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SMC	Shirdi Municipal Council
DP	Development Plan
EMP	Environmental Management Plan
ESR	Elevated Storage Reservoir
GLSR	Ground Level Service Reservoir
GSI	Geological Survey of India
IMD	Indian Meteorological Department
LPCD	Litres Per Capita Per Day
MLD	Million Litres Per Day
MJP	Maharshtra Jeevan Pradhikaran
MPCB	Maharashtra Pollution Control Board
MPN	Most Probable Number
PFR	Pre-Feasibility Report
SOI	Survey of India
STP	Sewerage Treatment Plant
SWM	Solid Waste Management
UA	Urban Agglomeration
WSAPL	Wilbur Smith Associates Private Limited

PREFACE

The religious places in India are the most important assets to be preserved since these are also the most favored destinations for the domestic as well as International tourists. The State of Maharashtra has a laudable history of saints and pilgrim places; hence it is rightfully called "Santanchi Bhoomi" (Land of Saints). The religious places in Maharashtra are mostly located in small cities or towns having population of less than 2 lakhs. The local authorities neither have adequate funds to protect the archaeological and heritage importance of such places nor do they have infrastructure that can manage the floating population that converges on the festive days or the religious occasions at such places. This puts a very heavy demand on the available, infrastructure and amenities in such towns and creates several environmental problems which adversely affect public health and environment.

The pollution problems arising out of the activities at these places include: water pollution of adjoining streams, rivers and lakes due to bathing, washing of clothes and human excreta; ground water pollution due to poor MSW management, noise and dust pollution due to unplanned vehicular traffic and poor road condition, visual pollution due to littering of plastic bags and containers and environment unfriendly landscapes etc. These problems are aggravated during the festive and other important days of religious celebrations due to poor / inadequate infrastructure management practices.

Considering the seriousness of the issues the Board considered implementation of project on environmental improvement of religious places in its 139th Meeting held on January 22, 2004. A conceptual paper regarding the environmental improvement at Shirdi, Shani-Shingnapur and Alandi Devasthan was presented at this meeting and the concept of undertaking such projects in Maharashtra was in principle approved by the Board. It is decided to engage the services of M/s. Wilber Smith Associates Pvt. Ltd., Bangalore (WSAPL) to undertake the study of Shirdi, Shani- Shingnapur and Alandi so that a detailed assessment of the environmental problems, infrastructure and financial resources required to tackle these issues at the above places can be worked out in the first phase before the actual implementation of the project can be considered by the Board. The project proposals are based on the concept of eco-city project being implemented by MoEF/CPCB at Mathura, Vrindavan etc.

Dr. D.B. Boralkar

Member Secretary
Maharashtra Pollution Control Board

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PROJECT TEAM

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1.0 PROJECT BRIEF

1.0 BACKGROUND

The land of Maharashtra is blessed by the holy stay of many great Saints and Spiritual Leaders. Some of the most important pilgrim destinations in Maharashtra are Pandharpur, Tulajapur, Shirdi, Shani Shinganapur, Alandi, Dehu, Ashta Vinayak etc. These pilgrim towns attract large number of pilgrims for various parts of the country. However, typically all these places are small towns/villages with populations ranging about a few thousands and hence lack the necessary infrastructure to cater to the large of pilgrims visiting them every year. As a result this has put lot of stress on the local natural resources and there has been a steady degradation of the local environmental conditions.

Considering the seriousness of the issues, the Maharashtra Pollution Control Board (MPCB), considered the implementation of a project on environmental improvement of religious places in its 139th meeting held on January 22, 2004. A conceptual paper regarding the environmental improvement at Shirdi, Shani Shinganapur and Alandi was presented at this meeting and the concept of undertaking such a project in Maharashtra was in principle approved by the Board.

The objective of the project is to identify the environmental problems of these religious places and provide appropriate funding through MPCB and /or CPCB, so as to improve the overall environment and serenity of these places of religious importance.

For this purpose, MPCB has engaged the services of WSAPL to carry out a detailed assessment of the environmental problems, infrastructure needs in Shirdi.

Based on the initial reconnaissance survey, the typical environmental issues and the areas for improvement of the related environmental infrastructure were identified and presented in the form of a Concept Plan, by the Consultant.

Further to preparation of the Concept Plan, Feasibility Studies for the shortlisted environmental improvement projects were conducted. This report presents the required improvements in roads and traffic management in Shirdi alongwith block cost estimates for the same.

1.1 STUDY AREA STUDY AREA

Considering the fact that all the activities and development of Shirdi are linked to the Sai Samadhi Temple and other religious places in the town, the study area for the present project is divided into two zones namely, the "Pilgrim Zone" of religious activities, and the "Shirdi Town" of the regular civil life in the town. The area covered under the two zones is described below.

Pilgrim Zone	The old gaothan area including the Sai Samadhi Mandir, Chawadi, Dwarkamai Masjid along the new Pimpalwadi Road, proposed DP road along Laxmi Nagar Nala behind the Pimpalwadi Road parking, 300m west of Ahmednagar Manmad Road up to Kankuri Road, along Kankuri Road, Ahmednagar Manmad Road up to Nandurkhi Junction and including Khandoba Temple Sainath Hospital, MSRTC Bus stand and SMC Building.
Shirdi Town	Remaining area within the municipal boundary. This comprises the area along the remaining parts of Nandurkhi Road and Kankuri Road and new developing areas along the proposed ring roads.

1.2 REPORT STRUCTURE

This report is organised in Seven Chapters as below.

- The ***First Chapter*** of the report i.e. the present chapter discusses the background of the project, scope and the study area.
- The Eco city guidelines in the context of Shirdi are discussed in the ***Second Chapter***.
- The ***Third Chapter*** deals with the Sewerage Scheme proposed for Shirdi
- The projects identified for solid waste management of Shirdi are discussed in the ***Fourth Chapter***.
- The water supply scheme proposed for Shirdi is presented in the ***Fifth Chapter***.
- The ***Sixth Chapter*** presents the various projects identified for roads and traffic for Shirdi.
- Project on development of Renewable energy Park in Shirdi is presented in the ***Seventh Chapter***.
- ***Eight Chapter*** presents the projects on Rain water Harvesting
- Other miscellaneous projects including development of eco-pilgrimage in Shirdi are discussed in the ***Ninth Chapter and Tenth Chapter***.
- The ***Eleventh Chapter*** describes the overall benefits of the environment improvement projects
- A summary of all the above projects is presented in the ***Twelfth Chapter***.

2.0 ECOCITY GUIDELINES FOR DEVELOPMENT OF SHIRDI

2.1 THE NEED AND APPROACH

Preparation and implementation of Master Plans / Development Plans and formulation of Development Control Regulations are the main tools of ensuring planned growth in urban areas. The plans and regulations are generally guided by the land use planning and physical planning perspectives of cities than the environmental conservation and protection.

While these aspects are important for any growing urban area, cities with special character like religious importance, tourist interest, etc. needs extra care in managing its growth and conserving its environmental resources. The Development Plans of these towns, irrespective of their size and growth patterns, should be guided more by its specific characters of development and factors of environmental importance than conventional planning guide lines. In the light of the above factors, the Development Plan of Shirdi was reviewed with special emphasis on its suitability to conserve environmental resources and ensuring sustainable development. The out come of the above review was further correlated with the principles of eco-city principles and the Guide Lines for developing Shirdi as an Eco-city were prepared.

2.2 DEVELOPMENT PLAN OF SHIRDI – A REVIEW

The Development Plan (DP) of Shirdi was prepared by the Office of Town Planning Department, Government of Maharastra and is valid for the period 1993-2003. The plan follows the standard planning process based on UDPFI Planning norms and the guidelines of the MRTP Act 1965.

The plan proposes following land use development

Table 2.4 Existing Land use of Shirdi

Sl. No.	Category/ User	Area in Ha	% to Developed Area	% to Total Area
1	Residential	11.87	12.55	0.91
2	Commercial	4.23	4.47	0.32
3	Industrial	-	-	-
4	Public & semipublic	9.30	9.85	0.71
5	Transport (Roads & Parking)	30.22	31.96	2.33
6	Public Utility	0.86	0.90	0.06
7	Play ground, Open space, Garden etc	0.33	0.35	0.02
8	Vacant land	37.74	39.92	2.90
	Total	**94.55**	**100**	**7.25**
9	Agriculture	-		91.05
10	Water Bodies	-		1.70
	Total area	**1298.40**		**100**

Source: Development Plan for Shirdi 1988 - 1998

Besides the above landuse it proposes measures for improvement of the town. The

significant amongst them are described below.

- Ring road of 18 m width along the northern limits of the SMC and New Bhakta Niwas on the southern side for a length of 3 km.
- Another outer ring road of 24 m width along the eastern boundary.
- The DP proposes a policy of not allowing industrial activity in the town. This will be beneficial to the town and maintaining its pilgrim town image and preventing environmental pollution.
- Reservation of land for new Bus stand ad parking areas near the northern and southern entry of the town.
- The DP also proposes a bypass for the existing Ahmednagar Manmad road to prevent the trough traffic from entering the town.
- The DP also reserves areas for gardens, camping ground for pilgrims, playground and schools.
- Decongestion of the Temple area by rehabilitating/ shifting the shops around and restricting the entry of vehicles in the area.

While the above proposals cater to some of the development requirements of the town, a close analysis of the plan indicate the following.

- The DP has anticipated a population of 20000 by 2001 at an average growth rate of 32.51%, where as the actual population in 2001 as per the census is 26169 at a growth rate of around 56.0 % These deviations can be attributed to the tourist characters of the town that acts as a catalyst to the socio-economic growth of the town and associated population growth.

  In view of the above, the Development Plan for towns like Shirdi shall consider the trends of floating population and factor the growth trends into the population projections. This can be best done by adopting projection methods such as polynomial projections (graphical) that suggests the best-fit population growth curve for any city.

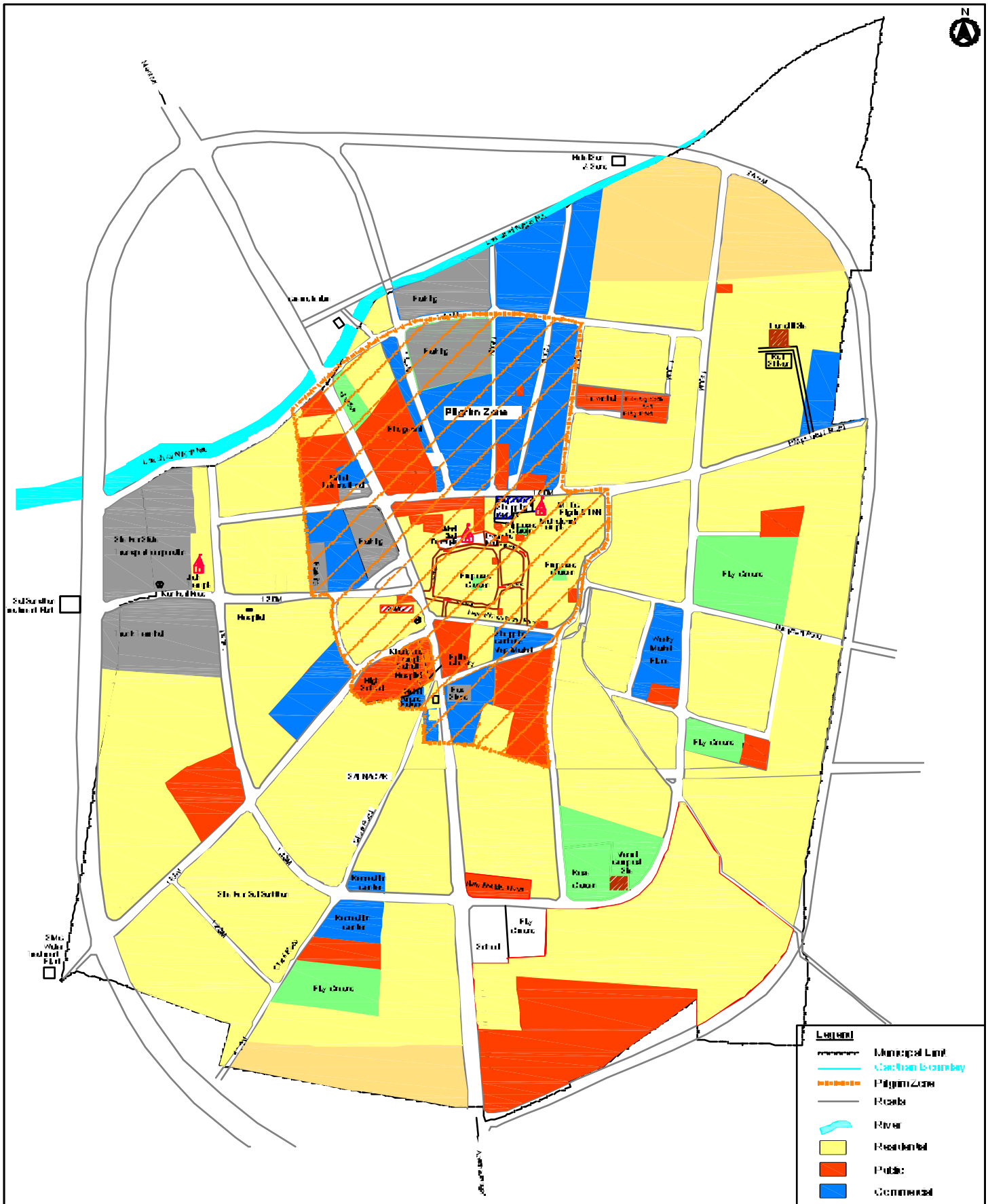
- The Samadhi Temple and associated religious structures are the main focus points of development in Shirdi. In view of the above, the land use allocation for the area around these structures and the rest of the town shall be planned separated with a holistic view of developing the town. Such an emphasis seems to be missing in the current development plan.

- Due to large influx of tourists / pilgrims, environmental resources are strained to a greater extent in Shirdi. It is hence very important to include protection and conservation of natural resources of the town, which is now missing in the development plan.

  This should comprise appropriate Development Control Regulations (DCR) for the built form.

- Similarly, the DP does not provide a definite direction to the growth of the town and there are no specific proposals to create an image to the Town.

- Shirdi has considerable numbers of hotels and these are concentrated around the temple thereby congesting the area. The DP also proposes to allow hotels in residential areas. It does not propose any zoning guidelines for developing hotels and other commercial areas.



CONSULTANT:
Wilbur Smith Associates Pvt. Ltd.

TITLE:
Figure No. 2.1
Landuse Plan of Sinnar

SCALE: Not to Scale

DATE:

CLIENT:
Maharashtra Pollution Control Board

PROJECT:
Action Plan for Environmental Conservation in Sinnar

DWG. NO:

- A reservation for garden area right behind the Samadhi Temple has been deserved and proposed to be developed as a commercial complex on the Pimpalwadi Road. Such decisions could lead to congestion in the temple area defeating an important purpose of the DP.

In the light of the above discussion, it is important to plan the city with an objective of environmental conservation and sustainable development than the conventional physical planning and land use planning approach. For this purpose, the concept of eco-city and its principles are reviewed in the following section and the same is used to evolve guidelines for the development of Shirdi.

2.3 THE ECOCITY CONCEPT

No human settlement stands still--they are dynamic elements of stone, wood, flesh and exuberant energy with imprints of ancient forces of nature and history. Learning to respect these volatile forces and design less destructive ecosystems will bring nature into the cities/towns, and the cities/towns into human hearts.

Strategic planning should include following basic principles or sectors of incorporating sustainable principles to eco-city design. These seven components are interrelated, influence one another so that once transportation systems are changed with more pedestrian and cycle roads, they will in turn, and minimize energy use or consumption. Eco-city planning can be divided into these elements or components; land use, water, energy, socio-economic aspect to create an ecological urban skeletal structure.

Shirdi's problems are manifold, and greater control over the growth of the town must be exerted with appropriate planning and addressing environmental issues with an understanding of the local environmental system and proper assessment of the consequences of future plans.

The basic principle of the ecocity can be simplified as, "in an ecocity, people can live, work, shop, and play all within a short distance".

The more diverse and compact land use patterns with a hefty infusion of natural and agricultural restoration, appropriate technologies for energy conservation, effective recycling, widespread gardening, composting, waterbody restoration, building of lively city and neighbourhood centres with plazas to host vital social and economic life and so on, we begin to visualize what ecological cities are all about."

This can be achieved by bringing together energy, transportation, trees, urban horticulture, zoning and legislation, financing and economic systems, recycling, air, development design, restoration of waterbodies, city history, work, participatory democracy, student activism, and whole systems thinking about society.

"Transportation is what you do when you're not where you want to be," says Register, so the solution to smog, gridlock, greenhouse gasses, and the expense of owning a car is to gather together the places people want to be. The transportation of choice will be feet first, bicycles second, public transit third, and only then, the automobile.

2.4 MODEL ECOCITY PRINCIPLES

Model areas should be structured for mixed use with optimum ratio between residential, commercial, production and recreational uses.

- Density of development should be optimised with regard to the contradictory requirements of transport, ecology, economy, and social and hygienic aspects.
- Local culture and historical heritage should be protected and further cultivated.
- Green spaces for recreation are inevitable for human health and must be present in all neighbourhoods.
- Lines of new urban structure should be derived from the existing urban and regional environment to back up continuity.
- Urban structures and buildings should be designed to allow variability, extensibility, retrofitting, reusing or functional conversion.
- Housing should be provided at all levels and scales serving different needs of different groups of population, including affordable and social housing.
- Streets and squares should respect the human scale and be shaped in interconnected structure of specialised and logically composed public open spaces, with attractive and user friendly design.
- Urban environment should not contain architectural barriers to accessibility so that also disabled and disadvantaged people could be able to use al facilities without discomfort.
- Non-toxic and natural building materials from a renewable resource should be preferred, considering also the durability and the life cycle of the building.
- Local sources (materials, labour) should be preferred wherever possible.
- Layout and location of buildings should take advantage of the natural daylight and of passive cooling/heating.
- Compact buildings (such as terraced houses and multi-storey building complexes) bring considerable energy savings and should be preferred by developing new structures in model settlements.
- Pedestrians' and cyclists' paths should represent the main grid of the inner district traffic.
- Basic facilities should be located to allow best accessibility by pedestrians
- Motor traffic should be reduced as much as possible.
- Inhabitants, especially in the residential areas, should be released from the negative impacts of transport and industry such as noise, air pollution and vibrations.
- All the important targets in the city district should be serviced by public transport.
- Traffic speeds should be reduced to make the street safer and pedestrian friendly.
- The consumption of land through car parking as well as other negative effects of car parking should be reduced to the lowest possible level.
- Previously disturbed areas should be restored and/or redeveloped.

- The extent of impervious surfaces should be kept at minimum.
- All resources must be recycled and reused keeping the waste production to the lowest possible level.
- Water consumption should be reduced while assuring equal distribution of potable water for all inhabitants and households.
- Energy consumption of the settlement should be reduced using energy-efficient technologies and saving programmes.
- In addition to the reduction of energy demand, also alternative sources should be introduced.
- Natural elements such as trees, vegetation and water are to be used to improve climatic conditions, ecological stability as well as aesthetic values of the urban environment.

Broadly, an ecocity should have the following aspects installed into its function.

A. Energy conservation and efficiency

a. Use of available options of alternative energy technology
b. A city can formulate policies that can promote the use of alternative energy sources. All aspects of energy consumption and use of petrol/diesel should be targeted to enable energy efficiency in real sense.
c. Emphasis on city forms and policies that reduce reliance on fossil fuels such as petrol and diesel.
d. Efficient public transit that reduces individual energy consumption.
e. Promotion of architectural principles that utilize maximum available natural light and ventilation.
f. Promotion of green products that save on energy costs
g. Community awareness on energy conservation.

B. Effective solid waste management

a. Installing waste to energy mechanisms to create a cyclic closed urban system.
b. Exploring alternatives wherein industry waste exchanges are facilitated
c. Creating proper mechanisms of handling bio-medical and hazardous waste.
d. Establishing norms for effective disposal and treatment of all waste, including bio-medical and hazardous waste.
e. Promotion of composing technologies to convert bio-degradable waste into rich composts for gardens/agriculture (organic farming, vermicomposting).
f. Promoting green products that utilize less packaging, use less resources and create less non-degradable waste after use.
g. Community mobilization for cleanups and awareness.

C. Efficient transportation

a. Promote the use of non-polluting public transit by creating easy, fast and assured service.
b. Promote bicycling and install infrastructure to allow easy and efficient cycling within the city.
c. Restrict polluting vehicles and establish stringent norms for pollution control.
d. Remove polluting public transit operations, facilitate non-polluting options by creating easy demand and supply mechanisms.
e. Develop and maintain proper road networks, streamline roads to avoid congestions, implement stricter driving regulations.

D. Addressing environmental issues and risks

a. Air quality monitoring and setting in place policies that control and reduce air emissions and improve ambient air quality.
b. Water quality monitoring and setting in place policies and actions to improve the existing water quality of natural sources such as wells, lakes, rivers etc.
c. Addressing land contamination issues, land use planning etc.
d. Bio-diversity protection and conservation actions and strategies.
e. Promoting green areas and open spaces and installing mechanisms to effectively protect, improve and sustain existing natural areas.
f. Global environmental issues like climate change, ozone depletion etc need to be addressed at all levels.

E. Self sufficiency and sustainable economic development

a. Plan for city's ecological carrying capacity limits.
b. Install mechanisms to implement environmental considerations in trade transactions.
c. Promote locally grown foods and facilitate distribution networks to bridge the gap between food demand and supply.
d. Encourage local entrepreneurship by focussing on marketing of traditional skills and techniques.
e. Local capacity building through training and awareness programmes.
f. Facilitate mechanisms for affordable housing, housing improvements etc.

