of the Aravali Mountain range, at an altitude of 268 m above sea level, and is 160 km south of the national capital Delhi and 150 km north-east of the state capital Jaipur. Alwar is one of the fastest growing towns in Rajasthan, and is an important trading centre, with good road and rail links. The municipal area covers 49.3 km², and the population is 260,000.

2. Topography, soil and geology

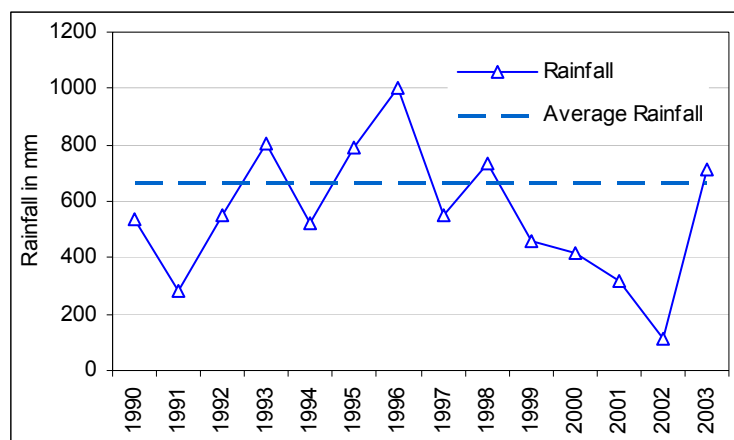
23. Alwar township is relatively flat, located in the alluvial plain beneath the Aravali Mountains in the west. The soil is mainly alluvial and non-calcareous, semi-consolidated to consolidated, brown in colour, and loamy sand to sandy loam in texture. Exposed rocks belong to the Delhi Super-group of lower proterozoic age, consisting of schist, quartzites, slates and gneisses. Sub-surface layers of unconsolidated quaternary formations form the principal aquifer system.

24. According to the Vulnerability Atlas of India, part of Alwar District, including Alwar Town, is in an area of high earthquake risk (Zone IV). Although Rajasthan has not experienced a major earthquake in the recent past, there have been 37 events with a magnitude of 5-7 since 1720, with the most recent occurring in 2001. This measured 6.9 on the Richter Scale, but because the epicentre was in neighbouring Gujarat, no major damage was reported in Alwar.

3. Climate

25. The climate is semi-arid and mostly dry, with a hot summer period in April to July, followed by a short monsoon in July to September, and a cool dry winter period between October and March. Average daily temperatures peak at around 41 °C in June (when the minimum is 28 °C at night), and in January the temperature falls to an average of 23 °C during the day and 8 °C at night. The long term average annual rainfall is 638 mm, of which around 85% falls during the monsoon. However rainfall is highly variable, and has been generally low in most recent years (Figure 5).

26. Relative humidity is around 70% during the monsoon, but is much lower throughout the rest of the year, falling to 20-25% in the summer. Winds are generally light and variable during the cool winter period, and mainly from the north and north-west, and the strongest winds are the south-westerlies that bring the monsoon in June and July.



Source: Agriculture Dept 2007

Figure 5: Average Annual Rainfall in Alwar 1990-2004

4. Air Quality

27. The Rajasthan State Pollution Control Board (RPCB) monitors air quality at three stations in Alwar town, two in industrial areas and one in a residential quarter. Data shows that particulate matter is high because of the dry atmosphere, dusty roads and surrounding land, and Respirable Suspended Particulate Matter (RSPM: particles < 10 μ m) and Suspended Particulate Matter (SPM) frequently exceed National Ambient Air Quality Standards (NAAQS, Table 2). In contrast, levels of chemical pollutants (oxides of sulphur and nitrogen) are below national standards, presumably because of the limited development of heavy industry.

Table 2: Ambient Air Quality in Alwar (Annual Average 2005; units in μ g/m³)

Monitoring Station	Land use	RSPM		SPM		SO _x		NO _x	
		Ave	Max	Ave	Max	Ave	Max	Ave	Max
RPCB Office	Residential	161	668	285	1153	7.4	16.9	10.0	18.8
NAAQ Standard	Residential	60		140		60		60	
RIICO Pump House	Industrial	91	408	160	515	7.1	16.7	9.2	17.1
Gaurav Solvex	Industrial	99	320	173	509	7.9	18.3	9.8	20.3
NAAQ Standard	Industrial	120		360		80		80	

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter
Source: Rajasthan State Pollution Control Board (RPCB) 2005

5. Surface Water

28. The State of Rajasthan is predominantly dry, except for some parts of the south and south-east, and Chambal is the only perennial river. There are certain seasonal rivers in Alwar District, including the Ruparel, Sabi, Chuhar, Sidh and Landoha, which carry monsoon drainage from upland areas. Several of these have been impounded, to provide water for irrigation. Ruparel is the nearest seasonal river to Alwar, and passes through the Sariska Tiger Reserve

and the village of Bara 19 km south of Alwar. This feeds Jaysamandh Lake through an 8 km long manmade feeder canal from Bara Weir.

29. There are no natural lakes in Alwar District, although there are a number of artificial lakes formed from water retained by manmade bunds, of which Jaysamandh and Siliserh are the largest. Jaysamandh Dam is 6 km south of the town between the villages of Ballana and Liwari, and is an earth and concrete structure built in 1910. The lake has a maximum capacity of 34 ML, but rarely fills to that level. Siliserh Lake is 13 km south-west of the town and is retained behind an earth embankment and masonry wall built in 1845 across a tributary of the Ruparel (Photo 6). The capacity of the lake is 14 ML, and water for irrigation feeds into two masonry canals running from the dam.

