

# Design of Drainage line of Bhilarewadi village in Pune Area by Using Bentley's SewerGems

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**Abstract** - SewerGems is unique software which is used for the design and analysis of sewerage system of particular specified area with considerable amount of future population. The SewerGems software was developed by the Bentley's system. It can perform multiple networks at a time by creating plans profile sheets etc. *This paper presents the study and analysis of sewerage system for the Bhilarewadi village situated in Pune district, Maharashtra. SewerGems is a computer software which was developed by the Bentley's for design and analysis of sewer networks. Bentley SewerGEMS is the first and only fullydynamic, multi-platform (GIS, CAD and Stand-Along) sanitary and combined sewer modeling solution. With this software we can analysis the sewer system for combined and separately as well. The hydraulic design consists in the computation of the transit and total flow and hydraulic modelling for network pipes diameters or slopes. The network consists of pipes of varying diameters, manholes and outfall. SewerGEMS offers a full range of possibilities for the designer to draw, label, dimension and plotting the drawings of the sewage networks*

water supply system. It involves auto investment with need for daily maintenance and the operational cost is one of the major expenditure. Sewerage system is a network of pipes, pumps and force mains for the collection of waste water from a community. The immediate and nuisance free removal of sewage from the sources of its generation followed by treatment or dispersal into the environment in an eco-friendly manner is necessary to protect public health and environment.

Hence, proper network has to be provided to avoid the above said conditions. The sewer networks are also have to be ensured so that they are not leaking which may lead to ground water contamination and soil pollution. SewerGems software is adopted for the design & analysis of underground drainage system. The sewer network is designed by considering regulations of the local governing bodies and with the use of commercially available materials. Utilizing these data, analysis has to be performed to simulate hydraulic conditions of sewers.

## 1. INTRODUCTION

Water is one of the most important factors for the sustainability of life. Water covers about 70 % of earth's surface and the fresh water available is about 1.7% as surface and ground water sources. The supplied water is used for domestic, industrial recreational purposes. This water is likely to be generated as waste water. In practice around 80% of the water supplied is likely to be converted in to waste water. Hence, there is a need for the sewerage systems to carry the generated wastewater to a specific point for treatment and disposal purposes.

A sewerage network is just a reverse action of water supply network. In terms of cost involved, laying a sewerage system appreciably high compared to the

### 1.1 STUDY AREA:

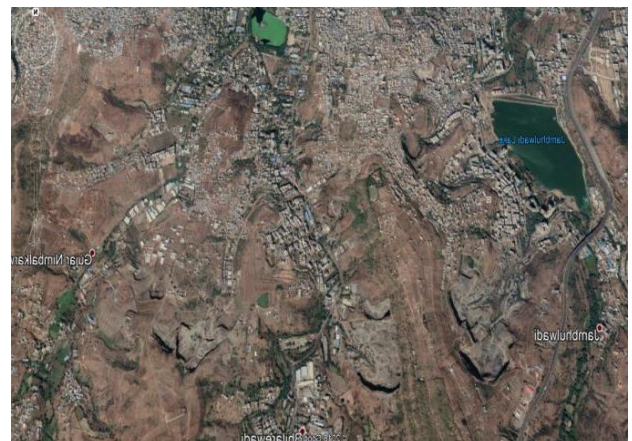


Fig 1 Study area source Google earth map

Analyzing the different areas and their sewerage system and getting down to the one area which is feasible for the project site. Also surveying the underground water table. Acquisition of land should be avoided. Inconvenience of nearby peoples should be taken care Proper disposal site should be available. Checking the existing Sewerage construction if any nearby. The on-site Sewerage system is to be designed in such a way that the estimated peak now rate from the site for the design Average Recurrence Interval (ARI) of the receiving minor system is no greater than which would be expected from the existing development.