F. Community participation and decision making

a. Mobilize community groups to come and act together to improve social and environmental health.
b. Utilize community participation for a consultative as well as decision making role.
c. Continuous education and capacity building of the community to enable informed decision making.
d. Evolving public-private partnerships, industry private sectors participation and collaborations within local NGOs and various community organisations.

G. Improving environmental governance and municipal services

a. Local authorities and processes should be flexible enough to incorporate changes and affect implementation without delay.
b. Transparent decision making with citizen's support.
c. Free sharing of information and open discussions with the community and experts.
d. A shift to efficient processes and mechanisms to facilitate innovative solutions.
e. Installing effective financial management, municipal expenditures, personal management etc.
f. Improved and efficient public facilities and municipal services, developing eco-sensitive infrastructure like roads, water supply, wastewater collection etc.

2.5 GUIDELINES FOR REVISION OF DEVELOPMENT PLAN FOR SHIRDI ON ECOCITY PRINCIPLES

Based on the above principles and the 1988-98 DP of Shirdi and assessments of existing development through reconnaissance survey in 2005 within the municipal area, the following guide lines / activities are recommended to develop Shirdi as an Eco-City:

Since the existing development plan is has expired in 1998, the development plan to be revised shall be prepared with the integration of eco-city principles to the convention development planning process. This shall comprise the following.

- A detailed survey of the existing land use should be carried out to map the changes in land use, and identify areas of mixed land use, which is an important feature of all Indian Towns that have grown organically.
- A survey (or analysis based on secondary data) should be undertaken to ascertain the number of pilgrim visiting the time during lean season, peak season and festival times and a realistic estimate of floating population.
- Divide the town in two broad zones one which has more of the pilgrim activities called the "Pilgrim Zone" and the other area regular civil life of the town called as "Shirdi Town". Land use and infrastructure planning shall be carried for each of the zone separately, keeping their special characteristics.
- The Pilgrim Zone in Shirdi would comprise of an Area within the Gaothan boundary and an area 200 m on the western side of the Ahmednagar Manmad Road.
- Declare major area of Pilgrim zone as an entirely pedestrian zone with access only to 2 – 3 wheelers and emergency vehicles.
- The significant land uses in the town are temples, hotels, commercial area (shops) and residential areas. It is necessary to allocate land for new Dharmashalas (Sansthan activities), Hotels and Lodging areas keeping in mind their proximity to the temple area. These need not be in the Pilgrim Zone but can be on the fringe of the Pilgrim Zone.
- The land requirement for these should take into account the number of visitors, number of vehicles (Parking spaces) and sanitation facilities to be provided to the pilgrims.
- Land use in the Pilgrim Zone should be restricted to those associated with the temples other uses such as government offices, schools can be relocated to suitable areas outside the Pilgrim Zone.
- During the three festivals of Gurupurnima, Ramnavmi and Dussera lakhs of people congregate in Shirdi, land has been allocated for setting up tents and temporary shelters for these pilgrims. This should be developed on priority.
- The Ring Roads and bypass proposed in the DP should be taken up for implementation to avoid through traffic passing from the town. The alignment of the road shall be finalised based on detailed traffic / engineering surveys and also, based on the existing and proposed new industrial and other regional developments.
- It shall be made mandatory in the DP that all the large paved areas such as the parking lot; ST bus stands and other government / public institutions shall have rainwater-harvesting systems installed.
- In addition to the green belt proposed along the suitable land uses such as institutional areas, meditation centres; ashrams etc.
- It should be mandatory for large commercial buildings, office complexes, hotels and dharmashalas to install rainwater-harvesting systems. A norm for the plot area and built up area should be fixed above which all buildings should have a rainwater harvesting system.
- Hotels and Dharmashalas should be encouraged to use non conventional energy sources to the maximum possible, such as solar panels for water heating.

- The Palkhi Marg should be reserved as pedestrian road entry of vehicles can be permitted in early mornings and late nights.
- A tourist Map of Shirdi should be prepared and displayed at important places such as the Samadhi Temple, entry points to the town etc. Appropriate signage for road names, junctions should also be developed and installed.
- The Temple trusts, Municipal council and citizens groups, non-governmental organizations, associations of pilgrims ("Phads" and "Mandals") should work in close co-ordination in developing and implementing proposals for Shirdi.
- An environmental monitoring system should be developed to assess the impact of the high volume of pilgrim traffic on Shirdi. This will serve as a guideline for future planning proposals.
- Citizens and Pilgrims should be encouraged to minimize the use of plastic and other non-biodegradable waste.

3.0 SEWERAGE SCHEME

3.1 INTRODUCTION

Shirdi town, spread over an area of 13.15 sq. km. The town does not have a proper drainage system. Most houses, hotels and Dharmashalas have individual septic tanks. The sanitation needs to be improved as for as sewerage is concerned. There is a need for proper sewerage scheme and treatment plant to treat the waste and dispose the sewage as per norms of stream discharges. It is necessary to control such pollution through a systematic arrangement for collection and treatment. The Water Supplied shall be canalised through the collection network to finally reach the treatment place and finally to reuse after treatment.

3.2 EXISTING SYSTEM

Presently sewerage scheme in Shirdi is in a limited area. The total length approximated having the sewers are about 10 km. Sewage in some places is discharged to open gutters. The Sewage collected from the network also leads to the Laxmi nagar Nala. Existing network covers less than16% of the area of the town.


Laxmi Nagar Nala

Sansthan has its own under drainage scheme for all its buildings, roads. The Sewage generated from the bhakata nivas, sulabh shouchalaya, sullage from septic tank are sent to through internal sewerage network. There are waste water recycle plants proposed for hospitals, treating the sewage anaerobically and the sewage treated is utilised for horticulture purposes.

There is one Bio gas generation plant of 35 cum/day capacity (3 no) to treat Sulabh shouchalaya sewage and to generate power through methane gas. But this is not efficiently generating the gas as loading is not done properly. The sewage from the premises of other building reaches the septic tanks and lead to the natural nala. There are about 2 recycle plants for hospital and dharmashala and above 25 septic tanks to treat the sewage.


Bio gas plant of Sulabh Shouchalaya

3.3 PROPOSALS FOR THE NEW SEWERAGE SYSTEM

Total length of sewers to be laid in the town is about 55 km. the existing sewers are to be connected to the new network which is exists for a length of 10.0 km. Municipality has come out with a sewerage scheme at a cost of 12.3 crores covering all areas. The drainage zones have been done according to the topography of the area. The sewers are proposed to follow the gravity lines.3 zones created for gravity flows with 3 pumping stations at different locations. The final pumping station leads the sewage to proposed sewage treatment plant. The sewage is treated through Activated Sludge process. The proposed STP capacity is 12.63

MLD in first phase and 23.72MLD in Second Phase.

As per our calculations, with a supply level of 90 lpcd for resident population and 30 lpcd for floating population the sewage generation is tabulated as below in table 3.1.

Table 3.1 : Sewage Generation

Status	Projected Population (Residents)	Projected Population (Floating)	Total Population	Sewage Generation	Infiltration	Total Sewage
Census (2001)	26169	19372	45901	23.49	0.18	23.67
Ultimate (**2011**)	36353	26275	62628	37.12	0.18	37.30
Ultimate (**2031**)	74306	33696	108002	61.59	0.18	61.77
Additional Population during the Mela Period		300000	300000	72.00	0.18	72.18
Total Sewage in LL						133.95
Total Sewage Generation in MLD						13.39

As per the calculations the sewage generation will be 6.177 during the design year 2031. The additional volume of sewage from floating population during festive days shall be disposed through the same network. An additional collection sump shall be constructed to store the sewage and shall be fed into the conventional treatment plant at constant dosages. The network shall be sized considering festive population with an area weightages in percentage.

3.4 TREATMENT OPTIONS

The table 3.2 gives the details of treatment options and approximate area required in setting up the treatment plant. To set up 6.50 MLD plant based on conventional extended aeration process, 1.2 hectares of area is needed. This area has to be made available to treat the sewage in the town. An additional holding pond, to temporarily hold the sewage during mela period is proposed for a detention period of one day.

Based on the analyses, land costs are very high in Shirdi and there are lots of constraints in obtaining the land for STP. Hence, an efficient treatment option with smaller area requirement is proposed with extended aeration technology. 6.5 MLD of sewage is to be treated through any one of the process mentioned below. Treatment plant shall be proposed in two stages. The plant shall be designed for 3.5 MLD initially and shall be upgraded to meet 6.5 MLD capacities as soon as the intermediate design years are completed.

The treated Sewage is proposed to be flushed with treated sewage. Silted particulate matters are flushed off with water driven force that creates self-cleaning velocity.

The network is not shown in the drawing. However the location of the proposed Sewage Pumping Station and STP is shown. This location is a very tentative location shall require a detailed study in reference to the ground profile of the town

Table 3.2 Details of treatment methods

No.	Type of Treatment	Area / MLD		Total Area Required
		Range	Nominal	
		Ha. / MLD	Ha. / MLD	(acres)
1	Multiple Pond System (An.P+FP+MP)	1.00 - 2.80	1.5	27.46
2	Aerated Lagoon System (AnP+AL+MP)	0.60 - 0.80	0.7	12.81
3	UASB System (UASB + AL + MP)	0.50 - 0.70	0.6	10.98
4	Conventional ASP	0.20 - 0.25	0.25	4.58
5	Extended ASP	0.18 - 0.22	0.2	3.66

The proposals for sewerage system are

- Proposals for the new sewerage collection system with lift and pump Stations
- Sewage treatment plant along with additional collection facility during the Guru purnima/Ramnavami/Dussera period for the part of the flow.
- Reuse of the treated sewage effluent for Agriculture.

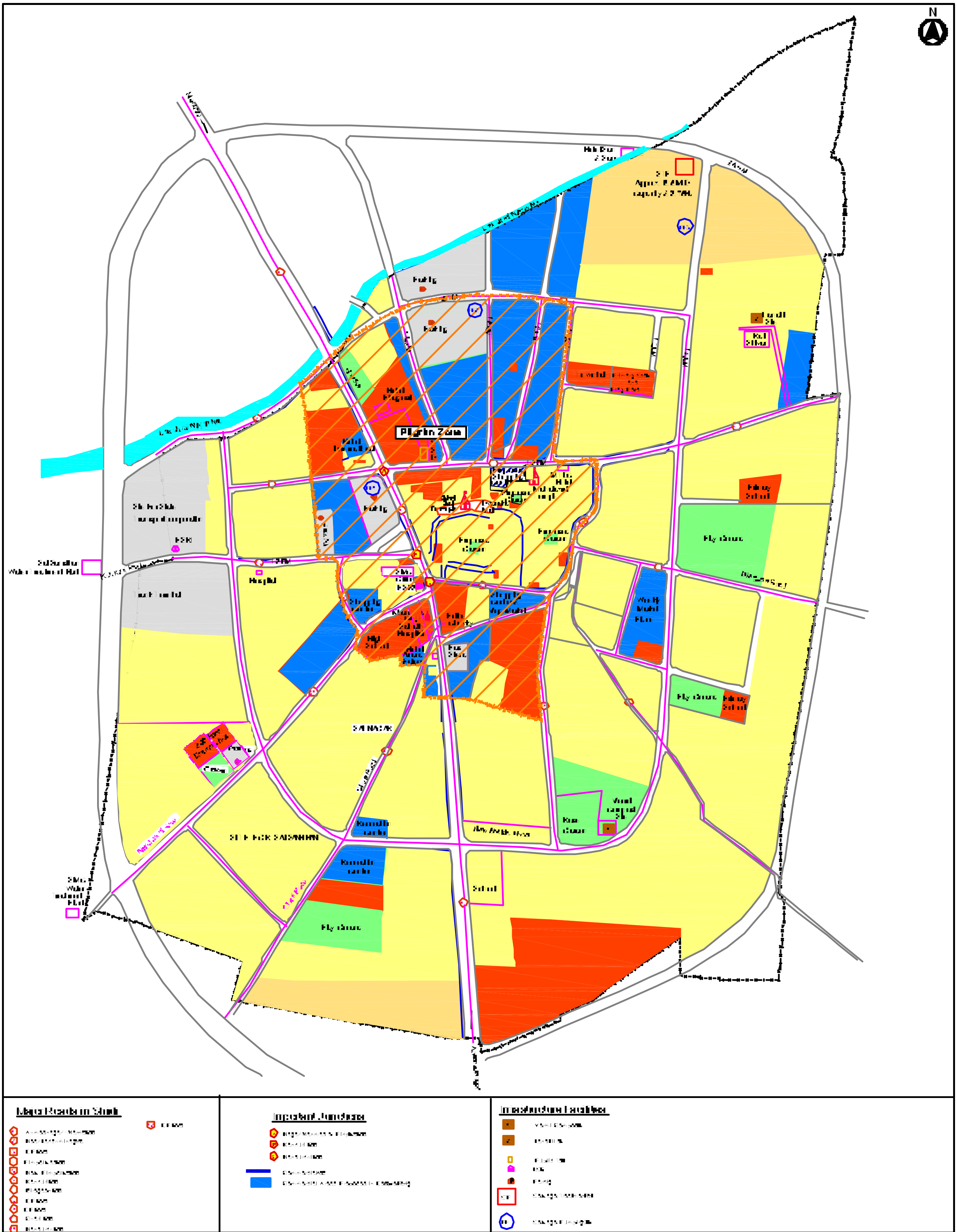
3.4 CAPITAL COST

Cost of the proposed improvements to the sewerage system is listed in Table 6.3. The cost estimates have been prepared based on the MJP SoR and consultants data bank.

Table 6.3 : Project Cost

No.	Description	Phase I	Phase II	Cost (Rs. Lakhs)
1	Collection system	800.00	800.00	1600.00
2	Pumping stations and pumping main	120.00		120.00
3	Holding Tanks	30.00		30.00
4	Sewage treatment plant	200.00	200.00	400.00
	Base Cost of UGD system	**1150.00**	**1000.00**	**2150.00**
	Physical Contingency 5 %	57.50	57.00	-
	Supervision & quality control 2 %	23.00	22.80	-
	DPR cost 2 %	43.00		-
	Total Cost for Sewerage Scheme	**1273.50**	**1079.80**	**2353.30**

Note: The land cost for proposed sewage treatment plant is not considered for the costing purpose.



CONSULTANT:

Wilbur Smith Associates Pvt. Ltd.

TITLE:

Figure No.

Infrastructure Map of Shirdi Town

SCALE: NTS

DATE

CLIENT:

Maharashtra Pollution Control Board

PROJECT:

Action Plan for Environmental Improvement
for Shirdi

DWG. NO:

4.0 SOLID WASTE MANAGEMENT

4.1 EXISTING SCENARIO OF SOLID WASTE MANAGEMENT

Collection, transportation and disposal of municipal solid waste is an obligatory function of the urban local body, in this case, the Shirdi Municipal Council (SMC). The municipal solid waste mainly comprises waste from the Shri Sai Baba Samadhi Temple complex and other religious places in the town, households, markets & commercial establishments, hotels & restaurants, guesthouses (dharmashala) marriage halls, and hospitals in the town. SMC's Health Department, headed by a Sanitary Inspector, is responsible for the solid waste management in the town.

4.2 SOURCES OF SOLID WASTE GENERATION

On an average, daily about 15000 people visit Shirdi. The number increases on Thursdays and weekend. The number increases on the three important festivals of Ramnavmi (March/ April), Gurupurnima (July) and Dussera (October). During Dussera around 3 lakh people visit Shirdi while during the other two festivals 1.5 lakh people visit the place. The people stay in Shirdi for 2 days during these festivals. The prime solid waste generating sources in the town are the temple complex, household waste, and other bulk waste generating sources such as hotels, restaurants, markets and shops. There are no industrial units within the limits of the SMC or in its proximity. Hence, there is no industrial waste generated in the town.

4.3 QUANTITY OF WASTE

As per the SMC Heath Department's estimate, Shirdi generates about 7.5 tons of waste per day that gives a per capita generation of about 287 gm for a population of 26169 (2001 census). However, considering an average daily floating population of about 15000 people visiting Shirdi generating about 0.75 tons of waste (@ 50 gm/capita), the per capita waste generation in Shirdi is estimated to be around 256 gms.

As per the CPHEEO manual, for towns which fall under the range of below 5 lakh population, the generation of waste shall be around 210 gm per capita per day. Similarly the Central Pollution Control Board (CPCB) in its Publication "Management of Municipal Solid Wastes – Status and Options" estimates the daily per capita solid waste generation in small, medium, and large cities / towns in India to be 0.1 kg, 0.3 to 0.4 kg, and 0.5 kg per capita respectively. Further, National Institute of Urban Affairs (NIUA), the apex body of urban management, anticipates the per capita solid waste generation to be around 0.35 to 1 kg/ cap/ day. From the above norms, the per capita waste generation for the Shirdi will be in the order of

- 210 gm / capita as per CPHEEO
- 300 to 400 gm / capita as per CPCB and
- 350 gm / capita as per NIUA guide lines

However considering tourist characteristics of the Shirdi, the per capita values are expected to be on the higher side and hence the estimated figure of 287 gm per capita per day is considered appropriate.

Out of the total 7.5 tons waste generated the waste from Sansthan areas such as dining hall, accommodation facilities, staff quarters and temple complex consists of 2 tons. This is

collected by the Sansthan and transported to the disposal site. According to SMC, daily collection of waste is about 4 tons, estimated based on the vehicle capacity and number of trips per day. The SMC has three vehicles one tractor, one tempo (607) and a mini tempo, each having a capacity of 1 ton, 2 ton and 0.5 ton respectively. Considering the bulk density of the solid waste as 0.35, the actual collection of the waste is only 3 tons per day out of the 5.5 tons generated in the town.

The Sai Sansthan has one tempo of 2 ton capacity for collecting waste from temple, guesthouse etc. All the vehicles make two trips daily. The waste collected by the Sansthan contains left over food from the dining hall, flowers, garlands etc and hence the bulk density can be taken as 0.45. This gives a daily collection of 1.9 tons of the total 2 tons

Thus roughly 2.5 tons of waste is left uncollected in the town.

4.3.1 Waste generation during fairs

During the festival of Dussera, about 3 lakh pilgrims stay in Shirdi for 2 days. The waste generated during Dussera is estimated to be 30 tons during the two days (3,00,000 pilgrims @ 50gm/capita for 2 days). During the other two festivals of Gurupurnima and Ramnavmi about 1.5 lakh pilgrims stay in Shirdi for two days. The waste generated during this time is about 15 tons for each festival.

4.3.2 Household Waste

In Shirdi, the quantum of waste generated from households is about 1.75 tons per day, which is 23 percent of the total waste generation of the town. The household waste mainly consists of organic waste such as vegetable waste, food etc. Significant quantities of paper and plastic are also present in the waste.

4.3.3 Street Sweeping and Drain De-silting

The other sources of waste generation in Shirdi are street sweeping and drain de-silting activities. As per the CPHEEO manual, the per capita waste generation from street sweepings is estimated at 0.05 kg/ cap / day. Similarly, the waste generated by drain cleanings is estimated at 0.1 kg/cap/day as per norms specified by the CPHEEEO manual. However, based on the discussions with the Sanitary Supervisor, it is estimated that Shirdi generates around 1.75 ton of waste per day from street sweepings and drain cleaning, which is about 23 percent of the total waste generation

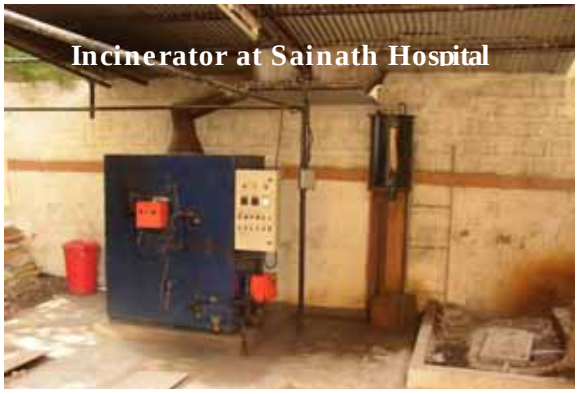
4.3.4 Commercial and Hotel Waste

Commercial establishments like hotels & Dharmashala, restaurants, shops and trade centres generate solid waste to a quantum of 1.5 tons per day. Shirdi being an important sacred place in the region, there are many hotels and lodges in the town. Their number is estimated to be about 180. The total commercial and hotel waste constitute about 23 percent of the total waste generation of Shirdi. This does not include waste from accommodation facilities of the Sai Sansthan.

4.3.5 Vegetable Market Waste

Shirdi has one vegetable markets on the New Pimpalwadi Road. In addition, daily vegetables shops are also set up in certain stretches of Kankuri Road. There is one meat market in the town. The total waste generated from both the vegetable markets is about 0.5 tons per day constituting 7 percent of the total waste. The waste is mainly organic in nature.

4.3.6 Bio-medical Waste



Shirdi has a 197-bed Hospital run by the Sai Sansthan. In addition, Shirdi has about 4 nursing homes and 15 clinics. The daily biomedical waste (infectious) generation from the hospital is about 4 to 5 kg (0.004 ton). The waste is burnt in the incinerator installed by the Sainath Hospital. The incinerator installed by Sainath Hospital has a capacity of 20 kg. The diesel consumption for 20 kg waste is 30 litres. The stack height of the incinerator is 52 feet. A mechanism is being worked out to collect the biomedical waste from other hospitals and clinics for disposal at the incinerator.