30. Hans Sarovar is another small lake 5 km south-east of the town, near Agyara village. It is formed behind an earth embankment built in 1910, and the water is used for pumped irrigation in nearby farms, although as the lake rarely fills to capacity, such usage is limited. The lake receives untreated and partially treated effluent from the nearby Matsya Industrial Area (MIA), where there are several chemical plants and other industries. In December 2006 the water was very low in volume and bright pink in colour (Photo 7), presumably from the discharge of dye and/or other chemicals.

6. Groundwater

31. The main aquifer around Alwar is contained within unconsolidated quaternary formations of silt, sand kankar and boulder, and is reported to have a potential yield of 20-30 m³/h. According to the GoI Central Ground Water Board (CGWB 2006²), groundwater occurs under unconfined conditions at shallow depth (18-28 m below ground level) and in a semi-confined condition at deeper levels (around 65 m), and is tapped by a number of tube-wells, which discharge at a rate of between 25 and 68 m³/h.

32. Seasonally the aquifer declines between November and May and recharge begins with the monsoon rains in mid-June. However there has been an alarming decline over the past 20 years from over-extraction and low rainfall, and CGWB reports that the water table in Alwar town has fallen from 9 m in 1984 to 27 m in 2004, at an average rate of 0.91 m per year. Agriculture accounts for more than 80% of the use, and major reductions occur during *Rabi* crop irrigation in October-April.

33. Groundwater quality has also declined as a result of urbanization, disposal of untreated domestic and industrial wastewater and excessive usage of fertilizers. Recent analyses by the Public Health Engineering Dept (PHED) shows high levels of nitrate and iron in water from existing tube-wells (Table 3).

² CGWB Western Region, Micro Level Studies, Ground Water Scenario, Alwar Urban Area, July 2006.

Table 3: Groundwater quality in Alwar, 2004-2005

Parameter	Monitoring Location								BIS Drinking Water Standard	
	Sivaji Park		Police Lane		Kala Kuva		Samola		Desirable	Acceptable
	May 04	Jan 05	May 04	Jan 05	May 04	Jan 05	May 04	Jan 05		
pH	7.75	8.16	7.62	8.29	8.12	7.84	7.1	8.68	6.5-9.0	NR
EC	1195	1140	580	650	700	1150	1900	1980	NLP	NLP
Co ₃	Nil	Nil	Nil	Tr	Nil	Nil	Nil	120	NLP	NLP
HCO ₃	183	256	207	220	146	451	659	793	NLP	NLP
Cl	213	234	43	92	107	121	149	57	250	1000
SO ₄	125	11	28	20	45	30	110	142	200	400
NO ₃	61	65	32	39	46	67	130	11	45	100
Total Hardness	300	360	160	210	150	250	160	140	300	600
Ca	32	44	36	40	24	92	12	36	75	200
Mg	54	61	17	27	22	4.9	32	12	30	100
Na	155	112	58	68	90	168	378	437	NLP	NLP
K	4.2	3.3	2.6	4.1	11	9.8	1.2	1	NLP	NLP
F	0	0.33	0	0.55	0	0.79	0	1.5	1.0	1.5
Zn	-	0.620	-	4.180	-	0.653	-	1.000	5.000	15.000
Cu	-	0.032	-	0.172	-	0.014	-	0.014	0.050	1.500
Ni	-	0.001	-	BDL	-	0.005	-	BDL	NLP	NLP
Mn	-	0.020	-	0.015	-	0.044	-	0.021	0.100	0.300
Fe	-	1.915	-	0.029	-	7.390	-	0.532	0.300	1.000
Pb	-	BDL	-	BDL	-	0.025	-	0.013	0.050	NR

Source: CGWB (2006). All units are mg/l except EC in μ mhos/cm. BIS = Bureau of Indian Standards
NLP-No Limit Prescribed; NR-No Relaxation; BDL-Below Detectable Level; Tr-Trace

B. Ecological Resources

34. Alwar Town is an urban area surrounded by land that was converted for agricultural use many years ago. There is no remaining natural habitat in the town, and 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 are three Reserved Forests (RF) to the west of the city (Bhurasid RF, Alwar RF and Dholdhup RF), where hillslopes feature scrub vegetation and mixed dry deciduous forest. Although there are no rare species or important timber trees, the vegetation is reported to be important for soil conservation.

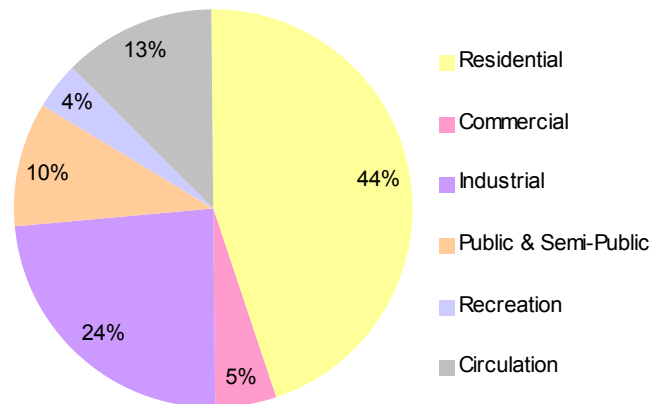
35. The closest protected area to Alwar is the Sariska Tiger Reserve, 40 km to the southwest, which was designated as a sanctuary in 1955 and a tiger reserve in 1979. The reserve covers 900 km² of forested hills and plateaux, although habitat has been degraded by agriculture and the fauna depleted by poaching, and there are reportedly now no tigers remaining.

