PROJECT REPORT

FOR PROPOSED TRENCHING FOR

SAFE MANAGEMENT OF FAECAL SLUDGE AND SEPTAGE

PREPARED FOR

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TRENCHING SITE

APPROACH ROAD

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Contents

List of tables

List of figures

1 Trenching

Introduction

Trenching is a method of land application of faecal sludge or septage (FSS) as a controlled disposal method. The site must be carefully selected and the facility must be designed & operated to mitigate & minimise impact on environment and safeguard health & safety of operators & public. Appropriate trees (high Nitrogen demand varieties) can be planted on top of the filled trenches, the trees get benefit from organic matter and nutrients that are released from FSS. The implementation agency should obtain permission from the government authority to implement trenching.

Advantages:

- Very simple & easy to construct
- Very low investment
- No expensive infrastructure & pumps are needed
- Very limited or no O&M
- Produces no visible nuisance, if properly planned, designed, operated & monitored
- Gain benefit from the planted trees/green cover (CO2 fixation, control soil erosion & economic benefits from the produces)

Disadvantages:

- Requires considerable land, which is limited in most places
- Leaching from the trench might pollute groundwater & surface water bodies

Need for trenching in Chunar

As per the Swachh Survekshan for sanitation rankings of 4237 cities/towns, published in 2019 under the SBM scheme, Chunar ranked 827 out of the 1013 cities/towns surveyed in the North Zone and 506 among the 590 cites/towns surveyed in Uttar Pradesh (MoHUA, 2019).

In order to analyze the existing FSS and wastewater management practices of the city, CSE prepared a detailed report on excreta flow diagram, also known as shit flow diagram (SFD). Data for SFD was collected throughsample survey of households, key informant interviews, focused group discussions with masons, desludgers, and physical inspection of sanitation facilities in Chunar city (Rohilla, et al., 2018). GIS based maps of the city were also developed.

The city of Chunar has an area of 8.31 sq.km, which is divided into 25 municipal wards. The core of the city is densely populated, whereas the households in peripheral area of the city have settlement pattern rural in nature. The city doesn't have any sewerage network (as compared to 29% urban population of Uttar Pradesh) and is completely dependent on Onsite Sanitation Systems (OSSs). About 69% of population has access to toilets (as compared to 96% urban population of Uttar Pradesh) and the rest of the 31% defecate in the open (refer Figure 1). As the city moves towards achieving ODF status, percentage of population dependent on OSS would further aggravate.

Desludging of the OSSs is not scheduled as prescribed by Central Public Health and Environmental Engineering Organisation (CPHEEO) and is only carried out when it gets full or when there is a back flow. People usually get their OSSs delsudged using the CNPP owned 3500 litres capacity vacuum tanker. CNPP charges ₹ 3000 per trip for desludging and usually 2 to 3 people participate in the activity. Additionally, manual emptying is practiced in areas where there are narrow lanes and

containments are inaccessible. People from lower caste community, who reside in peri-urban areas, are the ones usually engaged in manual scavenging.

Currently, there is no treatment of the FSS being generated/collected in the city. If the FSS collected is of low strength and in liquid state, it is disposed in the nearest storm water drain. On the other hand, if the FSS is too thick and the household don't want it to be disposed in their surroundings, it is dumped in farmlands/vacant plots/rivers, within or outside the city.

Understanding the gravity of the situation, the city sanitation task force (CSTF) of Chunar decided to install a dedicated treatment plant for safe management of FSS and have even identified & designated land for faecal sludge & septage treatment plant (FSSTP), in Dargahshareef Pargana Haveli area. National Mission for Clean Ganga (NMCG) has sanctioned the project and aims to establish it as a model for other small/middle sized towns/cities by March 2020.

Meanwhile, to avoid indiscriminate dumping of FSS in the environment, Chunar CSTF has decided to construct trenching site(s) where desludged FSS can be discharged safely, till the time scientifically - designed treatment facility is in place.