Table 4.1 shows the categories and quantity of waste generated by various sources in Shirdi town.

Table 4.1 : Categorisation of Waste

Source of Waste Generation	Quantity *(MT/day)*	Total *%*
Sai Sansthan (Includes Samadhi Temple Complex, Prasadalaya & accommodation facilities)	2	27
Households	1.75	23
Hotels, restaurants and commercial establishments	1.5	20
Vegetable market	0.5	7
Street sweepings, drain de-silting and others	1.75	23
Hospital waste (non-infectious and non-hazardous)	0.001	0
Total	**7.501**	**100.0**

Source: Analysis and discussions with SMC officials

4.3 COMPOSITION OF WASTE

No data on the waste composition was available with the SMC. Based on the field visit, discussions with the health department officials and the Consultant's understanding, it has been estimated that the organic content in the waste is about 50 percent. The higher organic content is due to the organic waste generated from the religious activities taking place in the town. Physical composition of waste for the town of similar size indicated in CPHEEO manual is given in Table 2.

Table 4.2 : Physical Composition of Waste

Parameter	% of Waste as per CPHEEO Manual	% of waste in Shirdi (in %)
Total organic content	44.57	50
Paper	2.91	50
Rubber, leather & synthetics	0.78	
Glass	0.56	
Metals	0.33	
Inert Materials	43.59	

Source: CPHEEO Manual on SWM

4.4 COLLECTION OF WASTE

4.4.1 Primary Collection

At present, SMC has a mini door for hoe to house-to-house collection, but the coverage is not complete. Some of the households dispose their waste into dustbins along the streets by their own means. SMC has provided about 44 RCC dustbins at various locations covering the entire town of Shirdi for effective collection of waste. Dustbins have been provided on all major roads and the average spacing of the dustbins is about 800 m (average 800 m for a road length of 52 km). However, this spacing is not uniform through out the town and it varies from place to place depending on the density and locality.

The reconnaissance survey conducted in the town and discussion with the SMC officials reveal that many of the households, shops and commercial establishments throw the waste on to the streets drains and open spaces creating unhealthy conditions. Further, the waste thrown into the open drains is leading to choking and as a result, the wastewater flows on the streets rather than in drains and forms wastewater pools at certain locations.

Street Sweeping. One of the major activities in the solid waste management is the street sweeping activity, which is time consuming, and labour intensive. In addition to street sweeping, due to the open drainage system in some part of the town, drain desilting is also essential. SMC carries out street sweeping and drain de-silting in the entire town. The total length of municipal roads and streets in Shirdi is 58.90 km. The total length of open drains is 7 km. The road length swept daily is 16 km, those cleaned once in two days is 1 km and others which are swept at frequency of once in a week or lesser is 2 km.

The manpower employed for the sweeping and cleaning operations include; 22 sanitary workers for street sweeping, 8 worker for drain de-silting activities, 4 workers for cleaning public toilets, 12 workers for solid waste collection from dustbins (@4 per vehicle), thus adding up to 46. In addition, there are 3 drivers and 2 supervisors. Total road length per sweeper @ 20 sweepers present per day, works out to be 0.86 km as against the desirable 0.4 to 0.6 km/sweeper. The sweeping operation is carried out in two shifts during the day covering different parts of the town.

Due to lack of sufficient manpower with the local body, frequency of the street sweeping and de-silting activities is not uniform all over the town. Depending on the locality and necessity, street sweeping is undertaken on the priority basis. However, main residential and other important areas are swept daily and some of the areas are swept occasionally.

4.4.2 Secondary Collection

The secondary collection refers to collection of waste from community dustbins and intermediate collection points or transit points. However, in Shirdi, there are no intermediate collection points or transit points and the waste is directly transported to the disposal site from dustbins.

Waste is collected from dustbins and open dumping sites in the town and manually loaded onto the transportation vehicles.

4.4.3 Frequency of Collection

The frequency of waste collection from the dustbins and other dumping points in the town varies depending on the quantity of waste accumulation and the locality. The waste from prime residential locations, commercial areas, public places like markets, bus stand etc is

collected every day. The Sai Sansthan also collects waste from its areas everyday. The vehicle performs 2 shifts daily.

4.4.4 Transportation of Waste

In Shirdi, waste transportation is carried out using open vehicles. SMC has three vehicles; a tractor, a mini lorry (Tata 407) and a minidoor for solid waste transportation. All the vehicles are in operational condition. The total transportation capacity available with SMC with the three vehicles is around 10.5 tons with each vehicle making two trips per day. However, considering the bulk density of the solid waste as 0.35, the actual collection of the waste is only 3 tons per day. The following table shows the details of solid waste transportation vehicles.

Table 4.3 : Details of Transportation Vehicles

Description	Ownership	Nos.	Capacity	Trip/day / vehicle	Total waste
			Ton	*No.*	*ton/day*
Mini lorry (Tata 407)	SMC	1	4	2	8
Tractor	SMC	1	1	2	2
Minidoor	SMC	1	0.5	1	0.5
Total		**3**	**3.75**	**5**	**10.5**

Source: Shirdi Municipal Council

4.5 DISPOSAL OF WASTE

At present the waste is disposed by mere dumping on an open area at the disposal site at Rui Shivar. Waste is dumped on the site manually in heaps and left as it is. The area is not covered after dumping.

4.5.1 Waste Disposal Sites

Presently, the solid waste is dumped on open land near Rui Shivar. This site is located within the SMC limits towards the north east boundary. It is about 2 km from the central area of the town. It was observed that the light materials such as plastic and paper are carried by wind to distant places, and the situation around the site is unhygienic. The area of the site is 1.03 hectares.

Table 4.4 : Salient Features of Existing Disposal Site.

Component	Description
Area	1.03 sq.m
Ownership	Site falls within the boundary of the SMC
Distance from the town	1.0 km off Pimpalwadi road
Approach road	BT road
Year of commencement	1998
Distance from nearest human habitat	1 km
Fencing around the site	No
Facilities and equipment at the site	Nil
Waste disposed per day	5 ton
Waste disposal method	Open dumping. Waste heaps formed due to unloading from the vehicle are left as it is. There is no practice of flattening the waste and covering it with inert material.

4.6 INSTITUTIONAL SET-UP

As described in earlier sections, municipal solid waste management is an obligatory function of the urban local body. SMC's Health Department headed by a Sanitary Inspector assisted by 2 Supervisors and Sanitary Workers, is responsible for the solid waste management in the town.

Due to lack of sufficient staff strength SMC has engaged the contract sanitary staff on temporary basis. The total manpower employed for the sanitary operations is 52. The following table shows the manpower details.

Table 4.5 : Manpower Deployment for SWM

Description	CMC staff	Contract staff
Sanitary Inspector	1	-
Supervisor (Mukadam)	2	-
Sanitary Workers	16	30
Drivers	3	-
Total	**22**	**30**

Source: SMC

The manpower employed for the sweeping and cleaning operations include; 22 sanitary workers for street sweeping, 8 worker for drain de-silting activities, 4 workers for cleaning public toilets, 12 workers for solid waste collection from dustbins (@4 per vehicle), thus adding up to 46.

4.7 SERVICE ADEQUACY AND KEY ISSUES

Based on the information collected and field visits, the key issues of solid waste management in Shirdi are identified and presented in this section. Key indicators are used to assess service adequacy of Shirdi. Table 7 shows the performance indicators of SMC in solid waste management and subsequently the key issues have been presented.

Table 4.6 : Solid Waste Management Performance Indicators

Indicator	Norm	Existing Service Levels
Waste Collection Performance	90-95%	55%
Vehicle Capacity Adequacy Ratio	30% of total waste generation	100%
Spacing of Dust Bins	100 m	avg 800m
Road Length per Sweeper	400 –600 m	860 m
Conservancy staff per 1000 population	3	1.6 (52 for 26169 + 5000 persons)

Source: Analysis.

Key issues and conclusions are based on field visits and data analysis presented below.

4.7.1 Absence of Effective Primary Collection Mechanism.

The absence of the door-to-door solid waste collection system in the town is leading to unhealthy conditions in the town. The practice of throwing of the waste onto the streets by shopkeepers, restaurants, households is aggravating the problem. Segregation of waste is not being practiced in the town.

4.7.2 Street Sweeping.

The frequency of street sweeping varies from one day to one week. As mentioned earlier the actual length of street per sweeper is around 900 m as against the norm of 400-600 m, which shows the lack of manpower for daily street sweeping.

4.7.4 Collection of Waste

At present SMC collection performance is only about 55 percent, which is less than the norm of 90 – 95 percent. As the analysis reveals about 2.5 ton of waste is not collected daily. This is creating unhygienic conditions in the city. The residual waste accumulates day-by-day forming heaps of waste in the city. Hence, there is an immediate need to increase the collection performance of the system to keep the city clean and healthy.


Uncollected solid waste


behind Samadhi Temple

4.7.5 Transportation of Waste.

At present waste is being transported in open vehicles to the disposal site. The spillage of waste along the route and odour from the waste is a common problem associated with open transportation of waste. Narrow lanes in the town are adding to the problem. The vehicles carrying the solid waste should be covered.


Vehicles of SMC


Vehicle of Sai Sansthan

4.7.6 Unavailability of Solid Waste Disposal Site for the long term

The SMC has a designated solid waste site a Rui Shivar. The life of the site is 5 years according to the officials of SMC. After this a new site will have to be identified. The SMC is planning to take up some abandoned stone quarries on the Nashik Road. It is necessary assess its technical and environmental suitability, on a high priority.

4.7.7 Disposal of Waste.


Present SW Disposal Site

The waste is disposed improperly at the site. The waste is finding its way onto the roads and surrounding areas due to blowing wind, making the area around the site unhygienic. The nearest habitation to this site is at about 0.5 km.

4.7.8 Occupational Health Hazards.

The waste collection, loading and unloading operations are done manually. The sanitary workers have not been provided with any protective equipment posing heath hazards.

4.8 PROJECT IDENTIFICATION

Based on the above analysis and discussion, the project components have been identifiedto improve the existing condition as well as to develop a comprehensive solid waste management system for the town of Shirdi.

4.8.1 Future Trends of Waste Generation

The section deals with the projection of solid waste generation with respect to the growth trend of the town and per capita waste generation and the improvements need to the existing system. Based on the data analysis and key issues identified in the above sections, the projects have been identified for the improvement of the solid waste management system in Shirdi.

The future trend of waste generation has been estimated based on the projected population and per capita waste generation. The population projections made in this report and a per capita waste generation rates (of 260 gm per capita for resident population and 50 gm per capita for floating population) arrived in the present study are used for estimating future waste generation trends. The rate of waste generation through out the horizon year of 2001-2031 is considered uniform i.e. 260 gm per capita per day and 50 gm per capita per day.

The waste generation is base on the projected resident population and projected floating population. The resident population is projected using the logistic curve method. The projected population for 2031 is 74306.

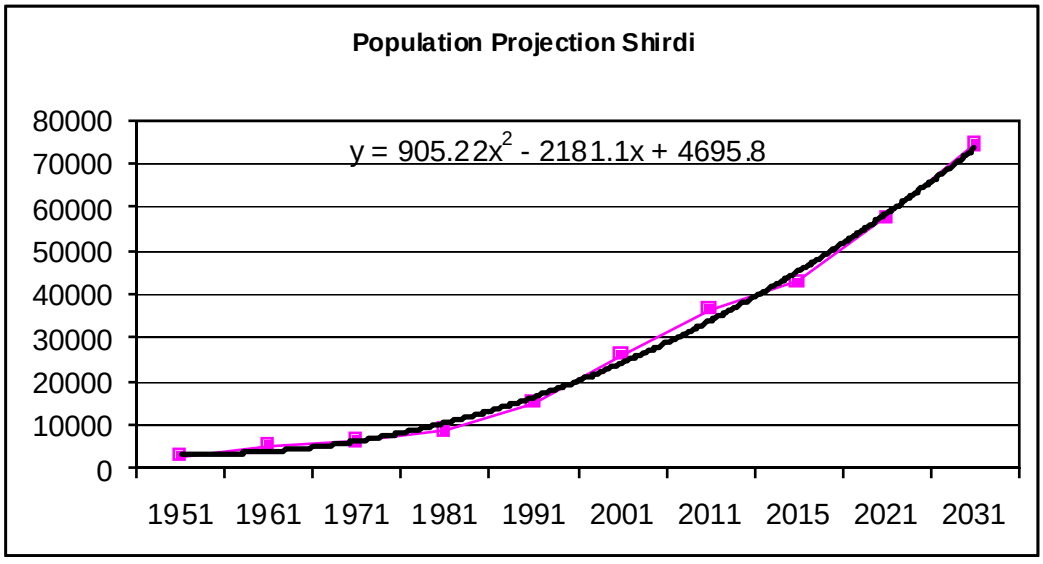


Table 4.7 : Projected Waste Generation

Year	Population	Waste Generation	Floating population	Waste generation	Waste Generation
	Nos.	*Gm/Day*	*Nos.*	*Gm/Day*	*Tons/Day*
1951	2950	-	-	-	-
1961	5239	-	-	-	-
1971	6369	-	-	-	-
1981	8806	-	-	-	-
1991	15129	260	8500	50	4
2001	26169	260	15000	50	8
2011	36353	260	19372	50	11
2021	57396	260	26275	50	17
2031	74306	260	33696	50	21

Source: Analysis.

4.8.2 Strategies for Solid Waste Management

This section presents an approach for the development of solid waste management system and improvements in strengthening the existing practices in Shirdi. The options address the physical components of solid waste management namely collection, transportation, treatment and disposal.

Based on the above analysis and discussion, the project components have been identified to improve the existing condition and as well as to develop a comprehensive solid waste management system for Shirdi. The cost of biomedical waste management, however, is not included.

For the purpose of efficient management of the solid waste, the Shirdi town can be divided into two areas viz.

I. *Pilgrim zone with maximum activities* – This covers the area around the Samadhi Temple, gaothan area, area along with the Pimpalwadi Road and the Ahmednagar Manmad Road approximately Due to its proximity to the Samadhi temple, this area has maximum concentration of hotels, lodges, restaurants and shops and hence the waste generated in this area has more organic component such as flowers and waste food.
II. *Sansthan Areas* – There are two areas in this namely the Dharmashala and staff quarters near Nandurkhi Road and The area around the New Bhakta Niwas (500 room) on Ahmednagar Manmad Road.
III. *Shirdi town* – Other areas of the town

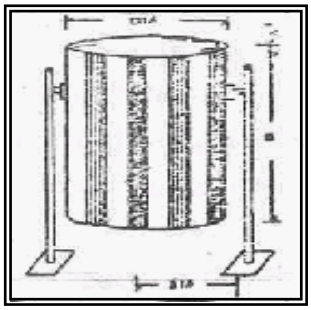
The project components have been identified based on the above classification.

4.8.3 Primary collection of waste

Pilgrim Zone

Door-to-door collection using containerised push carts: Door-to-door collection of waste is recommended in the Pilgrim zone due to high population density and narrow lanes. The waste collection in this zone shall be carried out by using containerised push carts. Each cart will have four HDPE containers of 1m x 0.69m x

0.15m size. The push cart for door to door collection will be provided with a bell so that the residents will be alerted of the arrival of the cart for emptying their waste containers into the containers of the cart. The sanitary workers shall collect the waste from domestic, commercial and temple area in their push carts. Similarly, the street sweepers will make heaps of waste on the side of the roads.



Litter Bins: In addition to the door to door collection, litter Bins are also recommended to be provided in the Pilgrim zone, for the floating population. The existing dustbins in this zone will be replaced by round tiltable litter bins of 0.02 cu.m capacity, spaced at 50 m interval. The litter bins shall be provided along the places of movement of the pilgrims such as, Samadhi temple area, Pimpalwadi road, New Pimpalwadi Road Palkhi marg, Ahmednagar Manmad Road, market places, and bus station. The private sector can be involved for this purpose by giving them advertisement rights on the bins for specified period. Considering the total length of roads in the Pilgrim zone as 3.5 km, total number of litter bins required is 70.

Sansthan Areas

Litter Bins: The internal road in the Sansthan Areas have dust bins which are managed by the Sansthan's Saintary Department. These areas are well maintained but the approach roads do not have any litter bins hence litter bins of the above size are proposed on the Nandurkhi Road and part of the Ahmednagar Road. The total road length is 1.5 km hence 30 bins are required.

Shirdi Town

Refuse Collection Bins (RCB): The existing practice of using RCBs can be continued in the other areas while increasing the number of bins, so as to minimize dumping along road side and in open areas. There are 44 RCC bins in Shirdi. However, the RCBs are not spread well over the town. This is demonstrated by the heaps of waste seen in some of the areas such as the near parking, bus stand. Also, most of the bins are not in a good condition, some of them are seen lying upside down and waste is seen dumped alongside the bins. Similarly, the capacity of the bins appears to be inadequate in crowded areas such as Gaothan, Near Samadhi Temple, bus stand where they are seen to be overflowing in spite of regular collection.

Hence, it is recommended that new RCBs of 0.2 to 0.3 cu.m capacity shall be provided in the Shirdi town area beyond the Pilgrim zone. The bins would be of non-rusting material such as FRP or HDPE and would be placed at an interval of 100m. Thus, for the road length of 25 km (excluding the Pilgrim zone & most of Ahmednagar Manmad Road as it is covered in the above areas) the number of RCBs required would be 250. In addition RCB's would also be placed at important locations such as shopping complex, parking areas, Bus stands and proposed new bus stand. Thus total number of RCB,s would be 255.

Street Sweeping

Street sweepers shall be assigned with fixed individual beats and 'pinpoint' work according to the density of the area to be swept. The following standards may be considered.

Table 4.8 : Street Sweeping Norms

Description	Name of Area	Norm (road length/sweeper)
High density area	Pilgrim zone	250 m – 300 m
Low density area	Rest of Shirdi	650 m – 750 m

Source: CPHEEO Manual on SWM

The main roads and the town center areas shall be cleaned every day. The low-density areas can be cleaned on alternate days. Drain de-silting will be done on need basis. The existing manpower for street sweeping is inadequate and hence additional manpower will have to be deployed. Based on the norms proposed above an additional 45 workers will be required by 2031.

4.8.4 Secondary Collection of Waste

The waste in the push carts shall be transferred into the secondary collection vehicles (tractor and mini lorry) which would be available at fixed location and time (secondary transfer points). The secondary transfer points are identified as near New Bhakta Niwas, Mhaloba Mandir behind SMC, Near Rajwada and near parking on Pimpalwadi Road

The mini lorry shall be used for collection of waste from the rest of the Shirdi town. The waste from the RCBs would be directly transferred into the lorry. An additional lorry is also proposed to be procured which would be useful in efficient collection of the waste.

The waste from the secondary transfer points would be directly sent to the disposal site.

4.8.5 Segregation of Waste at Source

Pilgrim Zone

Segregation of waste at source shall be implemented in the Pilgrim zone only, where door to door collection of waste is proposed. Separate collection and storage of the biodegradable and non-biodegradable fraction of the waste from households, dharmashala, shops and restaurants shall be carried out by the sanitary workers. For this purpose the residents would be asked to store the biodegradable and non-biodegradable waste separately. Also, the pushcarts would be provided with two separate containers in different colours for collection of the bio-degradable and non-biodegradable waste. Awareness programs should be conducted to train the people about the segregation of waste at household level.

Sansthan Areas

The waste generated from Sansthan areas does not contain much of bio-degradable content except in staff quarters. Segregation is proposed in this area. The other area is for pilgrims where it is difficult for segregation at source.

Shirdi Town

The segregation of waste can be extended to other areas of the town over a period of time. Shirdi has about 180 hotels it is proposed to have two separate bins at each hotel for organic waste and non-biodegradable waste. A dedicated vehicle will be deployed for the collection of waste from these hotels.

4.8.6 Transportation

The capacities of the mini lorry (Tata 407), mini door and tractor available with the SMC are

1.5 ton, 0.5 ton and 1 ton respectively. The total collection by the three vehicles considering 2 trips per vehicle per day with 35% collection efficiency works out to be 3.5 tons. This is found to be insufficient for the present condition. However, for a town of the size of Shirdi the number of trips made by the vehicles are less. It is expected that each vehicle should make at least 3 trips by which the collection would be 5.25 tons. It is proposed to have an additional vehicle, a hydraulic tipper to improve the collection. Thus the additional manpower required for collection will be of 15 sanitary workers.

The vehicle of the Sansthan is 8 years old and its capacity is proving inadequate hence a new vehicle is required. Similarly the vehicles of SMC are old and have inadequate capacity.

4.8.7 Treatment and Disposal

The characteristics and quantity of solid waste generated in the town primarily influence the disposal options. A review of the solid waste analysis results for Shirdi indicate that nearly 50% of the waste generated by the town is organic in nature. In terms of the quantity, around 7.5 tons of waste is generated every day during normal season and around 30 tons is generated during the Dussera festival (3, 00,000 pilgrims @ 50gm/capita for 2 days). During the other two festivals of Gurupurnima and Ramnavmi about 1.5 lakh pilgrims stay in Shirdi for two days. The waste generated during this time is about 15 tons each time.

The current practice of open dumping of waste is unsafe and unhygienic. The present practice of selling the organic component to M/s Clean Eco and Environment Developers can be continued. The possibility of involving the contractor in waste collection especially segregation should be looked at. This will enhance the quantity of organic waste collected by the contractor thereby benefiting them at the same time; improve the collection efficiency in Shirdi town. The rest of the waste shall be landfilled. The present practice of the Sansthan converting its organic waste into manure should be continued.