C. Economic Development

1. Land use

36. Located close to the national capital, Alwar was traditionally a services and administrative town, with little industrial development. However as Delhi has grown, so Alwar has benefited from its trade, infrastructure and prosperity, and has experienced rapid economic growth over the past 20 years. Alwar was recently selected as a regional town under the National Capital Plan for integrated development of the area around Delhi. The urban area of

Alwar covers 49 km², and although almost half of this is in residential use there is also a significant amount of industry, occupying 24% of the total land (Figure 6).



Source: Alwar Urban Improvement Trust

Figure 6: Current land use in Alwar Town

2. Industry and Agriculture

37. There are two industrial areas: the Old Industrial Area covers 88 ha and houses 42 units, mostly small-scale engineering such as stone polishing because of the ready availability of decorative stone from quarries in the surrounding hillsides. The Matsya Industrial Area (MIA) was established more recently by the Rajasthan Industrial Infrastructure Corporation (RIICO) and covers over 1,000 ha in the west of the town. Currently there are 213 operating industries in MIA, mostly mineral-based (88 units) and chemical (61). Of these, 28 operations are of large or medium scale and the remainder are small-scale.

38. There are also many households engaged in handicrafts in the town, such as the manufacture of cotton and wool products, and there are large numbers of small shops and businesses alongside the roads, particularly in the centre of the town (Photo 9).

39. Agriculture is easily the most important industry, both in Alwar District (where 65% of the total area is cultivated) and outside the headquarters town. Over 80% of the cultivated area is irrigated, mostly by groundwater. Many areas practice double cropping and the main seasons are *Kharif* (April-September: maize, cotton, etc) and *Rabi* (October-March: wheat, barley, mustard, etc).

3. Infrastructure

40. PHED provides a piped municipal water supply to the whole city (Photo 10), which is entirely groundwater-based because of the lack of a dependable surface water source. The present usage is 26.8 MLD, extracted by 170 tube-wells located in and around the town. However water is only available for 1-2 hours per day, mainly because of system losses (estimated at 40%) and low and unequal network pressure.

41. Only two newly developed colonies (Shivaji Park and Ambedkar Colony, housing 10,000 people each) have an underground piped sewerage system, and as there is no treatment facility, raw sewage is discharged into natural drainage channels. Most households depend on pit

latrines and septic tanks, and some have made illegal connections through which sewage enters open storm water drains, polluting both surface and ground water.

42. There are 51 km of concrete storm water drains in the main city area (Photo 11), but these cover only 13% of the total road network and the contents (which frequently include raw sewage) are discharged untreated into a *nallah* (natural or man-made drainage channel).

43. There is no proper solid waste management system in the town, and although the Municipal Council (AMC) has provided dustbins in a few areas, in the rest of the town garbage is dumped in the streets and drains, and on vacant plots of land. Alwar generates an estimated 90 tons of solid waste per day and AMC collects around 57 tons from its manual street sweeping operation (conducted in the main city only), and removes other waste from open dumpsites irregularly. This is transported on open vehicles to the outskirts of the town, where it is dumped on open ground as there is no landfill.

44. Thermal power is the main source of energy in Rajasthan, contributing 89% of the electricity, compared to hydropower, which produces the remainder. State-level companies (Rajya Vidyut Utpadan Nigam Ltd, RVUN; and Rajya Vidyut Prasaran Nigam Ltd, RVPN) are responsible for power generation and transmission respectively, and distribution is provided by a regional company, the Jaipur Vidyut Vitran Nigam Ltd (JVVNL). Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply is erratic and there are frequent outages in warmer months, and large fluctuations in voltage.

4. Transportation

45. Alwar is provided with a relatively good transportation system, particularly in the outer parts of the town, where streets are wide and not heavily utilised by traffic (Photo 12). The situation is different in the centre of the town however where roads are narrower and more congested (with both traffic and pedestrians), and the smaller roads are surfaced with concrete (Photo 13). The total road network is 421km in length, of which 70% are surfaced with bitumen/tar, 23% are concrete and 7% are WBM (Water-borne Macadam). The majority of roads (48%) are maintained by UIT, 38% by the Public Works Department (PWD) and 24% by AMC, and the condition is generally poor, with many roads in need of repairs and resurfacing.

46. Transport in the town is mainly by personal vehicles (bicycles and motor cycles) or auto- and bicycle-rickshaws, and privately owned mini-vans provide a form of intermediate public transport system. There are good road links between Alwar and surrounding towns, and a good quality road to the State capital Jaipur in the south-west and the national capital Delhi in the north-east (Figure 1). The national railway also runs through Alwar, and there are daily services through Rewari and Delhi in the north and Dausa and Jaipur in the south. The nearest airports are at Jaipur (150 km away) and Delhi (160 km).

D. Social and Cultural Resources

1. Demography

47. According to the national census the population of Alwar was 0.2 million in 1991 and 0.27 million in 2001, which shows an annual increase of 3.5% over the decade. The local authority however estimates that there are now 350,000 people in the town, which is occupied at an average population density of 6420 persons per km².

48. Overall literacy is 82.8%, reported at 91.4% for males and 72.9% for females, which is considerably better than literacy in the state as a whole, which is 60.4% overall, and 75.7% for males and 44.0% for females. The sex ratio is however significantly below the natural 1:1 ratio, being 853 females per 1000 males, lower than both the state and national averages (879 and 929 respectively).

49. According to the census, in 2001 only 28.8% of the population was in paid employment, significantly lower than both the state and national averages (42.1 and 39.1% respectively). This indicates that most of the townspeople are engaged in the informal sector, earning a living where they can, from small trading, casual labour, etc. Of those that are employed, almost all (98%) are involved in the service and industrial sectors, with the remainder being engaged in agricultural activities.