Planning for trenching

The following aspects must be considered as part of the planning process for trenching:

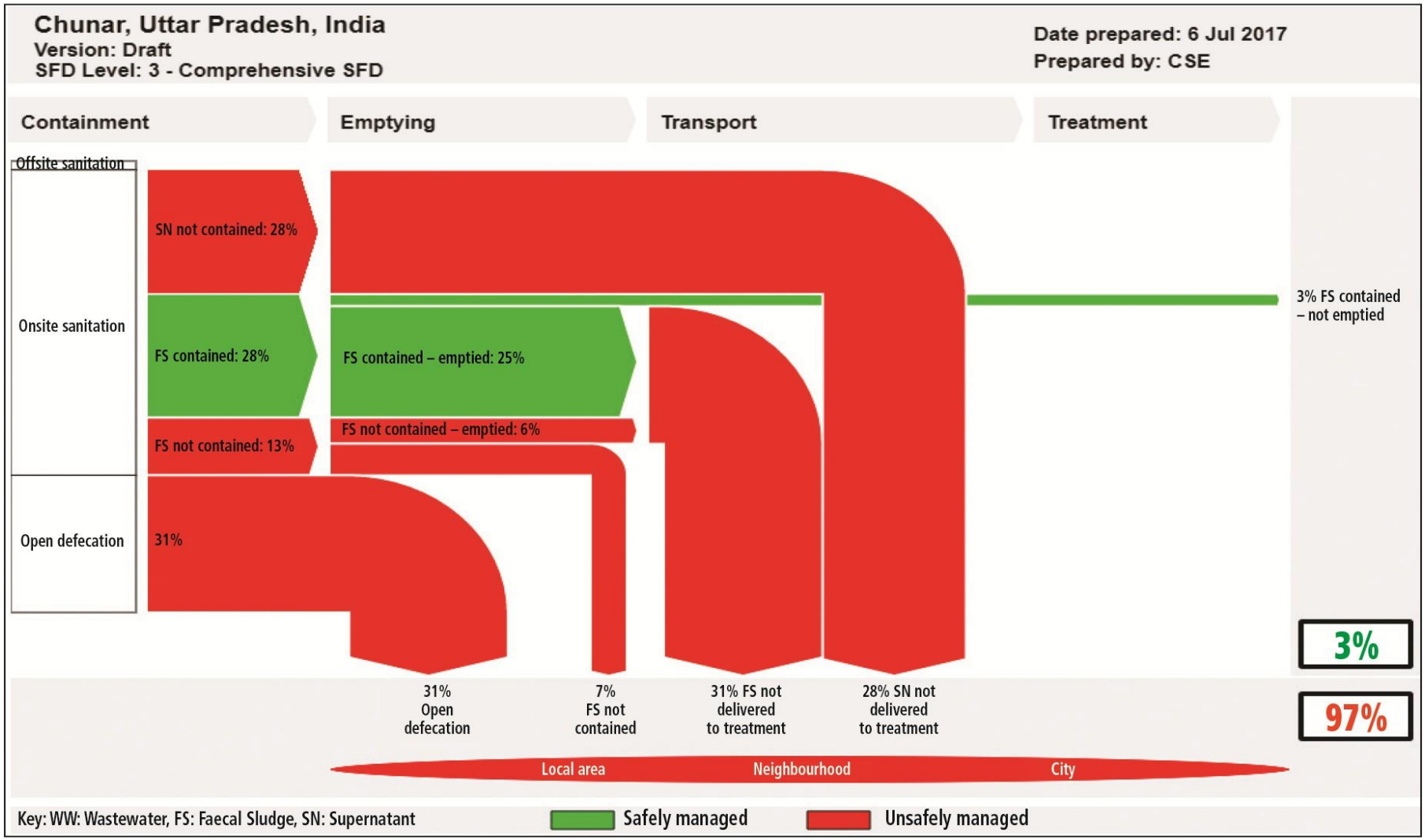
- Estimate the current and future FSS load to be disposed of and accordingly identify the trenching locations
- The sites must be selected based on suitability for trenching which includes following criteria:
    - Legal permissions & approval from relevant authorities
    - Should not be a water - logged & flood prone area
    - Soil permeability must be high so that it allows effective leaching (ex.: Black Cotton Soil can be avoided)
    - Land should be reasonably flat so that it's easily accessible for decanting vehicles
    - Sufficient buffer distance of atleast 200 meters from habitable properties
    - Site should not be close to surface/sub-surface/ground water sources, especially used for potable purposes
    - Leachate/filtrate/liquor treatment facility – if required to meet effluent discharge standards

Designing of trenches

The following design considerations should be kept in mind while designing trench:

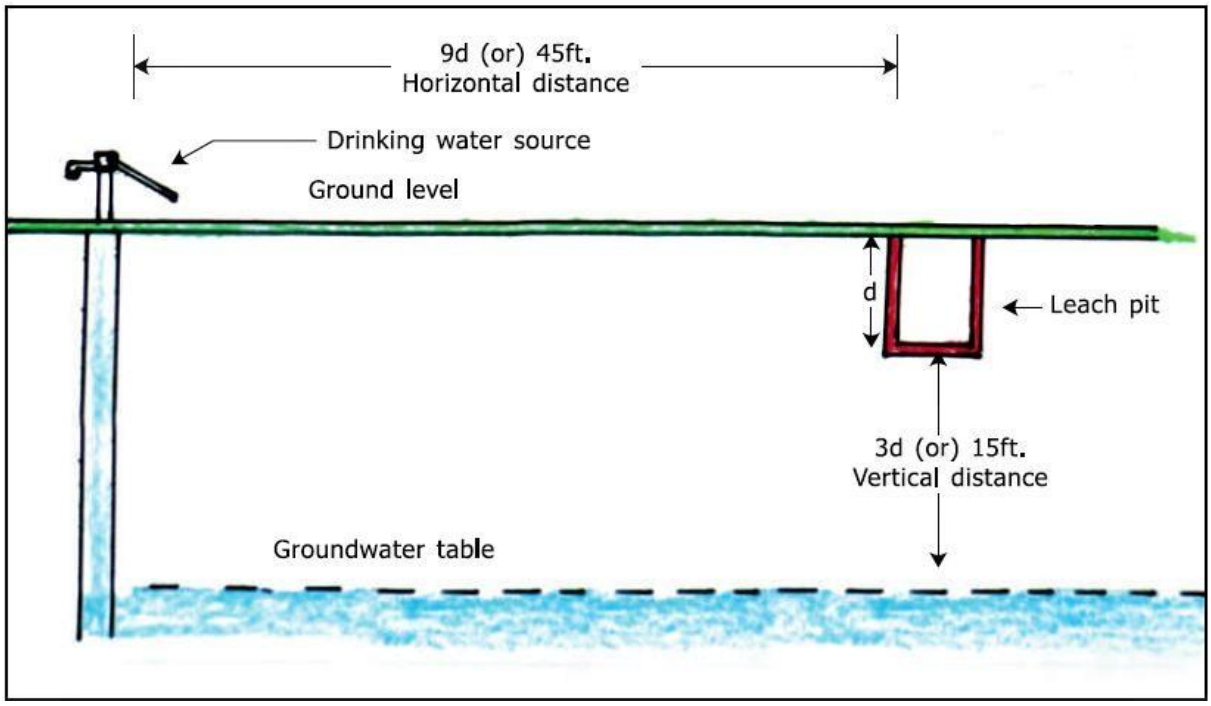
- Trench dimensions should be majorly based on type of soil & quantum of FSS to be deposited
- The permissible horizontal distance between the trench & surface water sources and the vertical distance between bottom of the trench & ground water table should be maintained as illustrated in Figure 2.
- Access roads to reach the trenching site & inner road between the trenches should be designed properly for easy movement of the tankers
- Fencing to protect the trenching area can be considered. Trees can be planted along the fencing to reduce the odour & give the site an aesthetic look
- Warning signage should be placed appropriately

Figure 1: Shit flow diagram of Chunar city



Source: **(SFD Report of Chunar, CSE)**

Figure 2: Minimum safe distances to avoid ground/surface water contamination



Safety precautions

Specific practices need to be emphasized that will help reduce the risk of on-the-job injuries at excavation sites. Such practices can include the following:

- Know where underground utilities are located before digging
- Keep excavated soil (spoils) and other materials at least 2 feet (0.61 meters) from trench edges
- Keep heavy equipment away from trench edges
- Identify any equipment or activities that could affect trench stability
- Inspect trenches at the start of each shift
- Inspect trenches following a rainstorm or other water intrusion
- Inspect trenches after any occurrence that could have changed conditions in the trench
- Ensure that personnel wear high-visibility or other suitable clothing when exposed to vehicular traffic

2 Trenching in Chunar

Site selection

Though, there still does not exist even a single act/rule which is directly applicable for the site selection for trenching (for FSSM), there are many other relevant rules as listed below which can be indirectly applicable:

- The Water (Prevention & Control of Pollution) Act, 1974 as amended
- The Air (Prevention & Control of Pollution) Act, 1981 as amended
- The Environment (Protection) Act, 1986
- Solid Waste Management Rules, 2016
- Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016

Selection of a suitable site for the trenching warrants an integrated approach comprising of multiple social, economic, technical and regulatory criteria. The ownership status of the land is also an important parameter as this would demand additional financial resources. The social factors like willingness of the local communities to have trenching site in their backyard must also be considered during selection of the sites. Technical specifications like availability of agricultural field/ water bodies for the discharge of treated wastewater / sludge, the ground water depth, geological formations are also considered.