The other technology options will not be suitable, due to the following reasons

1. **Incineration:** Due to low calorific value and high moisture content, this technology is not suitable for Indian Solid waste. Also capital, O&M costs will be very high.
2. **Pyrolysis and Gasification:** This process involves thermal decomposition at high temperature and besides recovering energy from the waste will ensure proper destruction of waste is possible. But due to the composition of the waste and high moisture content the application of this process is only limited.
3. **Pelletisation:** making fuel pellets is another option. Low calorific value wastes will not be suitable unless ingredients are added to increase calorific value. While a few Pelletisation plants are operating in India, long periods of project development and establishment are the hindrances in their large scale replicability at this stage.
4. **Bio-Chemical Conversion:** This is based on decomposition of organic matter to produce methane Gas. Anaerobic digestion in closed container can produce bio-gas to the tune of 50 to 150 m^3 per tonne of waste .Gas can be used for cooking, heating, or generation of electricity. Several schemes of bio-methanation plants are being planned in India

4.8.8 Composting

Considering the limited experience of above technologies and also as the surrounding areas being predominantly rural, it can be safely presumed that the composting will be suitable and will find a good market within the region. The SMC has already given the contract for composting the waste to M/s Clean Eco and Environment Developers Pvt. Ltd. Situated at Loni. The bio fertilizer is sold under the brand name of Nisarg Raja. Presently the composting is not done at Shirdi. The proposed disposal strategy for Shirdi will be to

- Compost the organic fraction of the waste (50% of the 7.5 tons – 2.75 tons in normal season and 40 tons (80% of total) during the three festivals at Shirdi.
- Sanitary land filling of inorganic fraction of waste and 20% compost rejects (1.5 tons/day during normal season and 10 tons (total) during 3 fairs
- Encouraging local level aerobic composting and
- Educating the community on 4R strategy (Reduce, Reuse. Recycle and Recover)
- Continuing and strengthening of the composting plant of the Sansthan.

Sections below discuss the various aspects of implementing the above strategy.

4.8.9 Area Required for Disposal Site

Area requirement for the composting and land fill sites is assessed for the base year 2031. The waste generation is estimated to be 21 tons per day. Out of this 21 tons around 7% i.e 1.5 ton will go to the vermicompost plant of Sansthan. Out of the remaining 19.5 tons the waste for composting works out to be 9.75 tons per day (50%), and that for the landfilling 11.7 is tons (including 20% compost rejects) by the design year. The design capacities have therefore been considered as 10 tons for composting and 12 tons for landfilling.

The above figures for 2011 would be total waste of 17 tons. The waste for the veri composting site of Sansthan will be 2 ton. Waste for composting 7.5 tons; and that for landfilling would be 7.8 tons (say 8 tons).

As summarised in Table 4.10, the area required for disposal of waste in Shirdi works out to a total of 49849 sq.m. This comprises of 651 sq.m of land for composting and 37300 sq.m for land filling of the inorganic waste. These area calculations form the basis for identifying the new disposal site or assessing the adequacy of the proposed composting site.

Table 4.9 : Area Requirements for Combined Composting and Landfill Plant in Shirdi

Component	Specifications	Area Requirements*, m^2
A. Composting		
Capacity of the Plant	10 tons per day (16.7 cum) (1 ton of waste = 1.67 cu.m)	
Type of Composting	Manual Aerobic	
1. Area for Windrows for 21 days fermentation period	21 nos of 2.0 X 1.0 m height Length of Windrows – 8.5 m	357.00
2. Spacing of Windrows	0.6 m	107.0
Total area for Composting		**464 (0.11 acres)**
B. Land Filling		
Capacity of the Plant	12 tons/day (9 t/d inert material + 1.8 t/d compost rejects)	
Total Quantity to be land filled till 2031	92000 tons (avg 10 tons/day for 25 years from 2005 to 2030, including 72 t during three fairs/year)	
Waste to be landfilled	56000 tons (@ 80% placed waste density)	
Type of Land filling	2.5 m (partly cutting and filling)	
Area Required for land fill		
Total area for Land fill	(1 ton of waste = 1.67 cu.m)	**49614 sq.m (12.25 acres)**
Total area for Disposal		**49629 sq.m (12.3 acres)**

Component	Specifications	Area Requirements*, m^2
Office, Internal roads and other common area (5%)		**2458 sq. m. (0.60 acres)**
Buffer zone around the site		**10000 sq.m**
Total area of the site		**61623 sq.m (15.22 acres say 16 acres)**
* - The above estimates for area requirement are preliminary estimates and are expected to vary during the DPR stage.		

4.8.10 Identification of Disposal Site

Identification of disposal site that meets the area requirements as estimated earlier and suits the siting criteria set out in the MoEF guide lines, is the next step in implementing the disposal options recommended for Shirdi.

Presently, the solid waste is being dumped in a open land near Rui Shivar off Pimpalwadi road within the SMC limits. The area of the site is about 1.03 hectares. Waste is dumped on the site manually left as it is. It was observed that the light materials such as plastic and paper are carried by wind to distant places, and the situation around the site is unhygienic. The nearest residential area is about 0.5 km from the site however, the town is developing in this direction. The above factors make this site unsuitable for composting and landfill.

The 1993 -2003 Development Plan (DP) of Shirdi prepared by the Director Town and Country Planning Maharashtra, has not identified any site for a compost plant/landfill. This could be because the existing landfill site can continue up to 2010.

As per the Municipal Solid Waste Management Rules, 2000 of MoEf, an integrated waste disposal facility comprising composting of organic waste and landfill of inert material is recommended at a suitable location. Hence, a separate site of 13 acres area should be identified for disposal of the solid waste.

Abandoned Quarries at Savli Vihir

It was informed by the SMC officials that some abandoned stone quarries exist on the Nashik road beyond the SMC limits near the area called Savli Vihir. These abandoned quarries could be suitable for disposal of the solid waste by landfilling. The site was visited by the Consultant and one of the pits was found to be suitable based on its location and visual observations of the strata and surrounding landuse. However, availability of the required area of land and feasibility of acquisition of the land has to be explored in the DPR stage. The landfill site can be developed jointly with neighbouring village authorities.

4.8.11 Layout of the Disposal Site and Operations of Land filling

The proposed site is designed to accommodate both the composting and land filling operations and hence the components of disposal site shall comprise of

- a compost plant of 10 ton capacity
- land fill site of 12 ton capacity
- demarcated areas for waste processing and storing the finished compost

- designated areas for stock piling daily cover material
- double clay liner, leachate collection and treatment system in the active land fill area
- weigh bridge and office space
- protective fencing all around and a main entry gate
- peripheral plantation 3 m wide where green belt is developed to improve the aesthetics
- main access Road of 6.00 m wide
- internal roads to provide access to all phases of the site and
- drainage facilities, etc.

A gradual method of filling the waste through cell method is recommended. Cells are so planned that it can take one years of waste completely and it can be closed after its life. The waste and compost rejects that are delivered in the site have to be spread uniformly and a two inch layer of inert material (say soil) has to be covered over the day's waste. In order to achieve better performance, the placed waste should also be compacted manually.

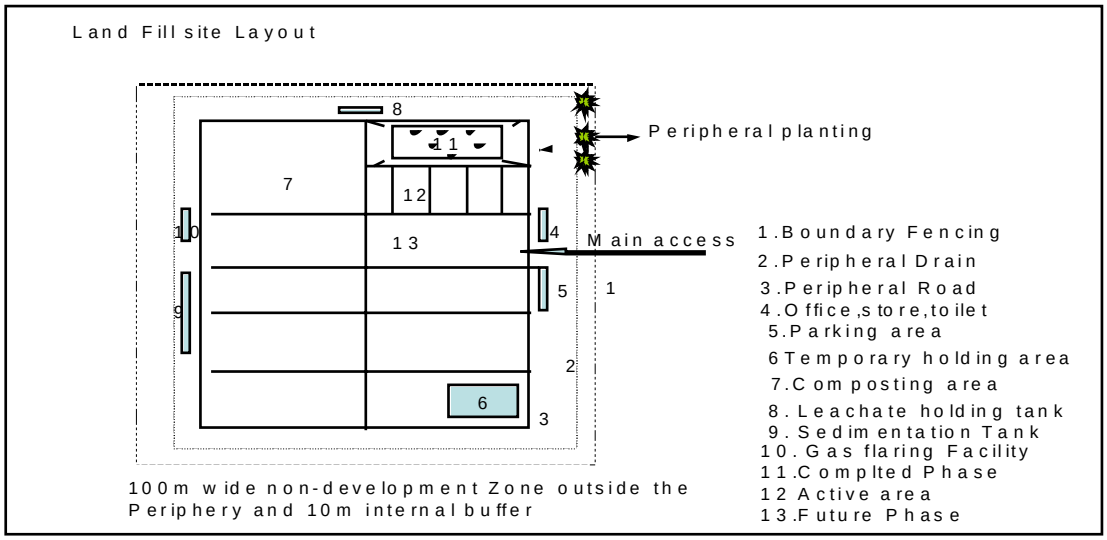
Problems of environmental pollution by way of leachates, ground water contamination, etc. from the land fill sites are minimised due to the fact that only inorganic waste is sent for land filling. However as a precautionary measure

- double clay liner at the bottom and the sides, compacted to achieve a permeability of 1x107 cm/sec
- provision of efficient drainage system to avoid storm water entry into the land fill area
- leachate collection and treatment system
- land fill gas collection and passive venting of the same

are recommended at the land fill site. A detailed design of the same however has to be carried out after finalising during the DPR stage.

Further to asses the impacts of the land fill site operations, it is also recommended to monitor the

- quality of the leachate before and after treatment
- ground water quality in the vicinity of the land fill site by way of monitoring wells and
- land fill gas generated from the closed cells of the site



4.8.12 Processing of Bio-degradable Waste in the Compost Plant

Aerobic Composting, Vermi composting and Anaerobic digestion are the three options of biological degradation of organic components in solid waste. Of the three, the simplest to develop, operate is Aerobic Composting. As present Shirdi town generates only about 2.5 tons of organic waste a day, mechanical compost plant is not viable and manual windrow composting will be the most ideal and economical option.

As estimated earlier, the compost plant needs an area of 651 sq.m and will be developed alongwith the landfill site. The composting unit comprises of

- 21 windrows of 8.5 m X 2.0m X 1.0 m arranged parallel to each other for receivingthe organic waste
- a manually or motor operated rotary screen for screening the wind row outputs
- maturity area for the compost to stabilise and
- packing and storing area

Fresh organic waste form the town will be delivered directly to one of the 21 windrow spaces on the paved/unpaved but levelled and well drained area. Each day's waste will form one windrow. Windrows loaded with the organic waste will be rotated manually on the 6th and 11th day from outside to centre, to provide aeration and destroy larvae.

On 21st day from the date of placing the waste on the windrow, the digested organic waste passed through a rotary screen of about 25mm square mesh to remove oversize materials. The screened compost will be stored for about 30 days in the maturity yard in heaps 2m x 1.5m wide to ensure that it gets stabilised before sale and the rejects will be disposed at land fill site.

To avoid odour, fly nuisance and the quality of the compost, a small amount of cow dung slurry is also added in the initial stages of windrow composting. Since the segregated organic waste is being used, it is estimated that around 20% of rejects will be generatedfrom the plant and around 2 tons compost out put is expected generate from the plant.

4.9 COSTING OF SOLID WASTE MANAGEMENT PROJECTS

The following table summarizes the cost estimates for the various proposals made above.

Table 4.10 : Cost Estimates for Proposed Solid Waste Management Measures

Item		Quantity	Rate	Amount
			Rs. Lakh / unit	*INR Lakh*
I.	Equipment			
	1. Refuse Collection Bins, Nos.	255	0.02	5.1
	2. Litter bins, Nos.	70	0.01	0.7
	3. Tools and equipment for garbage loading (Ghamela, Iron rakes, LLDPE baskets, spade, brooms)	70	0.01	0.7
	HDPE Dust bins for Hotels, Nos.	180 x 2 = 360	0.015	5.4
II.	Vehicles			
	1. Containerized push carts with 4 containers, Nos.	10	0.075	0.75
	2. Hydraulic Tipper (4 tons), Nos.	2	8.0	16.0
III.	Land acquisition for waste disposal site, sq.m	50000		
IV.	Compost and Landfill			

Item	Quantity	Rate	Amount
		Rs. Lakh / unit	*INR Lakh*
1. Compost plant, tons per day	10	1.5	15.0
2. Landfill, tons per day	12	6.0	72.0
V. Closure of existing SWD site at Rui Shivar			1.0
Sub Total			**116.65 say 120.00**
E. O & M Expenditure			
E1. Compost & land fill		8%	6.96
E2. Collection & Transportation		15%	4.29
Sub Total- E			**12.96**

Note: Cost estimates are based on Consultant's experience on similar projects and will vary depending on based on the DPR study.

Since the organic content is being sold to a private company it is expected that the cost of setting up the composting plant shall be borne by the company i.e. M/s Clean Eco and Environment Development. This is cost is therefore deducted from the total cost.

4.10 PHASING OF SOLID WASTE MANAGEMENT PROJECTS

The implementation of the project is phased in two parts up to the design year 2031. Phase I includes the immediate actions that need to be taken and period for same is 2005 to 2011. The Phase II includes the long term activities envisaged for solid waste management and disposal for the complete improvement in the environmental conditions. The period for Phase II is from 2011 to 2031.

Phase I (2005 – 2011) Activities

- Door to door collection in Pilgrim Zone
- Containerised push carts with separate bins for organic & inorganic waste
- Tools & equipment
- Additional trucks with hydraulic tipping arrangement one each for SMC and Sansthan
- Composting and secured landfilling
- 1.5 tons Vermicomposting at Sansthan's site can continue no capacity augmentation required.
- Compost plant capacity - 6 t/d
- Landfill site - 6 t/d
- Required area for composting – 0.05 acre
- Required area for landfilling – 5.0 acre (The existing site can be continued)

Phase I (2005 – 2011) Cost Estimate

The items for the first phase include purchase of dust bins, litter bins, vehicles and setting up of composting plant at SMC. Since the existing site can continue up to 2011 the cost of landfill is included in the next phase. The total cost for the above items is Rs. 40 lakhs. Out of these the Sansthan will bear the cost of its vehicle (Rs.8 lakhs) and the cost of setting up the compost plant and developing basic facilities around the site (Rs. 11.5 lakhs) will be borne by the private operator in this case M/s Clean Eco and Environment Developers. Thus funding will have to be sourced for the balance amount of Rs. 20.5 lakhs. The manpower required in this phase would be of 15 sanitary workers. The above cost does not include the annual recurring cost of Rs. 24000 per worker towards the salary.

Phase II (2011 – 2031) Activities

- Door to door collection in Pilgrim Zone
- Containerised push carts with separate bins for organic & inorganic waste
- Replacement of Tools & equipment
- Composting and secured landfilling
- Vermicomposting at Sansthan's site can continue no capacity augmentation required.
- Compost plant capacity - 10 t/d
- Landfill site - 12 t/d
- Required area for composting – 0.15 acre
- Required area for Landfill – 16 acre
- Land acquisition for new landfill site
- Closure of existing site at Rui Shivar

Phase II (2011 – 2031) Cost Estimate

The items for the second phase include replacing of damaged dustbins, litterbins, tools and equipments. The total cost for the above items is Rs. 80 lakhs. The cost of setting up the landfill site will be borne by private operator. A decision will have to be made by the authorities whether M/s Clean Eco and Environment Developers can continue or to call fresh tenders. The annual recurring cost for one sanitary worker would be Rs. 24000 per worker, which is not included in the above cost.

The agencies involved in the solid waste management project and their roles would be

- Collection and Transportation (house to house in Pilgrim zone and Shirdi Town) – SMC
- Collection and Transportation in Sansthan area – Sai Sansthan
- Development and operation of landfill site and compost plant – Private operator
- Awareness generation amongst residents and pilgrims – NGO's, SMC, School Children and Sai Sansthan
- Project Development assistance and seed funding – MPCB/ Private sponsor

4.11 STRATEGIES FOR HANDLING WASTE GENERATED BY PILGRIMS

Large number of tourists congregates in Shirdi on a pilgrimage to the Samadhi Temple. On average, about 15000 pilgrims daily visit Shirdi throughout the year. The pilgrim inflow is fluctuating with high inflow on Thursdays and weekends, during the fairs and other festivals, and goes down to lowest levels during non-festival season. The inflow is also related to the school vacations that fall during summer, Diwali and Christmas times. By and large January, February, August and September are lean season. The number of people visiting is high during the three important festivals of Dussera (October), Ramnavmi (April) and Gurupurnima (July).

Considering these aspects, special strategies are required to manage the solid waste generated during this peak season. Since the generation is for a very short period (2 to 3 days in a month), development of permanent infrastructure for additional capacities is not economical. In view of this the following strategies are recommended for the identified location of Shirdi town during the peak season.

1. The Pilgrim Zone shall be declared as the Special Sanitation Area
2. Collection and conveyance of waste in these areas shall be assigned to a special team of

sanitary workers, who will attend to the cleaning operations at least thrice a day. In case of places around temple and Bus Stand, adequate number of people should be deployed to attend the conservancy operations.

3. Specially designed litterbins as presented in section 4.3 shall be placed at 50 m interval in the Pilgrim Zone for people to place the waste in the bins.
4. Waste from these bins shall be collected thrice a day.
5. The Special Sanitation Team engaged for the conservancy operations in these areas shall be provided with the separate uniform that identifies them easily and helps to educate the pilgrims on solid waste disposal.

4.12 COMMUNITY PARTICIPATION AND NGO INVOLVEMENT

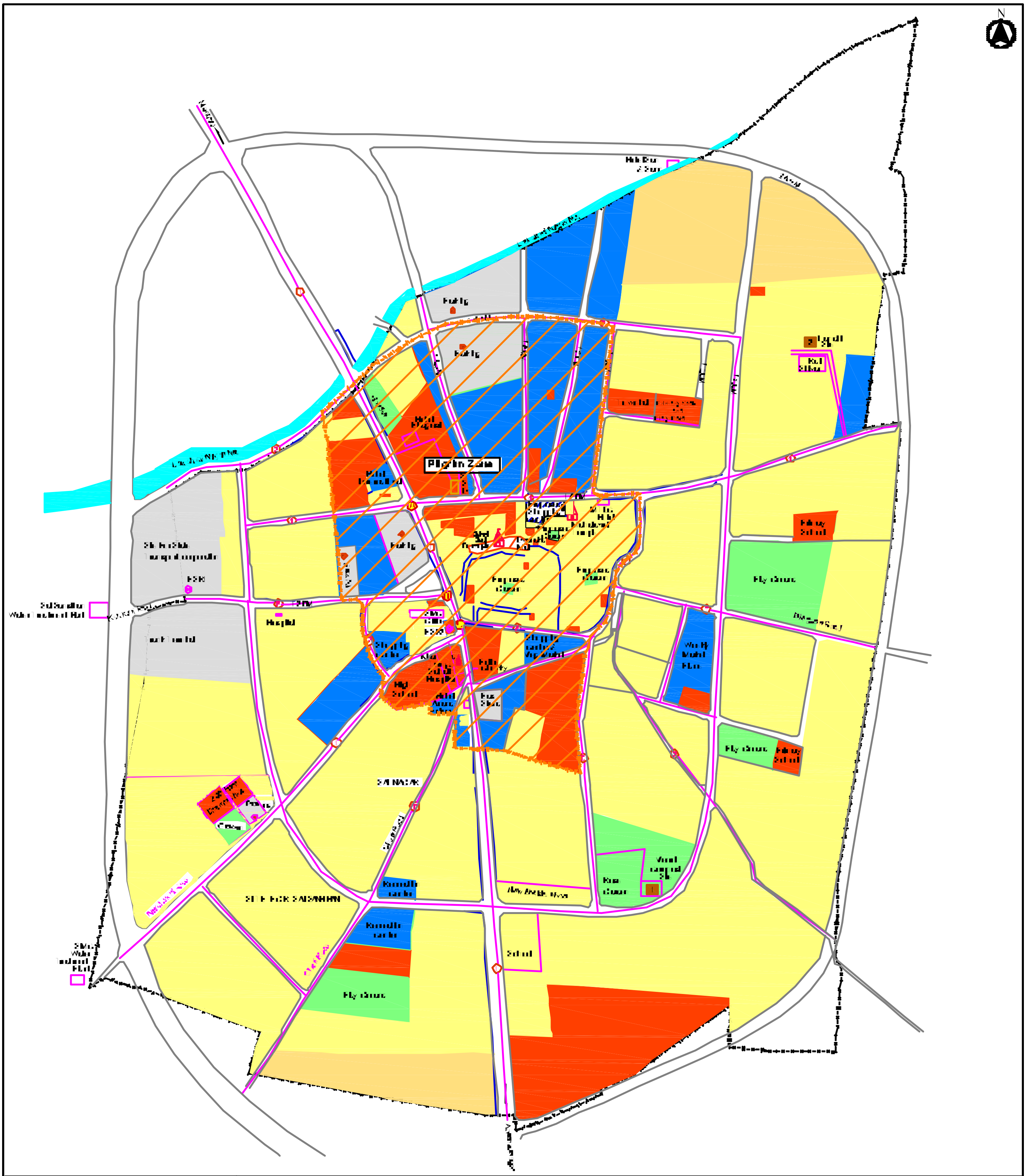
Public awareness and public involvement in the entire process of solid waste management is essential, which at present is managed through the temple administration. It is essential that the solid waste generators actively participate in mitigating hazards arising from improper waste management. One such initiative could include developing an Information, Education, and Communication (IEC) mechanism with the help of Non-Governmental Organizations (NGOs) working in the area.