50. Between 85-90% of people are Hindus and the remainder are mainly Muslims, Sikhs and Jains. The main local languages are Khariboli and Mewati, although almost all people speak the national language of Hindi and a few also speak English. Other languages spoken include Sindhi, Punjabi and Urdu, because Rajasthan borders Pakistan. About 3% of the population are from Scheduled Tribes (ST), but these are all part of the mainstream population; around 16% of the population belong to scheduled castes (SC).

2. Health and educational facilities

51. There are good educational facilities in Alwar, which serve both townspeople and inhabitants of surrounding villages and towns. There are 71 primary schools, 189 secondary schools and 43 higher secondary schools, plus six general degree colleges and nine professional educational institutes.

52. As the district headquarters town, Alwar is the main centre for health facilities in the area and there are six hospitals, plus a special TB hospital, 42 clinics, two family welfare centres, and three homeopathic hospitals in the city.

3. History, culture and tourism

53. Legend suggests that the town of Alwar was founded in 1049 by Maharaja Alaghraj. In the mediaeval period it was ruled by the Yadu dynasty in the 11th century, Shamsuddin Altamash the Sultan of Delhi in the 12th century, the Chauhans in the 13th century, followed by Mewatis, Mughals, Marathas and Jats, until finally it was captured by the Kachhwaha Rajputs in the late 1600's.

54. Alwar Fort, known locally as Bala Quila, was built in 1550 by Hasan Khan Mewati, and is one of the few forts in Rajasthan to pre-date the rise of the Mughals. It stands on a hill and rises 330 m above the city (Photo 14), and measures 5 km by 1.5 km. There are six entrances to the fort and 5 km of ramparts.

55. Tourism has risen in importance in Alwar over the past 20 years, and in 2005 there were 85,000 visitors, 90% from within India and 10% from abroad. Alwar Fort and Sariska Tiger Reserve 40 km away are the main attractions, but there are other interesting locations in and around the town including:

- The City Palace complex, which lies immediately below the fort, and was once the home of the maharajah. It has an impressive architecture (Photo 15), with many intricate ghats (staircases) and pavilions. The palace now houses government offices, and there is a museum and a large ornate pond (known as Sagar), surrounded by 12 chhatris or cenotaphs of red marble;
- Siliserh Lake (Photo 6), provides a dam, lake and four-storey palace dating from the mid-19th century, which has now been converted to a hotel and restaurant. The lake is both functional and attractive, set amongst low wooded hills, and attracts tourists from Alwar and beyond;
- Jaisamandh Dam is in a more remote location and reached by a narrow rural road, and its architecture and the surrounding landscape (Photo 8) make it a further attraction for increasing numbers of tourists.

IV. ENVIRONMENTAL IMPACTS AND MITIGATION: INFRASTRUCTURE CONSTRUCTION

A. Screening out areas of no significant impact

56. From the descriptions given in Section III.C 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.

57. 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 localised and short in duration;
- The overall construction programme will be relatively short for a project of this nature, and is expected to be completed in 1.5 years.

58. 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 4, with an explanation of the reasoning in each case.

59. These environmental factors have thus been screened out and will not be mentioned further in assessing the impacts of the construction process. Rapid Environmental Impact Assessment checklist is added in **Appendix- 1**.

Table 4: 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	Alwar is not located in a coastal area
Population and communities	Construction will not affect population numbers, location or composition

B. Sewage Treatment Plant

1. Construction method

60. As explained above, provision of a Sewage Treatment Plant will involve construction of the following structures on 32.65 ha of land immediately east of Agyara Dam:

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

61. 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.

62. 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.

63. 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

64. 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.

65. Ponds will be dug on around 80% of the site, and if these are excavated to a depth of 2.5 m, around 400,000 m³ of 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 in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;
- Preventing the generation of dust (which could affect surrounding agricultural land and crops) by removing waste material as soon as it is excavated, by loading directly onto trucks, and covering with tarpaulins to prevent dust during transportation.

66. 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. However sub-surface water could still collect in the ponds given the proximity of the lake created by Agyara Dam (Figure 3 and Photo 16) and the fact that farmers irrigate the surrounding agricultural land. If water collects in any quantity it will need to be pumped out, and it should then be donated to neighbouring 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

67. Farmers graze small herds of goats on the site of the proposed STP, and this has reduced the vegetation to scrub (Photo 17). There is therefore no ecological interest at the site, so construction will cause no adverse ecological impacts. There are however some trees that will need to be removed, and given global concerns regarding the loss of trees, the project should make a small positive ecological contribution by planting two native trees at a nearby site for every one that is removed.

4. Economic Development

68. The site of the proposed STP (including the additional land) 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. There is also no infrastructure on the site, and the construction work will be designed to avoid any effects on the integrity of the nearby Bharatpur Road and Agyara Dam.

69. 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 Alwar 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 Alwar town and do not use narrow local roads, except in the immediate vicinity of delivery sites;
- Scheduling transportation activities to avoid peak traffic periods.

5. Social and Cultural Resources

70. 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 EA and Contractor will be necessary.

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

- Consulting historical and archaeological authorities at both national and state level to obtain an expert assessment of the archaeological potential of the site;
- Selecting an alternative location if the site is considered to be of medium or high risk;
- Including state and local archaeological, cultural and historical authorities and interest groups in consultation forums as project stakeholders so that their expertise can be made available to the project;
- 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:
 - o Having excavation observed by a person with archaeological field training;
 - o Stopping work immediately to allow further investigation if any finds are suspected;
 - o Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

72. There are no modern-day social and cultural resources (such as schools and hospitals) near 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.

73. 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 labour force from communities within a radius of say 2 km from the site, if sufficient people are available.