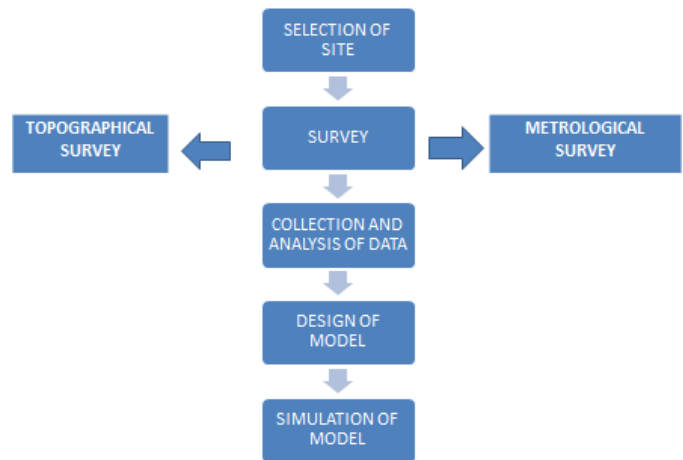
Further, it not to be concentrated in such a way as to cause nuisance to downstream properties. Sewerage line should be such that it can be connecting to existing Sewerage line. To inspect the reduced level's, conduits, manholes, catchment areas of the site. Slopes, elevations if any. Checking the surfaces around i.e. hilly areas, steep slopes, plane terrain etc. To provide convenience and safety for the public. The engineer shall consider the incorporation of a number of public safety measure in the design of the detention basin. The measures will be site-specific but may include:

- a. Warning notices.
- b. Fencing of the basin.
- c. Depth gauges.
- d. Child-proofing access to inlet structures, gully pits and manholes.
- e. Having due consideration for the probable maximum discharge and the safe conveyance this flow through downstream properties.

## 2. OBJECTIVES OF PROPOSED WORK

- To fix the study area.
- To collect the data required (topography, groundwater table, population ,RL's ,etc)
- To calculate the sewage flow of study area.
- To design and analysis the sewerage system using Bentley's SEWER-GEMS software.

## 3. METHODOLOGY



- **SEWERGEMS :**

SewerGems is unique software which is used for the design and analysis of sewerage system of particular specified area with considerable amount of future population. The Sewergems software was developed by the bentley's system. It can perform multiple networks at a time by creating plans profile sheets etc.

- **Calculation of the sewage flow of study area.**

Following are the steps are adopted to calculating flow of study area:-

1. Forcast the design population of the area.
2. Find sewerage flow per day by multiplying population with flow per day per capita sewage, the sewage is taken as (80%) of average water supply.
3. Select peak factor to find the peak sewage flow.
4. Calculate the allowance for industrial and commercial sewage if applicable
5. Find the design sewage flow by adding peak flow industrial allowance and infiltration.

## 4. RESULTS

- **Survey**

The detailed survey which was carried out in Mangadewadi area by using theodolite, in that alignment of roads are marked and should be presented in the autocad and converted that file into

shape file, because SewerGems can read shape files easily.

**• Future population forecasting**

For this work, the arithmetic mean method, geometric mean method and incremental increase method were used for future population forecasting, average value of these method was adopted. The population was forecasted of 20461 for next 3 decades till 2049

**• Design of sewer network using SewerGems**

The results of sewer network was derived from SewerGems and was analysed as per standard design and guidelines prescribed by CPHEEO (Central Public Health and Environmental Engineering Organisation). The results derived were well within the design parameters and they were in acceptable manner so as to implement on the field without much difficulty. The summary of the results are narrated in table.

The typical analysis of sewer network for the village was represented in the form of graphs, Profiles with respect to elevation invert level versus length

**• SewerGems results**

The result of network was derived from the ‘SewerGems’ according to the parameters given by the CPHEEO. The d/D ratio of 80% is fixed for the present study as recommended by CPHEEO guidelines. The results obtained are within the parameters.

Sr.no	Parameters	Total	units
1	Manholes	178	Numbers
2	Sewer line Length	3503	Meter
3	Area	377	Hectare

**Table 1: Summary of sewer network the village**

Sr.no	Diameter (mm)	Length (m)	Percentage
1	450	2630	75.07%
2	600	873	24.93%
3	Total	3503	

**Table 2: Details of the diameter with the length**

Sr.no	Diameter (mm)	Length (m)	Percentage
1	450	2630	75.07%
2	600	873	24.93%
3	Total	3503	

**Table 3: Details of velocity in Sewer lines**

**5. CONCLUSIONS**

The following are the conclusion based on the work carried out on network design for sewerage system at Mangadewadi village.

- This software is very simple for the design of sewerage network and also helpful for designing large network.
- The minimum velocity is more than the 0.61m/s, Therefore there is no need for providing extra velocity for self cleansing velocity.
- As 75.07% of pipes are containing of 450mm diameter and rest of 600mm diameter, Since CPHEEO prescribes 450mm minimum diameter and area consists of more number of initial branches of sewer lines, the minimum of 450mm diameter was considered in the design.
- The software is very useful alternative method for designing of sewer network, because of it’s accuracy and time saving.
- Thus, the final results comes in the dwg file which is easily readable for all applications

**6. REFERENCES**

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