Shirdi has many Hotels and Lodges. They can be roped in to sponsor the awareness schemes and signs and signage for cleanliness in the town. Shirdi has 3 schools the students from the schools could be deployed to create awareness among the pilgrims. Most of the pilgrims coming to Shirdi are educated urban people hence the school students spreading the message of cleanliness can have significant impact. The employees association of the Sai Sansthan, some local NGO's and member arriving with the palkhis can be sensitised to spread awareness on solid waste management issues in the town.

4.13 PRIVATE SECTOR PARTICIPATION

The following sectors shall be developed with private sector participation:

- Door to door collection of domestic, commercial and hotel wastes in pilgrim zone;
- Collection, transportation, treatment and disposal may be evolved on the pro-rata basis for door to door collection of waste, and hotel/restaurant waste;
- Awareness creation;
- Capital and maintenance cost for new vehicles/push carts; and
- Operation and maintenance of the Compost plant.



Major Roads in Shirdi

Important Junctions

Infrastructure Facilities

CONSULTANT:

Wilbur Smith Associates Pvt. Ltd.

TITLE:

Figure No.

Solid Waste Management Scenario

SCALE: NTS

DATE:

CLIENT:

Maharashtra Pollution Control Board

PROJECT:

Action Plan for Environmental Improvement
Of Shirdi

DWG. NO:

5.0 WATER SUPPLY

5.1 INTRODUCTION

Shirdi town is in Ahemadnagar District in the state of Maharashtra. The existing water supply system requires to be improved and the distribution system strengthened and expanded to cover the entire town. The population of the town as per the 2001 census is 26169. This section of the feasibility report comprises a need assessment of the water supply system and improvements required on a short-term and long-term basis to ensure equitable distribution.

5.2 EXISTING SYSTEM

The Existing Water Supply Scheme in Shirdi is designed on the basis for a rural water supply scheme with a flow rate of 40 lpcd to serve 15000 people for resident population and with a flow rate of 20 lpcd to serve a floating population of 25000. The intake is located on the Godavari Right Bank Canal. The Existing scheme has an earthen Storage Tank of capacity 22 Million Litres with a detention period of 15 days. Treatment plant comprises of settling tank and pressure filter (18 m x 6 m having capacity of 2, 70,000 litres), One Elevated Service Reservoir of capacity 3, 50,000 litres with distribution network. Since the Water Supply to Sai Sansthan from this plant was in adequate to meet the requirement, one more piped water supply scheme for Sansthan, Kankuri village and Pimpalwadi village was sanctioned to pump water for 12 hours of a day. The Scheme is maintained by Sai Sansthan, on be half of ZP, Ahmednagar. The Scheme operated by Shirdi Sansthan has a capacity of 6.6 MLD with balancing tanks of 90 million litre capacity and treatment plant, Reservoirs at (1) Kankuri – 50,000 litres, (2) Pimpalwadi – (75,000 litres), (3) Sansthan – 10,00,000 litres and distribution network. The Intake is same for the scheme but is at different location on the Godavari Right Bank canal. This scheme has 3 balancing tanks of sizes 271 m x 114 m x 8 feet deep, 265.6 m x 341 m x 8 ft deep and 182 m x 65 m x 8 feet. There is pumping from two ponds with 5 hp pumps and the treatment plant comprises of Chemical mixing units, Clariflocculators, Filtration Plants, and Chlorination with Transmission line to the Elevated Service Reservoirs and from there to service reservoirs at various locations of the Sansthan.

5.3 NEED FOR UP GRADATION OF WATER SUPPLY SCHEME

Presently the existing water supply schemes operated by Town Panchayat and the Sanastan are not meting the adequacy of the water demand. The present per capita water supply is less than 70 lpcd for 70% percent of the population and less than 40 lpcd for floating population as adjudged by Mahrashtra Jevevan Pradhikaran.

The present day utility of water only from Sansthan is about 2.3492 MLD from the service reservoirs excluding the bore well supplies, which is not accounted in the calculations or the data. The Municipal water supply is limited to its boundary excluding the Sansthan to about 3 lakh liter per day. Hence, looking into the floating inflow of population and the future population growth and from the point of hygiene and environmental sanitation, present supply scheme is to be up graded to the norms specified by Central Public Health Environmental Engineering Organization, CPHEEO.

5.4 POPULATION PROJECTION

There is a steady growth in the population of Shirdi during 1951, 1961, 1971 and 1981. But, the growth trend in the last two decades, between 1991 and 2001, indicates that there is more

or less an increase in the population by two times the earlier decade population. This may be due to the probable reasons like inclusion of some of the additional areas into the Municipal fold, increase in land use pattern or due to unknown reason contributing for the population growth. Populations projected through ***Logistic Curve Method*** appears to be suitable for design considerations, as it follows the growth trend of the city on reasonable consideration of land use, developments and other factors for future infrastructure proposals, shall be adopted for design considerations, as this method

Table 5.1 : Projections for Water Supply Demand

Sl. no	Projections	1951	1961	1971	1981	1991	2001	2011	2021	2031
1	Available Data	2950	5239	6369	8806	15129	26169	*	*	*
2	Arithmetic Progression				*	*	*	30813	35457	40100
3	Geometric Progression				*	*	*	45314	78467	135874
4	Incremental Increase				*	*	*	28625	39832	46664
5	Logistic Curve				*	*	*	36353	57396	74306

The expected floating population during the years 2011, 2021 and 2031 is expected as 26275, 27616 and 33696 persons based on the available trend of existing floating population.

The table 5.1 shows that there will be a resident population of 74306 during 2031. The floating population at that time will be 33696. As per the State Water Policy, the per capita water demand will be 90 litres. The Floating Population will be served with 30 lpcd of water. The Demand for the ultimate design year is given in the table 5.2.

Table 5.2 : Water Demand projections

Status	Projected Population (Residents)	Demand @ 90lpcd (LL)	Projected Population (Floating)	Demand @ 30 lpcd (LL)	Total Population	Total Demand (LL)
Census (2001)	26169	35.33	19372	5.81	45541	29.36
Ultimate (2011)	36353	32.72	26275	7.88	62628	40.60
Ultimate (2031)	74306	66.88	33696	10.11	108002	76.98
Additional Population during the Fairs			300000	90.00	300000	90.00
Total water demand in Lakh Litres						166.98
Total water demand in MLD						16.70

The Ultimate Water Demand during the design year 2031 including the floating population is **76.98** Lakh litres per day. The total Water Demand in the town is **166.98 Lakh Litres** per day including the population need of one-day mela. But the quantum of water needed for a day celebrations is not considered as they may be served through alternative arrangements, like mobile tanker, through existing network by processing additional volume of waters etc.

5.5 PROJECTS IDENTIFIED

Based on the above analysis the following projects are identified

5.5.1 Proposed New Scheme by MJP

Considering the Water Demand for floating population visiting the town and inadequacy of existing plant to meet norms, ***MJP has proposed*** to take ***water from Darna dam site*** with a proposed cost of 15.7982 crore with separate balancing tanks, raw water rising mains, transmission lines and distribution lines and the treatment plant of capacity is MLD. The proposed per capita water demands are 70 lpcd and 40 lpcd for 70 of population (77000) and 30% of the population (150000). The daily demand is 9.49 MLD. ***The proposed treatment plant capacity is 8.5 MLD.*** This scheme id designed for the design year 2031. As part of the proposal, the municipality procures Pipes and MJP does the remaining pipe laying other related jobs. The procurement of pipes are in progress from municipal side, in accordance with the sizes proposed by MJP as per detailed engineering study report and the project is yet to start for civil works, as it has already procured the technical sanction from the government.

5.5.2 One Day Gathering – Gurupurnima/Dussera/Ram navami

The Festive days like, Guru Purnima, Ramnavami, Dussera, about 2 – 3 lakh people are expected. For these people 30 lpcd water is more than sufficient to meet the needs. This additional water to this floating population shall be supplied either through the existing network or through h mobile tankers at specified locations. This volume of water has not been considered in the design demand, as it is a one day or two day affair in the whole year.

5.5.3 Adequacy Check of Water Treatment Plant

The water required for this period shall be processed through the up coming 8.5 MLD Darna Dam Intake with a treatment plant for a capacity of 8.5 MLD in parallel with the existing 1.5 MLD plant at Kankuri site of the Sansthan. The cumulative water treatment plant capacity *excluding Shirdi Municipal Council's old plant of 1.5 MLD capacity* is 10 MLD. This is more than 7.698 MLD. Hence the new scheme will meet the requirement of water needs of Shirdi town.

5.5.4 Rehabilitation of Existing Municipal Water Treatment Plant

The Civil Structure are to be revamped with internal plastering and paints, the chemical house to be made active as it is not functional presently and instrumentation is required for alum/ chlorine dosing etc. related works.

5.5.5 Adequacy Check for Elevated Service Reservoirs

The service reservoir of Sansthan has 207000 litres capacity GLSR and 3099820 litres capacity ESR. The municipality is having one 3 lakh litre capacity service reservoir. The new scheme adds about 45 lakh litre capacity. The cumulative volumes of tanks are more than adequate to supply water people as per norms for the design population as this is more than the one third capacity required, of total demand.

5.6 CAPITAL COST

About 25 – 30 lakhs are needed to rehabilitate the municipal plant and that covers replacement of old pipes, valves, agitators mixing chemicals, Dozers for Chlorine mixing, etc. related civil mechanical and electrical works.

6.0 ROADS & TRAFFIC IMPROVEMENT

6.1 EXISTING ROAD NETWORK

Shirdi is connected to the District Head Quarter Ahmednagar and nearby main urban centres through the Ahmednagar Manamad SH - 10. It is also connected to the villages of Pimpalwadi, Nandurkhi and Kankuri by BT roads.

Internally, the entire Shirdi town is connected by roads and lanes. The internal roads in the gaothan are mostly 7 m wide, but the important amongst them such as the Palkhi Marg are being widened to 9m.

The major roads in the Shirdi town are as below. These roads cater to the demand of the commercial traffic through the town.

Table 6.1: Major Roads in Shirdi

Sl No	Road	Type	Width (m)
1	Pimpalwadi Road	CC	15 m
2	Ahmednagar Manmad Road	CC	30 m
3	New Pimpalwadi Road	CC	12 m
4	Palkhi Marg	BT	9 m
5	Kankuri Road	BT	12 m
6	Nandurkhi Road	BT	12 m

Source: Shirdi Municipal Council and field survey 2005

The Ahmednagar – Manmad Road passing through the Shirdi town, witness's movement of heavy commercial vehicles such as trucks and containers. All the important buildings in Shirdi such as the Sai Samadhi Temple, the SMC office, guesthouse and lodges of Sai Santsthan and other hotels and lodges are situated on this road. The other important roads to nearby villages such as Pimpalwadi, Nandurkhi and Kankuri join this road and the junctions are awkward in most cases.

The Palkhi Marg is an important road in the Gaothan and the procession of Sai Baba is taken out along this road on all the important festivals. This road is presently being concretised and widened to 9m. The Palkhi Marg forms the inner most ring road for Shirdi.

The Pimpalwadi and the New Pimpalwadi road form the second ring. Both the roads have been concretised and widened to 12m width. The Pimpalwadi road serves as access to most of the commercial area and hotels near the temple. The New Pimpalwadi road is gives access to the vegetable market and residential areas behind the Samadhi Temple. There are few hotels on this road as compared to Pimpalwadi Road.

The Kankuri and the Nandurkhi Road serve the rural areas outside the SMC limits. At present both the roads have residential areas along both sides for a length of 1km after which there is agricultural land. The Kankuri road leads to the water treatment plant of Sai Santhan and the Nandurkhi road leads to the water treatment plant of the SMC. The roads are 12m wide within SMC limits.

The road network in Shirdi is about 60 km, of which 21 km are Bitumen Topped (BT) roads and about 10 km are Concrete roads. About 14 km of roads are stone/ mud topped roads and another 11 km of roads are Kutcha roads. The narrow by lanes in the Gaothan area have been concretised.

Table 6.2 : Details of Roads in Shirdi

	Type of Road	Owned by NP	State Highway	Other	Total
1	Cement Concrete	10.16	-	-	10.16
2	Tar road	20.91	2.50	-	23.41
3	Stone/ Mud topped	14.20	-	-	14.20
4	Other	11.13	-	-	11.13
	Total	**56.40**			**58.90**

Source: Shirdi Municipal Council

Following roads in the Shirdi town are maintained by PWD. Rest of the roads are maintained by the SMC.

Table 6.3 : Important Roads Maintained by PWD and SMC

Sl No.	Road	Type	Approx. Length (km)
	Roads maintained by PWD		
1	Ahmednagar Manmad Road	CC	2.5 (within SMC limits
	Sub-total PWD roads		**2.5**
	Roads maintained by SMC		
1	Pimpalwadi Raod	CC	0.465
2	New Pimpalwadi Road	CC	0.63
3	Palkhi Marg	CC	0.55
	Nandurkhi Road	BT	0.875
	Kankuri Road	BT	2.0
	Sub-total SMC roads		**4.52**
	Total		**7.02**

Source: SMC, Road Department

Within the municipal limits, the width of the roads range between 3-30 m (10 to 60 ft). However, roads within the Gaothan area of the town are narrow bylanes and have a width ranging from 3 to 8 m (10 to 25 ft). The road surface is either concrete or bituminous in nature. The important traffic junctions in Shirdi town are;

Table 6.4 : Important Traffic Junctions in Shirdi

Sl No.	Name	No. of Roads
1	Pimpalwadi Road Junction	3
2	Kankuri Road Junction	3
3	Nandurkhi Road Junction	4

Source: SMC and field Survey 2005

Of the above, the junctions Nandurkhi Road junction is prone to frequent traffic jams due to movement of traffic from the MSRTC Bus stand, built up area, commercial activities, and haphazard parking. The Pimpalwadi road junction is likely to become critical when the DP road on the eastern side is developed.

6.2 PUBLIC TRANSPORT

The Maharashtra State Road Transport Corporation (MSRTC) receives 352 buses daily from different locations in Maharashtra and outside Maharashtra Private buses are also available from Mumbai, Pune, Banagalore, Hyderabad etc. Shirdi does not have a municipal transport facility. The MSRTC bus stand is located on the Ahmednagar Manamad Road. Six seaters ply between Shirdi and nearby places such as Kopargaon, Rahata, Bhableshwar etc. There are about 300 private taxis plying on the Shirdi - Shingnapur Route.

6.3 PARKING FACILITIES

Vehicle parking is not a major area of concern at present in Shirdi. The SMC does not have a parking lot of its own. There are two private parking areas for the pilgrims. The Sai Sansthan has parking facilities at its accommodation facilities, which takes care of most of the parking needs of the people staying there. The details of the parking areas are given in table 3.5. The area of concern is providing adequate parking for private buses and private taxis. The entry of vehicles in the town during festivals is moderated. Vehicles are permitted depending on availability of parking area. Most vehicles are parked on the outskirts of the town in open grounds.

Table 6.5 : Details of Vehicle Parking areas in Shirdi

Sr. No.	Name	Approx Area	Vehicles inflow
1	Ahmednagar Manmad Road Parking	1 Ha	Thursdays – 250 Normal weekdays – 100 Weekends – 400 Ram Navmi & festivals – 1000
2	Pimpalwadi Road Parking	2 Ha	Thursdays – 200 Normal weekdays – 70 Weekends – 300 Ram Navmi & festivals – 500
Sai Sansthan			
	Dharmashala	0.5 Ha	100 vehicles (or 60 buses)
	Bhakta Niwas	0.5 Ha	100 to 150 vehicles
	Sai Prasad	0.25 Ha	50 to 60 vehicles

Source: Sai Sansthan officials and Parking operators

6.4 STREET LIGHTING

Provision and maintenance of streetlights is an obligatory function of Shirdi Municipal Council. The Council executes the work of installing new streetlight poles and cabling works. The Potentials of private sector participation in streetlight operation and maintenance need exploration.

There are 550 streetlights in the city, spaced at an average distance of 107m. Conventional fluorescent tube lights account for 61% of the total lights, and the Mercury and Sodium Vapour Lamps accounts for 31% of the total number of streetlights. High mast lighting and High-powered fixtures are absent in the town. The Temple complex is well lit and the lighting is managed by the Sansthan.

Table 6.6 : Street Lights

Luminary Type	Units
	Nos
Halogen Lamps	-
Mercury and Sodium Vapour Lamps	214
Tube Lights	336
Others	
Total	550
Total road length, km	58.90
Spacing of street lights, m	107.09
Desired spacing	

Source: Shirdi Municipality Annual Report 2002-03

6.5 SERVICE INADEQUACY AND KEY ISSUES

Traffic management in Shirdi are mainly governed by the flow and movement of pilgrims in the town. The SMC and the Sai Sansthan has taken up the improvement of important road and the work is under progress. This has considerably solved the immediate problems of traffic management in the town.

The smaller issues of traffic and transportation comprise the congestion on Ahmednagar Manmad road due to through traffic, although the road has been widened to 30m wide 4 lane divided carriageway. Most other important roads branch out from this road hence there are minor traffic problems at these junctions. The junctions are not evenly spaced due to which the situation becomes complicated with respect to traffic management.

The key issues and conclusions based on field visits and data analysis are presented below.

Table 6.7 : Essential Road Network Indicators

Indicator	Current Situation
Road Density	3.68 km/sq. km
Per capita Road Length (Municipal Roads)	2.15
Percent of surfaced roads (BT and concrete roads) to total road length	55
Percent of un-surfaced (WBM and kutcha) roads	45

Source: Analysis.

(i) High density and congested lanes – The Ahmednagar Manamd Road is congested with almost all the important activities of the town happening on the road. The Palkhi Marg and are around the Samadhi Temple has many shops selling flowers and the pooja articles. The road width is very narrow in these areas.

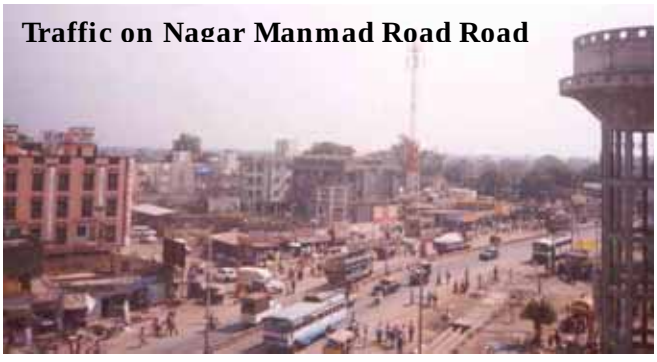
(ii) Informal activities along roadside - The margins of roads are encroached upon near the Samadhi Temple in the Gaothan area by small street vendors, illegal parking and other informal activities. The Palkhi Marg is being widened and encroachments are being demolished. The SMC is in the process of rehabilitating/ removal of encroachments from the Ahmednagar Manamad Road and the Pimpalwadi Road. Once this is complete most of the problem will be solved.

(iii) Absence of street furniture/signage - The roads lack signals, signage, and footpaths.

(v) Inadequate parking facilities for private taxis and buses – Taxis are parked on the main roads there by creating problem to the other traffic. Almost 50 private buses enter the town daily but there is no authorized bus stand/ parking area for these buses. Some times they stand on the main road in search of passengers or to pick up regular passengers from the temple and nearby hotels.

(vi) Thorough traffic of heavy commercial vehicles - The Ahmednagar Manmad Road passes through the centre of the town. Many heavy vehicles ply on this road. The road has been widened to 30m recently, which has eased the problem for the time being. The PWD has proposed a bypass called the Shirdi Rahata Bypass to

Traffic on Nagar Manmad Road Road



avoid the through traffic from entering the town. The SMC has also requested the Sate Government to work out the feasibility of constructing a flyover on the Ahmednagar – Manamad Road for the entire length (approx 2.5 km) that passes within the SMC limits. However this is at conceptual stage and no details are available about the same.

Table 6.8 : Traffic Volumes on Ahmed Nagar Manamad Road

Location	Dec 99	Dec 02	Dec 03	May 04	Dec 04
Savli Vihir	26355	22482	24680	20121	-
Babhleshwar	Not Avlbl	Not Avlbl	Not Avlbl	20065*	20596
Ahmednagar MIDC	23806	20293	21306	22944	-

* Data for September 2004

Source: Public Works Department, World Bank Division, Ahmednagar

(vii) Junction improvement – Major junctions in the town namely Pimpalwadi Road Junction, Nandurkhi Road Junction and Kankuri Road Junction lack traffic management facilities such as signage, traffic island, dividers, high mast lights etc. causing blockage to regular traffic, air and noise pollution, grimy aesthetics. These junctions can also be improved with some beautification measures such as fountains, green islands etc.


Nandurkhi Road Junction

(viii) Inadequate street lighting - The new residential development is not sufficiently covered by streetlights.


Auto Rickshaw parking c


Pimpalwadi & Nagar ManmadRoad

6.6 PROJECT IDENTIFICATION AND COSTING

Improvement of road network provides a conspicuous improvement in the urban fabric and act as major catalyst in stimulating the development of the region. The following proposals are based on road surface conditions, deficiency in the road network, connectivity evaluation, parking and pedestrian requirements, and are based on discussions with the SMC staff and site inspections. The locations of the proposed improvement areas are shown in Figure 2.2

6.6.1 Road Improvements

The strategic objectives of road network improvements are (a) To improve the connectivity

and accessibility within the town, (b) To improve the efficiency of road space, and (c) To reduce delays at the junctions and remove bottlenecks if any.