C. Sewerage Network and Trunk Sewer

1. Construction method

74. Provision of a sewerage system in part of the town during the first phase of investment (Tranche 1) will involve construction of:

- A tertiary network comprising 9 km of 200 mm diameter RCC pipe and 3 km of 350 mm pipe in three colonies with sufficient water supply (Shantikunj and Schemes 2 and 3);
- A 9 km secondary network of 500 mm RCC pipes to collect sewage from these areas and the colonies that already have a network (Shiva-ji Park and Ambedekar Colony).

75. A trunk main and sec will also be built outside the town alongside the Bharatour Road to transfer sewage to the STP. This will consist of:

- 18 km of 800- 1200 mm diameter RCC pipe; and
- New drain will be constructed for carries runoff and Agyarav dam discharge

76. 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.

77. 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 (Photo 2). 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 (Photo 19), so the trenches may have to be dug into the edge of the road.

78. Trenches will be dug by backhoe digger (Photo 20), supplemented by manual digging where necessary (Photo 21). 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 (Photo 22) or using a small rig (see Photo 20). 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.

79. 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.

80. At intervals, small chambers (ca 1-2 m³) 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.

81. 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 (Photo 19). In these places it may be necessary to break open the surface of the road using hand-held pneumatic drills (Photo 23), 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

82. 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. If average trench dimensions are 1.9 x 0.8 m, then construction of 43 km of sewers will require the excavation of 66,000 m³ of material. After construction, approximately 50% of the trench will be occupied by the pipe, so there will be around 33,000 m³ of waste soil left over. 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 minimise 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, in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;
- 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;
- Cover or water stockpiled soil to reduce dust during windy weather.

83. 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 (> 27 m). In addition the Contractor will almost certainly conduct all excavation in the dry season, to avoid the difficult working conditions during the monsoon.

84. 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

85. 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 two new trees (of the same species) for each one that is removed.

4. Economic Development

86. 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.

87. 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;
- Consulting affected businesspeople to inform them in advance when work will occur.

88. 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.

89. 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;
- Integrating the construction of the various Alwar subprojects (in particular water supply and sewerage) so that:
 - o Different pipelines are located on opposite sides of the road wherever feasible;
 - o Roads and inhabitants are not subject to repeated disturbance by trenching in the same area for different purposes.

90. 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.

91. 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;

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

5. Social and Cultural Resources

92. 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, as Alwar town has. 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;
- Developing a protocol for use in conducting all trenching, to recognise, protect and conserve any chance finds (see Section IV.B.5 for details).

93. 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, 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);
- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

In addition the Executing Agency 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.

94. 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;
- Accident reports and records;
- Etc.

95. 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 infrastructure will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

96. 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)³, 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;
- 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:
 - o Removal of all persons to a safe distance;
 - o Usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material;
 - o Procedures for the safe removal and long-term disposal of all asbestos-containing material encountered.

97. 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.

³ 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>

V. ENVIRONMENTAL IMPACTS AND MITIGATION: OPERATION AND MAINTENANCE

A. Screening out areas of no significant impact

98. 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 5 below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 5: 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 Siliserh lake, which will not be affected
Wildlife, forests, rare species, protected areas	There are none of these features in or outside the town
Coastal resources	Alwar is not located in a coastal area

B. Operation and maintenance of the improved sewerage system

99. The new sewerage system provided during the first phase of investment 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 Public Health Engineering Department, and the discharge after treatment will comply with Indian wastewater standards.

100. 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.

101. 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.

102. 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

103. The provision of an effective sewerage system in 40% of the town should improve the physical appearance and condition of these areas because raw sewage from the Shiva-ji Park and Ambedkar Colonies 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.

104. 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.

105. 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.

106. 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 (Figure 3), 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 (see Section VII.C below).

2. Ecological Resources

107. 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 colonise 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 favour of the better disposal method suggested above, whereby the effluent is supplied to farmers to irrigate and fertilize their fields.

3. Economic Development

108. 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;
- 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.

109. 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

110. 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.

111. 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;
- 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.

112. 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 (see Section IV.C.5) to protect workers and the public. This should include application of the asbestos protocol if any AC pipes are encountered.

113. 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 utilise 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.

114. 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 diarrhoea 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.

VI. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN

115. 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. This has been done in Sections IV and V above and no other impacts are expected.

116. 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. For example, if a STP produces an effluent that does not meet legally established standards, then this is an impact of the design as it would not occur if a more rigorous treatment technology had been adopted.

117. In the case of this subproject there are few impacts that can clearly be said to result from either the design or location. This is mainly because:

- The project is relatively small in scale and involves straightforward construction and low-maintenance operation, so it is unlikely that there will be major impacts;
- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other ground disturbance. However the routine nature of the impacts means that most can be easily mitigated;
- In the key field 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.