The recommendations include:

i. Rehabilitation of existing roads, involving resurfacing of roads and in some cases, reconstruction; and undertaking periodic maintenance of the same.

ii. Upgrading of existing roads, by widening some main roads (to possible extent)

iii. Developing new roads as per the alignment proposed in the 1993 - 2003 DP.

The Sai Sansthan and the SMC has taken up the improvements of important roads in the town. The work is in various stages of completion. The details of the same are given in Table

Table 6.9: Road Improvements Under progress in Shirdi

Sl No.	Road	Proposed Improvements	Cost (Rs. Lakh)	Stage
1	Ahmednagar Manmad Road	Strengthening and widening of the road within SMC limits.	297.40	75% work completed
2	Old Pimpalwadi Road	Strengthening and widening and concreting	105.80	Complete
3	New Pimpalwadi Road	Strengthening & widening	45.0	Complete
4	Nandurkhi Road	Widening and black topping	11.50	80% complete
5	Palkhi Marg	Widening and strengthening	138.80	Work started
	Total		**598.85**	

Source: SMC Road Department and Sai Sansthan Construction Department

Table 6.10 : Improvement of Major roads

Sl No.	Road	Proposed Improvements	Length (km)	Cost (Rs. Lakh)	Priority
1	Kankuri Road	Strengthening and widening of the Kankuri Road from junction with Nagar Manmad Road to SMC boundary including construction of 1.5 m wide foot path on both sides.	2.0	66.6	Medium
2	Kankuri – Dorhale Road	Strengthening and widening from existing 3.5 m to 5.5 m wide	3.0	50.6	Low
3	Road Parallel to Laxmi Nagar Nala	Strengthening & widening of the road from junction with Nagar Manmad Road to SMC limits	2.0	43.0	Medium
4	Biregaon Road	Strengthening and widening	1.5	25.3	Medium
	Total			**185.5**	

Source: Analysis

6.6.2 Construction of Bypass Road to avoid Heavy Vehicle Traffic through the Town.

Priority - High

The field survey showed that majority of the commercial traffic plying on Ahmednagar Manmad Road not destined to Shirdi, causing traffic and pollution problems.

To avoid this, the PWD has proposed a bypass road along the eastern side of the town. The alignment branches off the main road at Nighoj, 2.0 km before Shirdi on Manmad side and goes via Dorhale, Korhale, Kelwad, Khadkewake and joins the old road at Pimpri Nirmal 11 km from Shirdi on Ahmednagar side. The total length of the bypass is 23 km and it is a 2 lane carriageway. The alignment is shown in Fig 2.3.

Construction of the bypass road should be taken-up at the earliest and shall be maintained properly to encourage its usage by commercial traffic.

Cost estimate

The following specifications are considered for estimating the cost of the proposed bypass road.
Carriageway – 7m
Hard shoulder – 1.5 m both sides
Total length – 23 km.

The total cost of the bypass is 15.28 crores.

The other recommendations include:

i. Formulation of a road development and maintenance plan with prioritization of roads
ii. Rehabilitation of hawkers and vendors who have encroached the Ahmednagar Manmad Road road, Palkhi Marg and other roads in the town.
iii. Conversion of Pimpawladi and New Pimpalwadi Road as one way road
iv. Shifting of MSRTC bus stand to the location identified in the DP on Kankuri Road
v. Extension of the existing road system proposed in the Development Plan (DP), to improve linkages to town expansion areas; such as the Kankuri Road to Dorhale Road and the Nandurkhi Road to Korhale Road
vi. Developing the 18.0 m wide ring road having a length of 3km and the 24m wide outer ring road having length of 1.8 km.

Table 6.11 : Construction of New Roads

Name of the Road	Length	Width and type	Cost (Rs. Lakh)
1. Ring Road	3.0	18 m BT	366.00
2. Outer Ring Road	1.8	24m BT	261.00
3. Shirdi Bypass	23	2 lane BT State Highway	1528.00

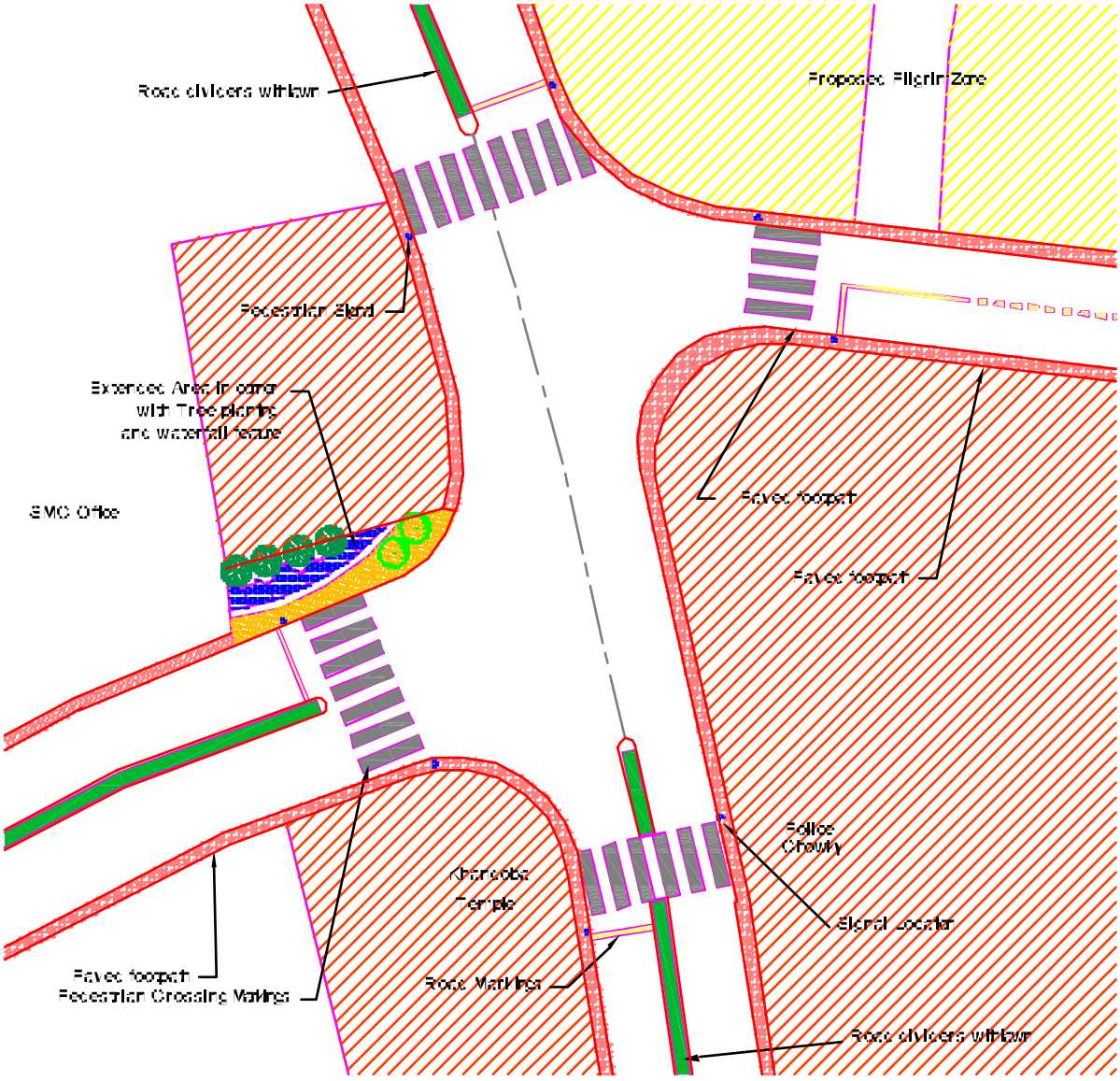
6.6.3 Junction Improvements

The following major intersections in the town are recommended for improvements for better traffic management and beautification of the town. Proposed improvements at each of the junction are described below. The summary of the same is presented in Table 6.15.

Table 6.12 : Cost of Junction Improvements in Shirdi

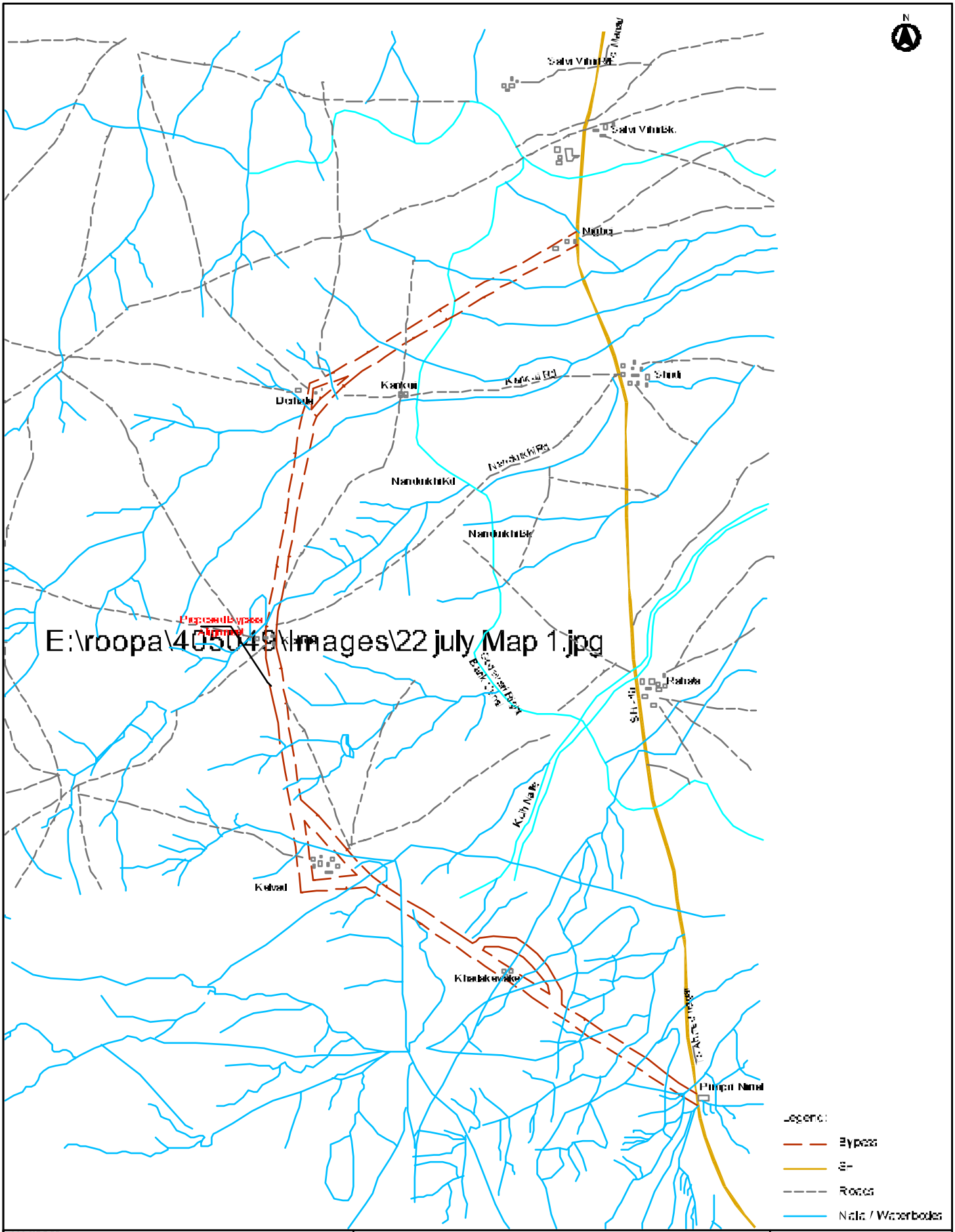
Sl No.	Name of the Junction	Proposed Improvements	Cost (Rs. Lakh)
1	Pimpalwadi Road Junction	Signalising the junction, Signs and Signage, High mast Lamp	20.00
2	Kankuri Road Junction	Traffic island, widening of the square by partial acquisition of the parking area, signages, green belt, high mast lamp	23.00
3	Nandurkhi Road Junction	Landscaping in northwest corner, signages, Tourist map of Shirdi, green belt, high mast lamp	21.00
4.	All the above	Landscaping	5.0
	Total		**69.0**

Source: Analysis



NANDURKHI ROAD JUNCTION

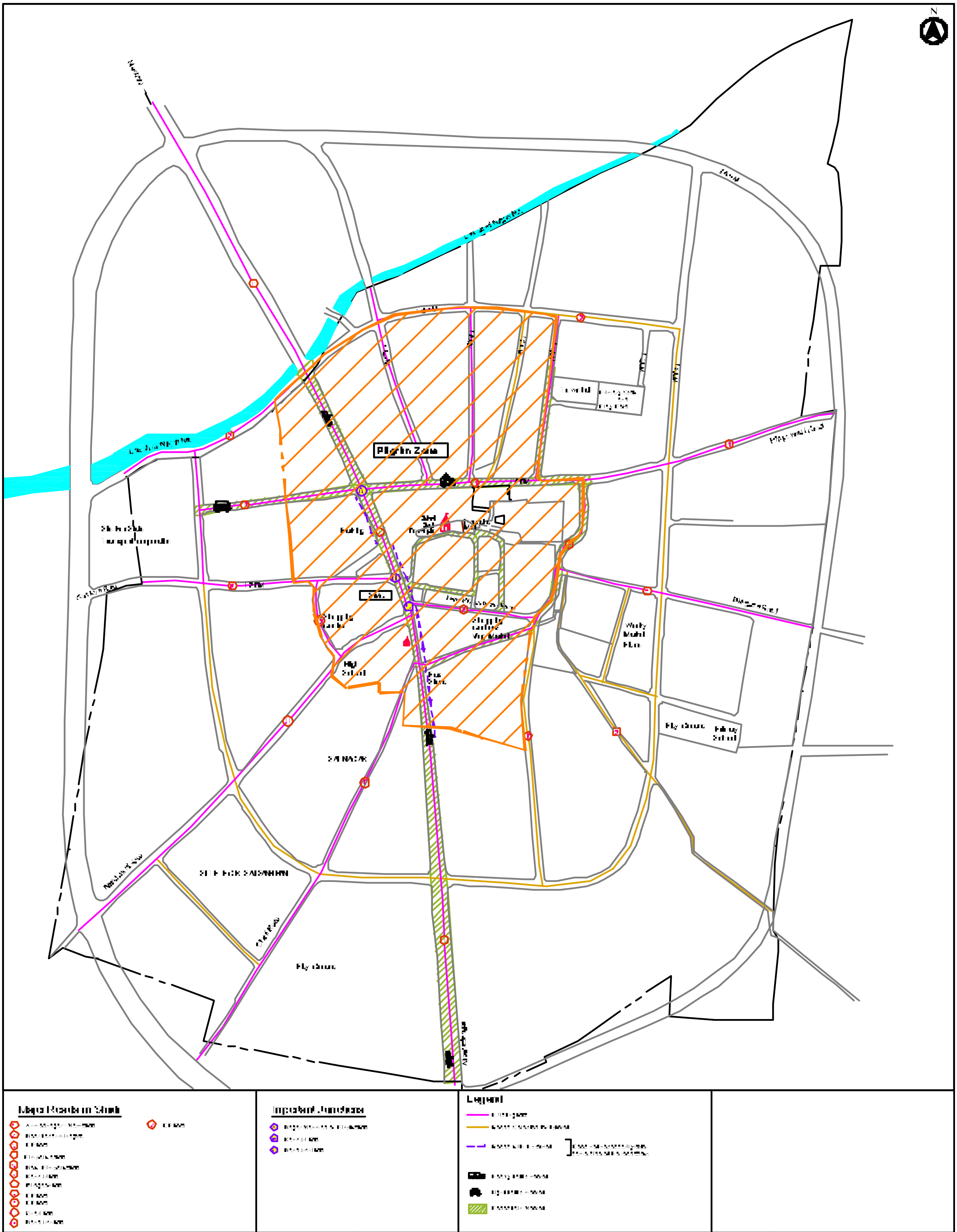
CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Figure No. 4 Proposed improvement of Nandurkhi Road Junction	SCALE: NTS DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement in Shirdi	DWG. NO:



E:\roopa\4050439\Images\22 july Map 1.jpg

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	Figure No:2 Proposed Alignment of Shirdi Bypass	SCALE: NTS DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement of Shirdi	DWG. NO:

Source : PWD World Bank Division Ahmednagar



Consultant: Wilbur Smith Associates Pvt. Ltd.

Title: Existing Traffic Scenario & Proposed Improvement in Shirdi

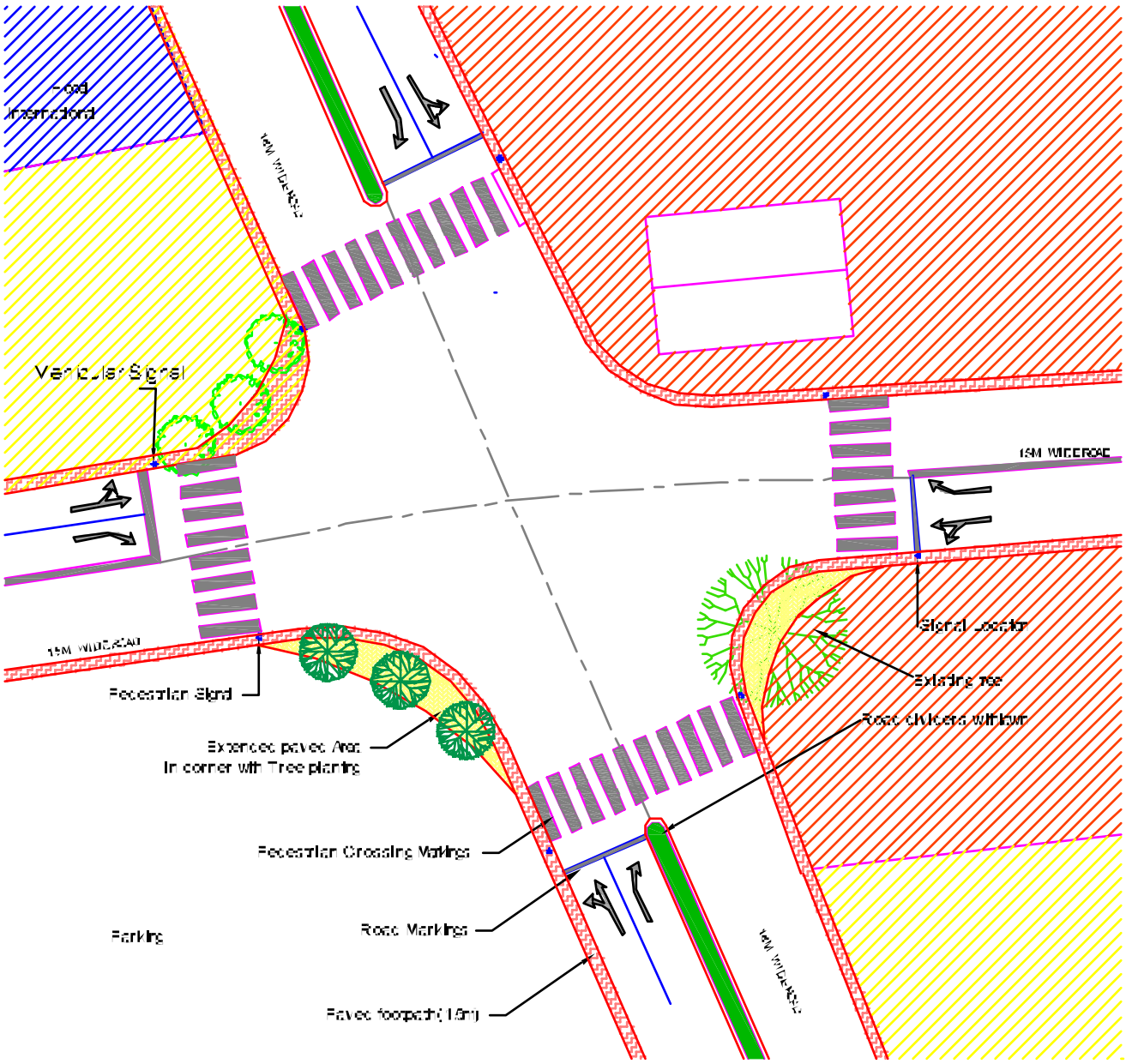
SCALE: NTS

DATE

Client: Maharashtra Pollution Control Board

Project: Action Plan for Environmental Improvement in Shirdi

DWG. NO:



NACAR MANMAD - PIMPALWADI ROAD JUNCTION

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Proposed Improvement of Nacar Manmad - Pimpalwadi Road Junction	SCALE: NTS DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement in Shirdi	DWG. NO:

6.6.3 Pedestrian Facilities

Pedestrians' movement is a significant component of the traffic in Shirdi. The movement of people is usually in groups. Based on the pedestrian demand assessment during normal and festival periods, following recommendations are formulated with an objective to make walking easier on the streets of Shirdi.

(i) To provide for adequate pedestrian infrastructure such as footpath.
(ii) To improve pedestrian safety by providing facilities such as pedestrian guardrails at major intersections.

Project 1 - Provision of 1.5m wide footpath on the following sections

Road Section	Length	Estimated Cost Rs. Lakh
1. On the Ahmednagar Manmad Road for the entire stretch of 2.5 km within SMC limits	2.5 km	41.25
2. Pimpalwadi Road from Nagar Manmad Road up to Junction with New Pimpalwadi Road	1.5 km	24.75
3. Kankuri Road from Nagar Rd Junction to SMC limits	2.0 km	33.00
Total		**99.00**

6.6.4 Parking Facilities to avoid congestion on important roads.

The key objectives are;
i. To prevent unauthorised parking of private vehicles, trucks and auto rickshaws on streets and
ii. To plan and provide for on-street and off-street parking facilities.

Based on the parking demand and availability of space at respective locations the parking supply is categorised in to on-street and off-street parking. The following projects are formulated to cater to the parking demand in the town. They are,

i. **Shifting of MSRTC bus stand Development of integrated MSRTC and Private bus terminus -** The above arrangement is proposed keeping in view the present concentration of all religious, commercial and institutional activities along the Ahmednagar Manmad Road However, in the long term, the non-conforming activities to Pilgrim zone, such as commercial and institutional activities, are proposed to be shifted along the 18m wide ring road and the 24 m wide ring road. Consequently, the new MSRTC bus stand can be developed into an integrated bus terminus for MSRTC, and Private bus stand.

ii. **Provision of on-street parking facilities** On-street parking facilities may be provided along the New Pimpalwadi Road, Chari Road and Pimpalwadi Road by properly earmarking space along one side of the roads.

iii. **Provision of auto and private taxi stands –** Parking spaces for auto rickshaw and jeeps may be provided near the MSRTC bus stand and Kankuri Road Existing auto stand on Chari Road and Pimpalwadi Road can be continued. The SMC is proposing a shopping complex cum parking area at the site of the present parking area of 1.0 Ha on the Ahmed Nagar Manmad Road. A part of this area should be developed as a private taxi stand especially for those plying on Shirdi – Shingnapur Route. A queue system for these private taxis should also be developed. This will be beneficial to the pilgrims as well as the operators. The rest of the parking area for vehicles can be

basement parking and the terrace area should be landscaped and preserved as a open plaza.

iv. **LPG/CNG based auto rickshaw –** Only LPG/CNG fuel based auto rickshaws should be permitted in future, with the availability of the said fuel. Similarly, after the development of the new integrated bus terminus, feeder services by LPG/CNG based vehicles can be provided to the town.

v. **Developing of parking area as per DP –** The development plan has proposed developing of parking area of 1 ha on survey no 4 and 5 towards the northern limits of the Municipal Boundary. The area is just above the existing parking lot on Pimpalwadi Road. The parking area can be landscaped properly so as to serve as rest areas for the pilgrims.

vi. **Proposed parking area of Sansthan –** The Sai Sansthan plans to develop a parking are on survey no 80/ 85 and 87 / 88 in village Nimgaon adjoining hirdi. This area is beyond the SMC limits to the northern side of Shirdi. The details on the exact area of the parking were not available.

The estimated block cost for implementation of the parking is summarised below.

Table 6.13 : Cost of Providing Parking Facilities

Description	Cost
	Rs.lakh
1. On Street Parking facilities along Kankuri Road	0.20
2. New Bus stand and Private taxi stand on Kankuri Road	376.70
3. Parking as per DP on Survey no 4 & 5for an area of 1 ha	51.00
4. New Parking on Survey no 80/ 85 and 87 / 88	3.0
Total	**430.90**

Source: Analysis.

6.6.5 Street Lighting

The present illumination along the roads in the Pilgrim zone is adequate. However, the streetlights are mainly in the form of tube lights (61%). The Kankuri Road, Nandurkhi Road, Palkhi Marg and New Pimpalwadi Road are recommended for illumination by sodium vapour lamps due to the heavy vehicular pedestrian movement. Similarly, high mast lamps with 4 sodium vapour lamps are proposed at the major junctions, existing and proposed parking areas.

Table 6.14 : Cost Estimates for the Proposed Streetlights

Description	Requirement	Unit Cost	Cost
	Nos.	*Rs. Lakh*	*Rs. Lakh*
Single arm pole with Sodium Vapour Lamps along the stretches mentioned above at 30 m spacing	50	0.17	8.5
High Mast Lamps with 4 sodium vapour lamps each at Kankuri Road and Nandurkhi Road junction.	2	2.5	5
Total			**13.5**

6.6.6 Road Safety Improvements.

In Shirdi, pedestrians constitute a significant share in the road users and commercial traffic

is also high. It is therefore imperative that the issue of traffic safety needs to be adequately addressed.

The key objectives are
- To prevent the growth of road accidents in the town and
- To enforce the traffic safety norms and make commuting in town more safe and healthy.

The recommendations are:
a. Physically segregating the slow moving and fast moving traffic
b. Provision of adequate pedestrian sidewalks and guardrails wherever necessitated
c. Avoiding entry of commercial vehicles destined other than Shirdi by providing a bypass
d. Strictly enforcing the traffic rules by providing adequate manpower to Traffic Police.
e. Provision of adequate signages wherever necessary.

Table 6.15 : Summary of Road and Traffic Improvement Project Costs in Shirdi

Improvement Schemes	**Phase II**	**Phase II**	**Amount**
	Rs. Lakh	*Rs. Lakh*	*Rs. Lakh*
1. Road Improvements	66.00	119	185.50
2. Construction of Bypass	1528.00	-	1528.00
3. Junction Improvements	69.00	-	69.00
4. Pedestrian Facilities	99.05		99.05
5. Parking Facilities	51.00		51.00
6. New Bus stand and parking for private taxis	-	376.60	376.60
7. Street Lighting	13.50	-	13.50
8. Road Safety Improvements	0.50	-	0.50
A. Sub-total	1827.0	495.6	**2323.15**
B. Contingencies (5% of A)	91.35	24.78	116.15
C. Supervision & quality control (2% of A)	36.54	9.912	46.46
D. DPR cost (2% of A)	36.54	9.912	46.46
Total	1991.48	540.20	**2532.23**

6.7 PHASING OF ROADS AND TRAFFIC PROJECTS

The above projects are to be implemented in two phases. The time line for first phase is up to 2011 and that for the second phase is 2031.

Phase I (2005 – 2011) Projects

- Construction of Ahmednagar Bypass road
- Improvement of Kankuri Rd Junction, Pimpalwadi Rd Junction and Nandurkhi Road Junction
- Greenbelt plantation along important roads
- Improving Pedestrian Facilities & road safety measures

Estimated cost – Rs. 1863.95 lakhs

Phase II (2011 – 2031) Projects

- Construction New bus stand and parking for private taxis
- Strengthening & resurfacing of roads

Estimated cost – Rs. 668.27 lakhs

Partners in Implementation

- Construction of roads by PWD / SMC
- Junction improvement works by Temple Trust, private sector
- Construction of Parking cum Commercial area by Temple Trust/ Private operator
- Maintenance of Parking areas by private operator
- Development of green belt along roads by Forest Dept

Table 6.16: Criteria for Selection of Roads and Junctions for Improvement

Sl No	Road Details	Criteria for Selection
Ring Road		
1	Proposed Ring Road	New formation road, to cater the needs of the commercial traffic and reducing the congestion in the town limits
2	Proposed Outer Ring Road	
3	New Bypass for Ahmednagar Manmad Road	To avoid the through heavy traffic from entering the town and there by ensuring the safety of the people.
Junctions in Pilgrim Zone		
1	Pimpalwadi Road Juntion	Busy junction presently 3 – ways but proposed to become 4 way with development of new road. The Samadhi Temple is located on this junction and there is heavy vehicular and pedestrian traffic.
2	Kankuri Road Junction	Major junction in the centre of the town with SMC office located at the junction and commercial area on all sides. The new bus terminal and parking is proposed along the Kankuri Road and hence it is likely to become a busy junction.
Junctions in Shirdi Town		
3	Nandurkhi Road Junction	Major junction in the town with a city bus station and roads leading to Sainath Hospital and 500 rooms Dharmashala.

7.0 DEVELOPMENT OF RENEWABLE ENERGY PARK

7.1 NEED AND BACKGROUND

The role of renewable energy in protection and conservation of natural resources has been widely acclaimed and established through several demonstration as well as full scale implementation projects. The gamut of renewable energy includes various resources such as solar energy, wind energy, bio-gas, hydel energy etc. The choice of renewable energy option depends on the geographical setting and available natural resources in the near vicinity. In a tropical country like India there is ample availability of solar energy in most parts of the country and hence can be suitably tapped. The other forms of renewable energy such as wind and water are restricted to certain specific areas. In spite of all these things the awareness about these resources and their applicability is very less amongst the common people. Hence it is thought of developing a renewable energy park in Shirdi to create awareness amongst the people and at the same creating added attraction for the tourists visiting Shirdi.

7.2 COMPONENTS OF THE PARK

Shirdi has a tropical climate and hence solar energy can be aptly used for various purposes such as water heating, street lighting, solar battery powered vehicles etc. Depending on the availability of wind a demonstration wind mill can also be set up. In similar parks set up in other places in India and abroad the response has been overwhelming. To start with the following exhibits are proposed in the renewable energy park

- Two solar-powered buses
- Weighing machine
- Solar powered bicycles
- Solar powered cars for children
- Solar powered toy train for children
- Quiz computer
- Solar drum and slide
- A prototype of solar- powered home
- Demonstration wind mill

The park will developed with appropriate landscaping and on the theme of spreading awareness on conservation and protection of natural resources. Thus it can also include demonstration units on rain water harvesting for ground water recharge, use of eco friendly building materials such as compressed earth blocks, fly ash, passive solar building techniques etc. The administrative office of the park, ticket counter etc can be built with such material so that they are bit just exhibits but will also prove how such materials can be functional. A nominal entrance fee can be charged from the visitors. The complex can house an interpretation centre with audio visual display techniques to sensitize the visitors. Initially an area of 0.5 ha can be developed suitably. Depending on the response it can be further augmented.

7.3 COST ESTIMATE

Such parks have been established in many places in India such as Garden of five senses near Mehrauli in New Delhi, Peshwa Park in Pune, Aurovilie in Pondicheery this is a living village developed on the concept of ecological sustainability. Based on the above experience and the actual exhibits the cost of the park is likely to vary between Rs. 50 lakhs to 2 crores.

7.4 PARTNERS IN IMPLEMENTING

Project Development assistance and seed funding – Ministry of Non conventional Energy Resources (MNES) and MPCB
Project financing and operation – Sai Sansthan / Private operator
Awareness generation and sensitizing the Pilgrims – NGO's and SMC

8.0 RAIN WATER HARVESTING

8.1 NEED AND BACKGROUND

Rain water harvesting in general is an activity of direct collection of rainwater. This collected water can be stored for direct use or can be used to recharge ground water. At the turn of the new millennium, about 290 million people will be living in urban areas of the country. Urbanisation trends indicate that the urban population would continue to grow at the rate of about 3 per cent per year in the next few decades. It is feared that the adverse consequences of the envisaged rapid growth of urban population will outweigh the positive impacts, unless specific policies and programmes for improving the governance and management of urban areas are evolved. This effort requires a comprehensive information base on various aspects of urbanisation, including patterns and trends of urbanisation, urban infrastructure and services, housing, transportation, poverty and environment. Maharashtra is one of the most urbanised states in the country having an urban population of 42.4 % as per the 2001 census. The same is projected to be 69 % by 2016. One of the most important aspects of urban infrastructure is providing safe and sufficient water to its residents. With the available resources fast depleting and sourcing water from long distances having far reaching adverse ecological and social consequences it is imperative that water is conserved at local level and thereby the stress on the fresh water resources can be reduced.

8.2 RAIN WATER HARVESTING IN SHIRDI

Shirdi is an important pilgrim place and hence there is substantial floating population visiting daily. The place has many hotels, lodges and dharmashalas and all of these are considered heavy water consuming land uses. At present Shirdi has a water supply level of 30 LPCD during monsoon and the same falls down to 18 LPCD in summers. The water is sourced from the irrigation canal called the Right Bank Godavari Canal. The Sai Sansthan has its own water supply for the various Dharmashalas and dining area run by the Sansthan. Discussions with the SMC officials and hotel owners revealed that the residents are dependent on the ground water to meet their daily needs. Also most of the hotels have their own bore well or buy water from tankers, which source the water from the nearby wells. Though it is difficult to quantify the amount of ground water being used its obvious that ground water is being used. The area falls in the GV 120 watershed as per Ground Water Survey and Development Agency (GSDA) numbering and it has fairly good ground water potential. The ground water depth varies from 5 to 15 M. According to GSDA there is no substantial depletion of ground water in the region, however no data on ground water table was available. Nevertheless rain water harvesting if promoted in Shirdi can definitely prove useful in conserving the ground water resources or if stored and used for secondary purposes especially by the hotels and Dharamashalas. These measures twould definitely be beneficial in the long term.

8.3 PILOT PROJECT ON ROOFTOP RAINWATER HARVESTING

Given the substantial number of hotels, dharmshalas and other public buildings roof top rainwater harvesting can be an effective means of conserving the water resources. The harvested water can be stored and used for secondary purposes such as flushing toilets, gardening etc or can be used to recharge the ground water.

Roof top rainwater harvesting for Shirdi Municipal Council Building

Being a government office the SMC building can be a good demonstration unit on successful rainwater harvesting.

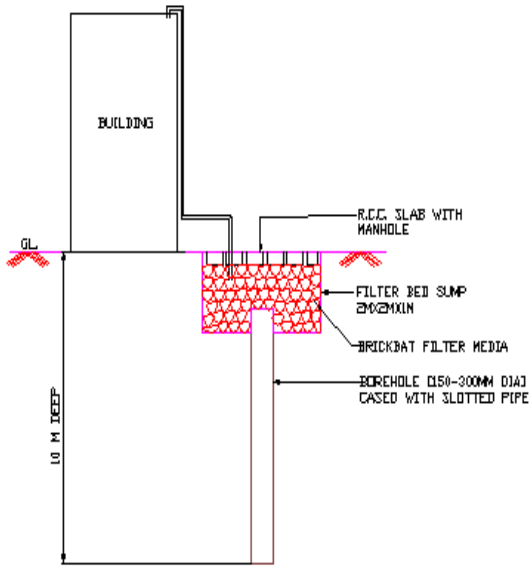
Table 8.1 Features of SMC building for roof top rain water harvesting

Sl. No	Features	Details
1	Total Terrace Area	220 sq. m.
2	Water Consumption @ 70 LPCD per day (Total Staff of 100 persons + 10 % visitors)	7700 litres
3	Annual water consumption	28.15 lakh litres
4	Average rainfall in Shirdi	42 cm (0.42 m)
5	Total volume of water that can be harvested form the terrace	220 x 0.42 = 92.40 cu. m.
6	Harvesting potential at 60 % of above	55440 litres

Source: Analysis and discussions with SMC officials

It is seen from the above analysis that the water harvested from the roof top is less than the annual water requirement of the building. With the above harvesting potential the harvested water if stored can last for only 7 days hence it will not be economical to construct a storage tank. However the same water can be used for recharging the ground water by directing the rainwater from the terrace to a recharge trench. Various options are available for recharging such as bore well, dug well, recharge pits, soakaways and recharge trenches. As existing unused wells are not available in the near vicinity it is advisable to go in for a soakaway.

A soakaway is a bored hole of up to 30 cm diameter drilled in the ground to a depth of 3 to 10 m. The soakaway can be drilled with a manual auger unless hard rock is found at shallow depth. The borehole can be left unlined if stable soil is found; else a PVC or MS pipe with perforation can be inserted. A small sump is built at the top end of the soakaway where some amount of runoff can be retained before it enters the borehole. This also helps in preventing heavy solid materials from entering the hole and clogging the same. At a peak rainfall of 20 mm and runoff coefficient of 0.85 the capacity of the sump works out to 3740 litres (3.74 cu. m.). The dimensions of the sump therefore are 1m deep and surface area of 2m x 2m. Brick bats and other filter medium such as coarse sand can be added to the sump. The bore hole will have to be cleaned periodically to maintain its efficiency.



The block cost estimate for the above rain water harvesting mechanism would be Rs. 50000 assuming no mechanical boring is required. A details study on the nearby geological strata will have to be done and some information on the hydro geology of the area will also be helpful in arriving at the exact cost. Detailed terrace plans of the building and site plans of the area surrounding the buildings are also required.

Rainwater harvesting for ground water recharge can also be developed in common areas such as bus stand, paved parking areas and commercial complexes.

9.0 ECO- PILGRIMAGE DEVELOPMENT

9.1 NEED FOR DEVELOPING ECO - PILGRIMAGE

Shirdi is a famous pilgrim town in Maharashtra near Nashik. The town is known for the Samadhi of Shri Sai Baba a saint revered all through Maharashtra. The place attracts lakhs of people every year. At present the people visiting Shirdi are from varied background from the rich and famous from urban areas to the lower income group rural people. On the occasion of the three annual festivals of Gurupurnima, Dussera and Ramnavmi large number of pilgrims congregate in the town. These festivals are a unique showcase of the socio cultural tradition of Maharashtra. Shri Sai Baba is one of the saints of the "Guru Parampara" in Maharashtra. The "Guru" is a teacher and philosophical guide and a revered person in Hindu tradition. Hence lots of people visit Shirdi on Gurupurnima to pay their respects to the teacher. The contemporaries of Shri Sai Baba include Shri Sawmi Samarth of Akkalkot (Solapur District), Gajanan Maharaj of Shegaon (Buldhana District), and Saint Gadge Baba etc. These saints have preached the tents of equality, brotherhood and peace. While places like Shirdi have become popular some of the nearby areas are yet unknown and unexplored. Shirdi also has other pilgrims' places in close vicinity such as Shingnapur, Nashik, Trimbakeshwar, Grishneshwar, Nevasa etc. While some places are large urban areas others are small towns and rural areas having rich legacy of the saints. It is important to preserve and promote this legacy and one way of doing it is by developing the places associated with the saints as eco-pilgrim destinations. The rural areas or small towns, promoting pilgrim activities will also help boost the local economy of these places. The important aspects to be covered in the tourism development plan are described briefly in the following sections. There are two aspects to it,

- Developing Shirdi as eco-pilgrimage destination
- Developing eco-pilgrimage circuit around Shirdi.

9.2 TOURISM ASSET INVENTORY

The tourism assets for any destination can be broadly grouped into two categories Natural attractions – these include scenic features such as mountains, forests, waterbodies, sea face etc and cultural attractions- these include indigenous tribal culture, temples, museums, forts palaces etc. In order to promote religious tourism the focus is mainly on the cultural assets. In case of Shirdi and near by areas the assets can be listed as below

Table 9.1: Religious Tourism Attractions in Maharashtra

Sr. No.	Place	Religious Tourism Attractions
1	Shirdi	Temple of Shri Sai Baba, Khandoba Temple etc
2	Shingnapur	On of the few temples of Shani in the country
3	Grishneshwar &Trimbakeshwar	One of the twelve Jyotirlingas
4	Aurangabad	Famous for Ajanta Ellora caves & Kailasa Temple
5	Shegaon	Temple of Shri Gajanan Maharaj
6	Nevasa (Nagar)	Samadhi of Nivruttinath (Dyaneshwar's brother)
7	Akkallot (Solapur)	Temple of Shri Swami Samarth

The above list is indicative and detailed survey will have to be carried out to make a comprehensive list. While place like Nashik, Shirdi, Aurangabad are well known those such as Akkalkot, Nevasa are not known and their significance has not been highlighted. The history and significance of the place – historical, religious, architectural, spiritual etc will

have to be documented and made available to the tourists. These would include the places like Samadhi's of the saints, their ancestral houses, temples, places where they frequently visited and natural aesthetic features such as rivers, lakes etc if any.

9.3 TOURISM INFRASTRUCTURE ASSESSMENT

The development of any place for tourism is based on the 4 A principle. These 4 A's are Attraction, Access, Accommodation and Amenities. The tourism attractions have already been discussed in the above section and these are the places associated with the Saints of Maharashtra and other pilgrim places. The next step would be to assess the infrastructure level with priority to the other 3 A's. While planning for the same the background of the people targeted should be kept in mind. At present the most of the people visiting these places are from rural areas and come from a lower to middle income group. People from the higher income group are very few. Some dip stick surveys on the inflow and pattern of pilgrims will be needed to consolidate the number's and pattern.

Access: The linkage of the place with respect to road, rail and air connection will have to be studied. Availability of public transport road conditions, frequency of public transport, local transport to move around the place, hiring of vehicles, parking areas etc will have to be considered.

Accommodation: The level accommodation facilities available in these towns, their number cleanliness, service etc needs to be assessed. While planning and providing accommodation for the higher income group the focus should be provide clean and hygienic places rather than luxurious places. The feasibility of converting old "wadas" into guest houses could be explored. This will help in conserving the traditional/ vernacular architecture which in itself is a tourist attraction. It has also to be kept in mind the accommodation is available and affordable for all sections of the society.

Amenities: The tourist amenities include communication facilities such as national and international trunk calling systems, internet kiosks, emergency health care services, authorized guides, information centres, wayside eating places and public conveniences, tourist map of the place, etc. In keeping with the spiritual and religious theme of the circuit these could also include meditation centres, yoga training centres, naturopathy clinics, etc. The feasibility of providing such amenities at some of the places along the circuit should be studied.

Shirdi Town

Access: Shirdi town is well connected by road to. There is no direct rail connection to Shirdi however Nashik,Manmad and Kopargaon which are 15 to 80 km km from Shirdi, have good rail connections to all parts of Maharshtra and India. The nearest airport is at Aurangabad.

Accommodation: At present the Shirdi has about 180 hotels and the Sai Sansthan has quite a few Dharmashalas and accommodation facilities. These cater to the needs of the different income group.