118. The one area in which the impacts could be said to be related to the design and location of the subproject, is the effect of the operating STP on surface and groundwater, if the treated effluent is discharged to the adjacent *nallah*. This would not occur if the STP was located elsewhere, or if a treatment technology to remove nitrate and phosphate was adopted.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of environmental impacts and mitigation measures

119. Table 6 lists the potential adverse impacts of the Alwar 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, which relates to the project programme described in Section II.B. 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

120. 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

Table 6: Environmental impacts and mitigation for the Alwar Sewerage Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	07	2008				2009			
Construction: Sewage Treatment Plant						D	1	2	3	4	1	2	Op	⁴
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	All sites									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 Alwar Town and narrow local roads	Contractor	From STP site									0
			Schedule transportation to avoid peak traffic periods											0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of proposed STP site	DSC	All sites									0
			Select alternative if site has medium-high potential	DSC										0
			Include state and town historical authorities as project stakeholders to benefit from their expertise	LSGD										0
			Develop and apply protocol to protect chance finds (excavation observed by archaeologist; stop work if finds are suspected; state authority to plan appropriate action)	DSC and Contractor										+
Economic benefits if local people are employed in Contractor's workforce	M	T	Contractor should employ at least 50% of workforce from communities in vicinity of STP site	Contractor	All sites									+
Construction: Sewerage Network and Trunk Sewer, runoff carrying drain														
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 2 for every 1 cut	Contractor	All sites									0
Shops may lose income if customers' access is impeded	M	T	Leave spaces for access between mounds of soil	Contractor	Network sites									0
			Provide bridges to allow people/vehicles to cross trench	Contractor										0

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

⁴ 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

			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													+
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											+
Location and Design																
Discharge of treated effluent to <i>nallah</i> could pollute surface & groundwater with nitrate, phosphate, etc	M	P	Conduct bacteriological tests to ensure safety of effluent	GA	STP											0
			Sell treated wastewater to farmers for irrigation													+

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.

121. 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.

122. Environmental issues will be coordinated by an Environmental Specialist within the IPMU, 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

123. Table 6 shows that most mitigation activities are the responsibility of the Construction Contractors⁵ (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 LS GD in their role as project proponent, and some actions related to the design that will be implemented by the DSC.

124. 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 operate⁶.

125. Table 6 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

⁵ During implementation the contractor will submit monthly progress reports, which includes a section on EMP implementation to the IPIU. The IPIU will submit reports to the IPMU for review. The IPMU will review progress reports to ensure that the all mitigation measures are properly implemented. The IPMU will consolidate monthly reports and submit quarterly reports to ADB for review

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

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.

126. Table 7 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 measures shown in Table 6 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.

127. 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 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.

128. 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

129. 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 6) are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

130. 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.

These have not been budgeted elsewhere, and their costs are shown in Table 8, 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 1.7 million, ie US\$ 37,000.

Table 7: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
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 Alwar Town and narrow local roads when transporting soil	From STP	Contractor	Observations off site; CC record	Weekly	EMS
Avoid transporting soil during peak traffic periods	From STP	Contractor	Observations on and off site	Weekly	EMS
Cover or damp down stockpiled soil in dry weather	Inhabited areas	Contractor	Site observations	Weekly	EMS
Conduct all excavation work in the dry season	All sites	Contractor	Site observations	Monthly	EMS
Pump groundwater from excavated areas and provide to farmers	STP site	Contractor	Site observations; farmer survey	Monthly	EMS
Leave spaces for access between mounds of soil	Network sites	Contractor	Site observations	Weekly	EMS
Provide bridges to allow people & vehicles to cross open trenches	Network sites	Contractor	Site observations	Weekly	EMS
Only remove trees if it cannot be avoided	All sites	Contractor	Site observations	Weekly	EMS
Plant and maintain two trees for every one removed	All sites	Contractor	Observations on/off site; CC records	Monthly	EMS
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA ⁷
Increase workforce in inhabited areas to finish work quickly	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Inform shopkeepers and residents of work in advance	Network sites	LSGD	Resident surveys; CC records	Monthly	EMS
Confirm location of infrastructure and avoid these sites	Network sites	DSC	Site observation; design reports	Monthly	EMS
Locate water and sewer pipes on opposite sides of roads	Network sites	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct trenching at same time	Network sites	DSC/LSGD	Site observation; design reports	Monthly	EMS
If work will affect traffic, conduct when traffic is light	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure police provide traffic diversions when required	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Request archaeological authorities to assess potential of all sites	All sites	DSC	DSC records; design reports	As needed	EMS
Select alternatives if sites have medium or high potential	All sites	DSC	DSC records; design reports	As needed	EMS
Include state and town historical authorities as stakeholders	All sites	LSGD	CC records; observations at meetings	As needed	EMS

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

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
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	
LOCATION AND DESIGN					
Sell treated wastewater to farmers for irrigation	STP	GA	Site observation; farmer 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	Alwar Town	GA	Hospital records; resident surveys	Annual for 6 years	Social studies consultant

Table 8: 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	100,000 ⁸	300,000	
Survey Expenses	Sum	100,000	100,000	400,000
2. Survey of STP sludge and effluent (5 years)				
Domestic Consultant	5 x ½ month	100,000	250,000	
Sample Analysis	5 x 20	3,000 ⁹	300,000	
Other Expenses	Sum	200,000	200,000	750,000
3. Survey of public health (6 years)				
Domestic Consultant	6 x ½ month	100,000	300,000	
Expenses	Sum	200,000	200,000	500,000
TOTAL				1,650,000

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project stakeholders

131. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:

- Residents, shopkeepers and businesspeople who live and work alongside the roads in which the trunk main and network sewers will be constructed and near the STP site;
- Custodians and users of socially and culturally important buildings in the same areas;
- State and local authorities responsible for the protection and conservation of archaeological relics and historical sites and artefacts.
- State and local tourism authorities;

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, 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.

⁸ Unit costs of domestic consultants include fee, travel, accommodation and subsistence

⁹ Cost of a standard bacteriological analysis (total and faecal coliforms, E.coli, enterococci, etc) is \$65 (INR 3,000) per sample

B. Consultation and disclosure to date

132. Two forms of public consultation have been used during preparation of the IEE, to discuss the project and involve the community in planning the mitigation measures and develop the Environmental Monitoring Plan. These are:

- A public meeting was held in Alwar Town in April 2007, to which representatives of primary and secondary stakeholders were invited. Attendees were informed about the aim of the various subprojects and the benefits they would bring, together with their likely impacts and the ways in which they would be mitigated. Participants were invited to discuss their views and concerns, which were then incorporated into the IEE. **Appendix -2** contains a summary of the meeting;
- *Ad hoc* discussions were also held on site with people and communities who could be affected by the subprojects, so that views could be expressed in a less formal setting. These were also considered in preparing the IEE.