Amenities: Shirdi has good health and medical facilities. Most people come to Shirdi in the morning and leave by evening. Other than the temple, there are no attractions for pilgrims/ tourists to increase the duration of their stay. Most people visit Shingnapur which is about 80 km from Shirdi. A few hotel owners and tour operators arrange tours to Aurangabad and Nashik. Shirdi lacks effective information for tourists such as maps, signs and signage, history and legends of the temple, informed guides etc.

9.4 ASSET DEVELOPMENT AND MANAGEMENT

The tourism assets are the attractions, which in this case would include temples, Samadhi's etc in most cases temples are managed by trusts. At present the Sai Sansthan is doing considerable job in developing the infrastructure of Shirdi. They have financed most of the road development, water supply and sewerage schemes.

The local community can also play a vital role in the upkeep of the sites. A portion of revenue generated from the village guesthouses, fees charged by guides etc can be used for the development of the place.

9.5 GUIDELINES FOR SUSTAINABLE TOURISM

The development of tourism can have negative impacts if it is uncontrolled and unmanaged. The impacts are detrimental to the natural and socio-cultural environment of the host area. In this particular case the cultural environment and social fabric is more at threat than the natural environment. However depending on the place and presence of natural feature such as forests, rivers, mountains etc it would assume equal significance. Hence these places will have to be developed on the principles of eco- tourism. The two important aspects of eco-tourism are

- Minimum adverse impacts to the social and natural environment and
- Direct benefit to the local (host) community

The above two objectives are achieved by targeting the high paying tourists but restricting their inflow (number). However it may not be possible to do in each and every case. The strategy to be adopted for promoting eco - pilgrimage in Maharashtra will depend on the socio-cultural assessment of the host community and the environmental sensitivity of the area.

The International Eco tourism Society has laid guidelines for developing sustainable tourism along with a code of conduct for the tourists as well as the community and other stakeholders such as hotel owners, tourist guides and tour operators. It is essential to identify the stakeholders and sensitise them about the concept of sustainable tourism. Some of the guidelines are given below.

<u>Guidelines for Project Implementing/ Initiating Agencies (PIA)</u>

- Educate local stakeholders to create awareness of the social, economic, and environmental costs and benefits to come from this project and brief them on principles of sustainable tourism
- Employ local people throughout all levels of the project
- Support local businesses through direct business transactions and a fund to encourage use and development of sustainable energy systems (e.g., solar light panels)
- Maintain availability of natural resources to locals;
- Capacity-building of local communities to facilitate their active participation at all levels of the process
- Ensure the development and enforcement of legislation/measures against any illegal, abusive, or exploitative tourist activity
- Support cultural and environmental programs of community groups and organizations;

- Promote information exchange on transportation, accommodation, public awareness raising programs and education, and ways to minimize negative effects of tourism, with other groups practicing ecotourism;
- Use plenty of signs to educate visitors about the problems of traveling off paths, and taking home souvenirs from the area.
- Ensure accuracy of information disseminated to tourists - ensure high quality interpretive skills;
- Deliver information about tourists to locals; and,
- Inform tourists about cultural and ecological values (give examples of how tourists can help conserve energy, water, and assist with waste recycling).
- Social, Environmental and Economic impact assessments to be completed prior to project initiation;
- "Design with nature" in collaboration with planning authorities by using low-impact designs, materials, and technologies;
- Minimize infrastructure impacts to vegetation and animals. Develop a transportation plan with minimum impact infrastructure planned (e.g., low compaction roads);
- Non-indigenous flora and fauna should never be introduced to the area;
- Utilize integrate land-use planning and coastal zone management techniques;
- Effectively take steps to decrease the volume of waste associated with travel and tourism;
- Practice energy conservation in all areas (heating, air conditioning, lighting). Use solar systems wherever possible;
- Practice water conservation and install water conserving fixtures;
- Encourage the use of public transportation and ride-sharing. Facilitate walking, jogging, cycling, and alternative transportation methods;
- Seek out options for diversion of waste to other products (i.e., animal feed and compost);
- Improve access to researchers;
- Determine the type of tourist to be interested. Promote and develop strategies accordingly
- Determine maximum numbers of visitors permitted within an area (carrying capacity);
- Offer tours and activities which are consistent with host community values, reinforce community identity, and provide commensurate benefits to the host community;
- Distance itself publicly from illegal, abusive, or exploitative forms of tourism.
- Conduct energy and water audits;
- Monitoring of impact of tourism on the local culture and environment and make plans to stop negative impacts and increase positive impacts;
- Conduct an ecosystem, social, and geologic inventory of the area affected before and after the project begins - use the analysis of differences for future policy development and make this information available to other ecotourism projects
- Use percent of returns to promote research on environment and social issues.

Guidelines for Tourists

- Where possible, purchase reusable, recycled, and unbleached paper products for guest rooms, dining facilities, and office use;
- Purchase supplies in bulk to decrease packaging waste.
- Practice the Principle "Take only Photographs and leave no tracks" to the fullest. Pack out everything that you bring in including plastic water bottles (or use purification tablets or a filter).
- Encourage and support host community environmental and cultural initiatives and efforts toward sustainable tourism.
- Learn about local history, customs and culture as well as vital ecosystems. Learn at least the basics of the local language. A simple hello please or thank you goes a long way.
- Respect local traditions and etiquette: Wear clothing that is accepted by the local culture. Be aware of People's sensitivity to being photographed; always ask first. Observe local customs.
- Avoid ostentatious display of wealth

The above guidelines are generic in nature and specific guidelines will have to be developed for the study area. Also the theme for development is important it could be on the principles of "Saints of Mahrashtra" where all places associated with the saints are developed in a tourist circuit. In Maharashtra these would essentially comprise of the six districts of Nashik, Pune, Solapur, Ahmednagar and Aurangabad.

9.6 COST ESTIMATE

Shirdi Town

The cost for developing amenities for eco-pilgrimmage in Shirdi are covered under the other projects such as Road Development (signs signage etc). The cost of other items is mentioned below.

Sl. No	Item	Approx. Cost in Rs. Lakhs
1	Preparing a tourist map & information Brochure of Shirdi showing important places within the town, their distances, history, legends, surrounding places, information on hotels, their pricing etc.	2.5
2	Compiling information related to disaster management such as availability of health facilities, risk prone areas of town emergency Numbers etc.	0.5
3	Training of various stakeholders such as tour operators, hotel owners, tourist guides' etc for promoting environment friendly and socially acceptable tourism in Shirdi	7.0
4	Preparing an environment & social code of conduct for pilgrims and tourism stakeholders and displaying it prominent locations	1.0
5	Identification of heritage structures/ site based on their architectural and socio-cultural importance for conservation and restoration.	3.0
	Total	**14.0**

Cost of developing meditation centers, nature cure centers etc will vary from project to project. It would also need some market research studies for their viability. Hence this cost is not included above.

Eco-pilgrim Circuit Development

The first step towards the developing this project would be preparing a Religious Tourism Master Plan for the five districts namely Nashik, Buldhana, Solapur, Auangabad, and Ahmednagar. The Master plan would assess the pilgrim attractions, heritage value, and the level of tourist infrastructure, available human resources, institutional mechanism and role of local community in implementing the project, marketing strategy; investment and return plan and detailed estimates for taking up specific projects. The approximate cost will be **Rs. 30 lakhs.**

10.0 OTHER PROJECTS

The following table presents other miscellaneous projects identified by different agencies/departments of the Government of Maharashtra and other stakeholders. These projects are still in the pipeline and more details were not available. The projects have included as they were found to be in line with the objectives this study.

Table 10.1: Details of projects identified by other agencies

Sl No.	Project Description	Cost, Rs. Crores	Proposed by	Remarks
1	Road side plantation (Approx. 3 km on both sides)			
	Ahmednagar – Manmad Road	0.17	Sansthan and SMC	To act as absorbing surfaces for dust created due to movement of vehicles thereby reducing air pollution and to provide shade and good environment.
	Kankuri Road			
	Nandurkhi Road			
	Biregaon Road			
	Pimpalwadi Road			
	New Pimpalwadi Road			
2	Tents for Palkhis on Mumbai Road	0. 50	Sansthan	
3	Developing camping ground for pilgrims	0. 20	Sansthan	Rest areas or open spaces
4	Developing gardens as per DP	0.18	SMC	
5	Museum of Shri Sai Baba	0.10	Sansthan	
6	Solar water heating for accommodation facilities of Sansthan	0.80	Sansthan	To reduce consumption of fuel wood
7	Construction of Sports complex	5.18	Sansthan	
8	Construction of Toilet Complex	0.11	SMC	To cater to increased inflow of Pilgrims
	Total	**6.54**		

11. ENVIRONMENTAL BENEFITS

The potential benefits of implementation of the various environmental improvement projects suggested in this report are listed below.

AMBIENT AIR

- Improvement in ambient air quality due to smooth movement of vehicles avoiding traffic congestion, idling due to availability of wider roads with resurfacing of roads
- Reduction in vehicular pollution due to diversion of traffic via proposed Bypass road
- Improvement in air quality, less dust pollution due to development of greenbelt along roads
- Reduction in air pollution due to decongestion of temple area and pilgrim zone
- Reduction in odour nuisance due to proper collection and disposal of municipal solid waste and sewage

NOISE

- Less noise pollution due to smooth movement of vehicles and green belt development along roads
- Reduction in noise pollution due to decongestion of temple area and pilgrim zone

WATER RESOURCES

- Reduction in dependence on ground water/ recharge of ground water due to rain water harvesting.
- Less surface and ground water pollution due to diversion of open sewage flow through a proper sewerage system and treatment of sewage as well as safe disposal of solid waste.
- Reduction in water borne diseases due to improvement water quality and availability of adequate treated water from augmented WTP.
- Conservation of water due to availability of treated wastewater for greenbelt development in the town

LAND

- Improvement in soil quality due to scientific disposal of municipal solid waste, and green belt development

AESTHETICS

- Pleasing aesthetics in the town due to development of green belt, landscaping & beautification of major junctions, appropriate street lighting, removal of solid waste dumps, efficient collection and disposal of daily solid waste
- Better aesthetics along the riverfront due to improved water quality, soft landscaping and greenbelt development, walkway and boating facilities, maintenance of cleanliness due to additional collection waste facilities like Nirmalya Kalash.

PUBLIC HEALTH

- Improved hygienic conditions in the town due to efficient collection and disposal of solid waste and domestic sewage, provision of public toilets in slums and mobile toilets for pilgrims, and development of green and open spaces.
- Improvement in public health due to better air and noise quality
- Better hygienic conditions at the eateries and food joints

IMPROVEMENTS IN TOWN INFRASTRUCTURE AND OTHER BENEFITS

- Wider and better quality roads
- Smooth traffic flow. No conflict of slow moving and fast moving vehicles
- Less traffic congestion
- Adequate and better parking facilities
- Improved pedestrian safety due to wider footpaths, guard rails, proper signages etc.
- Hazard free movement of pilgrims and tourists
- Improved sewerage and drainage system
- Availability of adequate water supply and safe drinking water.
- Clean roads & surroundings due to efficient collection and disposal of solid waste
- Overall clean environment
- Land availability (due to rehabilitation of existing SW disposal sites) for better use.
- Conservation of heritage structures.
- Strengthening of local ecosystem due to development of greenbelt and forest nursery
- More comfort to pilgrims due to better pilgrim facilities such as maps & appropriate signages, accommodation, water supply, public toilets and rest areas, and recreation areas.
- Safe and pleasant tourism experience for the pilgrims
- Overall socio-economic development of the town.

12. SUMMARY OF PROJECTS

A summary of all the projects discussed in this report is given below along with the cost estimates.

Sl. No	Name of the Project	Cost In Rs. Lakhs Phase I	Cost In Rs. Lakhs Phase II	Total Cost In Rs. Lakhs
1	Sewerage Network	1273.50	1079.80	2353.30
2	Solid waste management system	40.00	80.00	120.00
3	Water supply	30.00	-	30.00
4	Roads and traffic improvement	1991.48		
5	Developing Renewable Energy Park	50.00	-	50.00
6	Roof top rain water harvesting	00.50	-	0.50
7	Eco pilgrimage Development	14.00	30.00	44.00
8	Other projects	108.00	546	654.00
	Total	**3507.48**	**2276.03**	**5784.03**

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Shirdi Town)	Cost (Rs. Lakh)				
1. Construction of Underground Sewerage Network and STP	2353.30	▪ Development of an underground sewerage scheme covering the Pilgrim Zone ▪ Construction of an STP of 6.5 MLD capacity and a holding pond of one day detention capacity near Pump House No. 3 at Survey No. 27	1273.50	▪ Development of underground sewerage network covering rest of the Shirdi Town ▪ Construction of an STP of 5 MLD capacity and a holding pond of one day detention capacity near Pump House No. 3 at Survey No. 27	1079.80	▪ Residents of Shirdi due to improved sewerage and drainage facilities. ▪ Residents and pilgrims due to improved public health ▪ SMC due to better maintenance of sewerage and sewage treatment in the town, availability of treated wastewater for green belt development. ▪ Sai Sansthan as it can provide good sanitary conditions to the pilgrims	▪ Construction of Sewerage Network by SMC or Sai Sansthan ▪ Construction & Operation of STP by private operator ▪ Technical assistance by Maharashtra Jeevan Pradhikaran	▪ Aid from State and Central Govt. ▪ Municipal tax from residents, commercial organisations, dharmashalas and hotels & restaurants ▪ Construction and operation of STP by private sector	➢ Improved sewerage and drainage system ➢ Less surface and ground water pollution ➢ Improved hygienic conditions, reduction in water borne diseases ➢ Overall clean environment ➢ Improvement in public health ➢ Pleasing aesthetics ➢ Water reuse for greenbelt development
2. Solid Waste Management	120.00	▪ Implementation of waste segregation and collection system in Pilgrim Zone ▪ Development of the Compost Plant site proposed in the DP. ▪ Community awareness programmes, IEC campaigns by NGOs on waste segregation ▪ Improving collection by employing additional manpower and vehicles	40.00	▪ Implementation of waste segregation and collection system in entire town ▪ Identification and commissioning of composting plant ▪ Landfilling of non-degradable waste in abandoned stone quarries at Savli Vihir after establishing its feasibility.	80.00	▪ Residents of Shirdi due to improved SWM facilities. ▪ Residents and pilgrims due to improved public health ▪ SMC due to better maintenance of solid waste in the town. ▪ Hotel owners and shopkeepers as clean surroundings will increase their business	▪ Collection & transportation by SMC ▪ Development & Operation of disposal facility by private operator (can be M/s Clean Eco and Environment Developers) ▪ Project development assistance by MPCB ▪ Financial/equipment sponsorship of private sector for collection of waste, operation & maintenance of the Compost plant. ▪ NGOs', Social groups' participation in awareness programmes ▪ Participation from local religious education institutes in maintaining cleanliness of Temple area	▪ Aid from State and Central government agencies ▪ Partial recovery through sale of compost ▪ Contribution from households towards door to door collection.	➢ Clean roads & surroundings ➢ Reduction in odour nuisance ➢ Improved hygienic conditions ➢ Improvement in public health ➢ Better hygienic conditions at the eateries and food joints. ➢ Land availability (due to rehabilitation of existing SW disposal sites) for better use.

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Shirdi Town)	Cost (Rs. Lakh)				
3. Water Supply	157.98 (MJP Scheme) + 30.00	**Rehabilitation of Existing Water Supply Scheme** ▪ Rehabilitation of existing WTP of SMC by replacing old pipes, valves, agitators mixing chemicals, Dozers for Chlorine mixing, etc. ▪ Features of MJP Scheme ▪ Demand 9.49 MLD up to 2031 ▪ WTP – 8 MLD Capacity ▪ Supply rate of 70 LPCD for 70% Population and 40 LPCD for 30% population	-	▪ The MJP scheme is planned to take care of the needs of the town till 2031 hence no additional projects are proposed.	329.00	▪ Resident of Shirdi and Pilgrims due better quality and adequate supply of drinking and domestic water.	▪ Construction of intake and distribution network by SMC ▪ Construction by private sector ▪ Operation & maintenance of WTP by SMC and Sansthan ▪ Technical assistance by Maharashtra Jeevan Pradhikaran	▪ Aid from State and Central Govt. ▪ Municipal Tax ▪ Revision of water charges	➢ Reduction in water borne diseases ➢ Improved public health
4. Road and Traffic Improvements including Parking Facilities, Junction Improvement	2532.23	▪ Construction of Shirdi By pass for Ahmednagar Manmad Road ▪ Road Improvements ▪ Green belt plantation ▪ Pedestrian Facilities ▪ Parking Facilities ▪ Street Lighting ▪ Road Safety Improvements	1991.48	▪ Improvement of Kankuri Rd Junction, Pimpalwadi Rd Junction and Nandurkhi Road Junction ▪ Construction New bus stand and parking for private taxis	540.23	▪ Residents of Shirdi due to improved road conditions, road safety and air and noise quality. ▪ Pilgrims due to better road conditions, parking areas, and pedestrian safety. ▪ SMC due to better maintenance of roads in the town and. ▪ Traffic police due to less incidents of road accidents. ▪ Temple trust due to ease in pilgrim movement in the temple area and availability of area for improvement works.	▪ Construction of roads by PWD / SMC ▪ Junction improvement works by Temple Trust, private sector ▪ Construction of Parking area by Temple Trust, private sector ▪ Maintenance of Parking areas by private operator ▪ Development & maintenance of green belt along roads by Forest Dept, NGOs ▪ Private sector participation mainly through funding of project by local traders and industries.	▪ One time entry fee charged to the pilgrims and tourists entering the Pilgrim Zone ▪ Betterment charges from Temple Trust ▪ Toll tax for vehicles using Bypass road ▪ Municipal taxes	➢ Improved roads & traffic conditions ➢ Less traffic congestion ➢ No conflict of slow moving and fast moving vehicles ➢ Improved air quality ➢ Less noise pollution ➢ Hazard free movement of pilgrims and tourists ➢ Improved pedestrian safety

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Shirdi Town)	Cost (Rs. Lakh)				
5. Tourism (Eco pilgrimage) Development Projects	44.00	▪ Preparation of a tourist map & information Brochure of Shirdi ▪ Compiling information related to disaster management such as availability of health facilities, risk prone areas of the town, emergency services and agencies etc. ▪ Training of stake holders ▪ Preparing an environment & social code of conduct for pilgrims ▪ Identification of heritage structures/ sites based on architectural and socio-cultural importance for their conservation and restoration ▪ Pilgrim circuit development of religious places in neighbouring districts	44.00	-	-	▪ Pilgrims ▪ Temple trust	▪ Preparation of signages, training of stakeholders, development of environmental and social code of conduct by NGOs, educational institutes, temple trust ▪ Preparation of maps, brochures, identification of heritage structures, development of tourism circuit of neighboring religious places by Maharashtra Tourism Development Corporation (MTDC)	▪ Sponsorship of by private sector, temple trust ▪ Aid from MTDC	➢ Clean surrounding ➢ Conservation of natural resources ➢ Conservation of heritage structures
6. Renewable Energy Park	50.00	▪ Development of exhibits based on solar energy such as solar toy train, solar car etc ▪ Demonstration of sustainable building technologies	50.00	▪ Expansion of exhibits.	-	▪ Pilgrims visiting Shirdi & local residents ▪ Hotel owners and shopkeepers due to possible extension of pilgrims stay	▪ Sai Sansthan for providing seed funding ▪ Ministry of Non- conventional energy resources (MNES) ▪ Maharashtra Energy Development Agency (MEDA)	▪ Ticket collection from the park	➢ Awareness generation among large number of people ➢ Conservation of natural resources
6. Rain water harvesting	0.50	▪ Roof top rain water harvesting for public buildings and hotels for ground water recharge ▪ Storing the rain water for using for secondary purposes	0.50	▪ Rainwater harvesting in large paved areas such as parking, commercial complexes, Bus stand etc	-	▪ Residents of Shirdi and Pilgrims ▪ SMC as ground water will be replenished ▪ Hotels can reduce their water bills by using the harvested rain water	▪ Sai Sansthan for providing seed funding ▪ Ground Water Survey and Development Agency (GSDA)	-	➢ Conservation of ground water

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Shirdi Town)	Cost (Rs. Lakh)				
7. Other Projects	654.0	▪ Road side plantation (5 km on both sides) ▪ Tents for Palkhis on Mumbai Road ▪ Developing camping ground for pilgrims Construction of 5 seat Mobile toilet ▪ Developing gardens as per DP ▪ Solar water heating for accommodation facilities of Sansthan ▪ Construction of Toilet Complex	116.00	▪ Museum of Shri Sai Baba Decongestion and beautification around the temple. ▪ Construction of Sports complex	528.00	▪ Residents of Shirdi due to reduction in air and noise pollution, improvement in hygienic conditions and better aesthetics. ▪ Pilgrims due to better air quality, better hygienic conditions and aesthetics.	▪ Dept. of Social Forestry, GoM ▪ Temple Trust ▪ Shirdi Municipal Council ▪ Private sector for funding of public toilet construction and mobile toilets	▪ Pay & use toilets ▪ User charges for community halls	➢ Improvement in air quality, reduction in dust pollution due to greenbelt development ➢ Reduction in noise pollution reduction in dust pollution due to greenbelt development and decongestion of temple area ➢ Better aesthetics ➢ Improvement in hygienic conditions due to provision of public toilets in slums and mobile toilets for pilgrims ➢ Improvement in river bank and water quality due to shifting of crematorium ➢ Conservation of fuel wood due to use of solar water heaters