This IEE will be disclosed to the public by making it available on the ADB website, together with the IEEs prepared for the other subprojects and the summary IEE (SIEE) describing the impacts and mitigation of all subprojects.

C. Future consultation and disclosure

133. 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 program 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 city 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

134. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Alwar 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.

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

135. 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 15 km trunk main in the ROW alongside the Bharatour Road, to avoid acquiring agricultural land and affecting the livelihoods of farmers and farm workers.

136. 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.

137. 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 minimise disruption of traffic and communities;
- Providing temporary structures to maintain access across trenches where required.

138. 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.

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

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

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

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

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

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

142. These and the other mitigation and enhancement measures are summarised in Table 6, which also shows the location of the impact, the body responsible for the mitigation, and the programme for its implementation.

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

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

144. 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.

145. 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.

146. 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.

147. Table 6 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).

148. 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.

149. Finally, stakeholders were involved in developing the IEE through both face-to-face discussions on site and a large public meeting held in the town, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation, when a nationally-recognised NGO will be appointed to handle this key element to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

B. Recommendations

150. 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 IEE report (Table 6) are implemented in full, as described in the text above;
- The Environmental Monitoring Plan proposed in Section VI.C of this report is also implemented in full.

X. CONCLUSIONS

151. The environmental impacts of the proposed improvements in sewerage infrastructure in Alwar Town have been assessed by the Initial Environmental Examination reported in this document, conducted according to ADB guidelines. The overall conclusion of the process 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.

152. Additional acquisition of land adjacent to existing land for STP and also renovation of discharge drain will not affect any environmental components.

152. There are no uncertainties in the analysis, and no additional work is required to comply with ADB procedure or national law. There is thus no need for further study or Environmental Assessment.

APPENDIX -1

Rapid Environmental Assessment (REA) Checklist

**SEWERAGE
TREATMENT**

Instructions:	
◆	This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department
◆	This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
◆	This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
◆	Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:

Sector Division

SCREENING QUESTIONS		Yes	No	REMARKS
A.	Project Siting			
Is the project area				
◆	Densely populated ?	√		
◆	Heavy with development activities?	☐		
◆	Adjacent to or within any environmentally sensitive area			
	● Cultural heritage site	√		
	● Protected Area	☐	√	
	● Wetland	☐	√	
	● Mangrove	☐	√	
	● Estuarine	☐	√	
	● Buffer zone of protected area	☐	√	

● Special area for protecting biodiversity	☐	☐	
● Bay	☐	√	
B. Potential Environmental Impacts			
Will the Project causes			
◆ impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	√	The sewerage system is not impacting any such structures. The STP site far way from such sites
◆ interference with other utilities and blocking of access to buildings, nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	√	☐	Improvement of the sewerage system will minimise all these problems. STP site is far way from settlement. So these problems will be minimum.
◆ dislocation of involuntary resettlement of people	☐	√	STP has been proposed on government land and sewerage lines not disturbing any private property
◆ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	☐	☐	Secondary treatment will be provided at the STP. So these type problem will not arise
◆ overflows and flooding of neighboring properties with raw sewage?	☐	√	Sewerage system has been designed considering the population growth. It has been Designed for the scheme of 2041.

◆	environmental pollution due to inadequate sludge disposal of industrial waste discharges illegally disposed in sewers?	☐	√	No chance of contamination with industrial waste because the design of sewerage is underground close conduct. No one will be allowed to connect with the system with out permission of the authority even for domestic connection permission is required.
◆	noise and vibration due to blasting and other civil works?	√	☐	Mitigation measures to be provided will be taken care in EMP
◆	discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐	√	Confined underground domestic sewerage system. No chance for contamination
◆	inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisance, and protect facilities?	√		STP site far way from settlement. All the pumps will be with in enclosure and treatment plant will be surrounded by boundary. Adequate buffer zones as per MOEF norms will be provided.
◆	social conflicts between construction workers from other areas and community workers?	☐	√	Most of the worker will be of local area
◆	road blocking and temporary flooding due to land excavation during the rainy season?	√	☐	Mitigation measures to be provided will be taken care in EMP. Contractor will be suggested

				not to take such works in rainy season
◆	noise and dust from construction activities?	√	☐	Mitigation measures to be provided will be taken care in EMP
◆	traffic disturbances due to construction material transport and wastes?	√	☐	Mitigation measures to be provided will be taken care in EMP with proper traffic management plan.
◆	temporary silt runoff due to construction?	☐	√	Not considerable.
◆	hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	☐	√	All piping will be tested. Hydrotesting will be carried out for all material.
◆	deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	☐	√	No direct discharge .only treated sewage will be discharged
◆	contamination of surface and ground waters due to sludge disposal on land?	☐	√	It will be disposed off in designated site.
◆	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?	☐	√	Ventilation Shaft will be provided at the trunk main. Regular health checkup of the workers

**Appendix -2: Proceedings of City Level Consultation Meeting
At Alwar on April, 25, 2007**

1. The public consultation meeting was organized on April 25, 2007 at Alwar Municipal Council (AMC) meeting hall. The meeting was organized by the AMC on the request of the Council, prominent persons of the city, non-governmental organizations (NGOs), community based organizations (CBOs), political leaders, general public and also invited were the technical staff of the various government agencies (List of persons attended the meeting is enclosed herewith).
2. The objective of the meeting was to appraise the stakeholders about the environmental and social impacts of the proposed program and the safeguards provided in the program to mitigate the same. In the specific context of Alwar, the environmental and social impacts of the proposed subprojects under Tranche 1 in Alwar were discussed.
3. Domestic environmental specialist of ADB TA team and an EA representative, who is also the in-charge of Alwar town, made the detailed presentation to the stakeholders (copy of presentation is enclosed herewith). Draft resettlement framework (RF) and summary initial environmental examination (SIEE) documents of RUSDIP, translated in the local language – Hindi, were displayed in the Notice Board of AMC and also distributed during presentation to the interested parties. The copies of documents are also made available to all the interested parties through the AMC. It may be noted that the EA has already distributed these documents to the affected persons (APs) and projected implementation agencies, the PHED, AMC and UIT in March 2007.
4. The comments, suggestions of the stakeholders are presented below:
 - Forty-one stakeholders attended this meeting, which was chaired by the elected Vice-chairperson of Alwar Municipal Council.
 - The meeting started with a briefing by the Commissioner of Alwar Municipal Council.
 - Domestic environmental specialist of ADB TA team then made a detailed presentation on (i) objective and benefits of RUSDIP, (ii) proposed subprojects in Alwar in Tranche 1, (iii) mandatory environmental and social assessment requirements of subprojects, i.e. Government Regulations and as well as ADB policies on Environment, involuntary Resettlement and Indigenous People – salient features of these three key safeguard policies were presented, (iii) key social safeguard features in the program to avoid social impacts, (iv) draft resettlement framework (v) IR impacts of Tranche 1 subprojects in Alwar, (vi) environmental subproject selection criteria to minimize the negative environmental impacts of subproject implementation and, lastly, (vii) identified environmental impacts and mitigation measures through sample subproject IEEs.

- All the stakeholders were supportive of the project and indicated their willingness to participate in the program to make it successful.
- Stakeholders were of the view that these subprojects provide benefits to all the people by improving water supply, sewerage, roads and solid waste management infrastructure.
- Most of the stakeholders indicated that solid waste at present is not managed properly. Waste is collected partially and disposed haphazardly all over, making Alwar unhealthy. During rains the solid waste joins natural streams. Therefore, all were of the view that solid waste management subproject will improve the environmental and aesthetical values of the city.
- The proposed Lterana ROB will improve the traffic movement.
- People were impressed by the ADB Policy that the “absence of formal legal title to land is not a bar to ADB policy entitlement”. A public representative shared his views with all stating that he lost his land in a Government Project. He was not compensated properly affecting his economic development. He requested the EA to consider the market rate of replacement value of the land to be acquired.
- The EA appraised that RUSDP is designed to minimize the IR impacts. In unavoidable cases, the LA and R & R will be handled through the Resettlement Framework (RF) of RUSDP. Stakeholders were satisfied that all possible IR issues are included in RF, however, indicated to the EA that this shall be implemented in letter and spirit.
- Few stakeholders raised issue that why increase in water supply through development new bore wells was not considered in the Tranche 1. Stakeholders were of the view that water supply is insufficient and therefore requires immediate improvement. The EA indicated that looking into various issues raised by a study conducted by the Central Ground Water Board (CGWB) and decline in groundwater levels, further increase in groundwater extraction is likely to lead to various adverse environmental impacts. And therefore it will be beneficial to have a comprehensive groundwater modeling study before implementing the subproject. The study is proposed in Tranche 1. The EA also indicated that water supply improvement would however be done in the Tranche 1 by reducing the leaks in the system.
- A NGO representative indicated EA should involve NGOs in project implementation actively to which EA responded positively.
- Few stakeholders requested for the copy of RF and SIEE (in Hindi). EA is provided the copies through Alwar Municipal Council.



Photo 1: RCC Sewer Pipes



Photo 4: Proposed STP site surroundings



Photo 2: Road along which trunk sewer laid



Photo 5: Typical STP Pond



Photo 3: Proposed STP Site



Photo 6: Sillisher Lake



Photo 7: Polluted lake south of Alwar



Photo 10: Piped Water Supply in Alwar



Photo 8: Jaisamandh Dam



Photo 11: Roadside Concrete drains in Alwar



Photo 9: Shops in Alwar town



Photo 12: Road in the outskirts of Alwar



Photo 13: Road in the Centre of Alwar



Photo 16: Agyara Dam

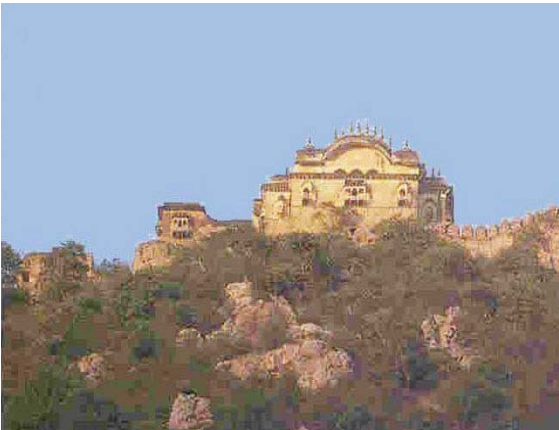


Photo 14: Alwar Fort



Photo 17: Grazing in and around STP site



Photo 15: Alwar City Palace



Photo 18: Agricultural land outside Alwar



Photo 19: Encroachments into ROW in Alwar



Photo 22: Crane for placing pipes in trench



Photo 20: Backhoe Digger



Photo 23: Hand-held pneumatic drills



Photo 21: Digging a trench by hand