In view of the above, a detailed 10 point checklist covering the above key aspects was prepared (refer Table1).

Table 1: Scoring guide for the screening of sites for FSSTP

S. No.	Parameters	Maximum Score	Scoring method for FSSTP
1	Ownership of land	10	ULB owned land - 10; State government land - 8, private land – 4, Under any dispute – 0
2	Availability of land	10	Immediately available - 10; Available in 1-3 months - 6 points. Available in > 3 months - 3
3	Distance from Residential area/ Habitat	10	Within 100 m— 0; Within 100-500 m - 3; 500m - 1km - 7, 1-3 Km -10, 3-5 km; 7; > 5 Km- 3
4	Approach road	5	No approach road - 0; wide approach road through the colony – 2; narrow road but not through the colony 4; Wide road - 5
5	Visibility and impact	15	At prominent location where good public transportation is available up to the site - 15; Good road with public transport and use off display board can enhance the visibility - 10; Good road but no visibility [interior area] - 5; Unreachable to common people for demonstration-2
6	Reuse option for treated effluent and dried manure	15	Chance of reuse of effluent for agriculture and manure for agriculture - 15, partial reuse of effluent and demand of manure expected- 10, Partial use (either effluent or manure]-5, no chance of reuse of effluent but only for disposal and reuse of manure-02
7	Disposal of treated effluent	5	Under gravity- 5; Partial under gravity and pumping - 3; Entire pumping – 0
8	Social acceptability. Is there any chance of problem for society?	10	No probability - 10, Issues may arise but involvement of relevant stakeholders can address the issue - 5, Likely chances of dispute – 0
9	Chances of flood in the area	10	No history of flood - 10; No flood in recent years - 7; Occasionally flooded site - 5, Flood prone –00
10	Is there any water body adjacent to the site	10	Nearby water body (within 100 m)- 2 points, 100-200 m - 4; > 500 m- 1km – 10
	Maximum Total	**100**	

The entire site screening and assessment exercise concluded that the Community Toilet Complex in Dumduma Mohalla (Ward No. 10) shall be the ideal site for trenching. Thus, this Project Report for trenching has been prepared for the Community Toilet Complex site. The site was physically verified and discussions were held with local communities residing in nearby areas and with the municipal

functionaries. The pictures of surroundings of the selected site and its google image are given in Figure 4. Table 2 summarizes the salient information of the site.

Table 2: Salient features of the selected site

Site	Advantage	Disadvantage
Community Toilet, Dumduma Mohalla, Ward No. 10	1. The land is owned by the ULB. 2. The site has a boundary wall already constructed. 3. Community toilet already has acceptance among local residents. 4. It is a sparsely populated area. 5. The site has a functional 5m wide approach road	1. The site might be accessible to children, thus will require fencing.

Preparation of the trench

A Trench of about one metre deep shall be dug. The width of the trench shall vary from two metres to four metres (2m – 4m) and length of the trench shall be sixteen metres (16m). The trenches should preferably have sloping side walls (1:1) and a floor of 1% slope to prevent water logging. Refer Figure 5 for the layout of the existing Community Toilet and proposed trench along with its detailed design.

Filling the trench

First, two layers of HDPE liners shall be laid, to avoid groundwater infiltration.Faecal sludgereceived per day shall be spread over this. After filling all the FS of one day, a thin layer (1 inch thick) of soil shall be laid over it followed by sprinkling of 1kg urea. This shall be done till the trench is filled upto 6 inch depth, which shall be filled by soil to prevent breeding of flies. The materials are allowed to remain as such without any turning and pot watering for about three months.

After the initial aerobic composting, the material undergoes anaerobic decomposition at a very slow rate and it takes about six to eight months to obtain the finished product.Figure3 provides a representation of the way the trench needs to be filled.

Figure 3: Filling the trench

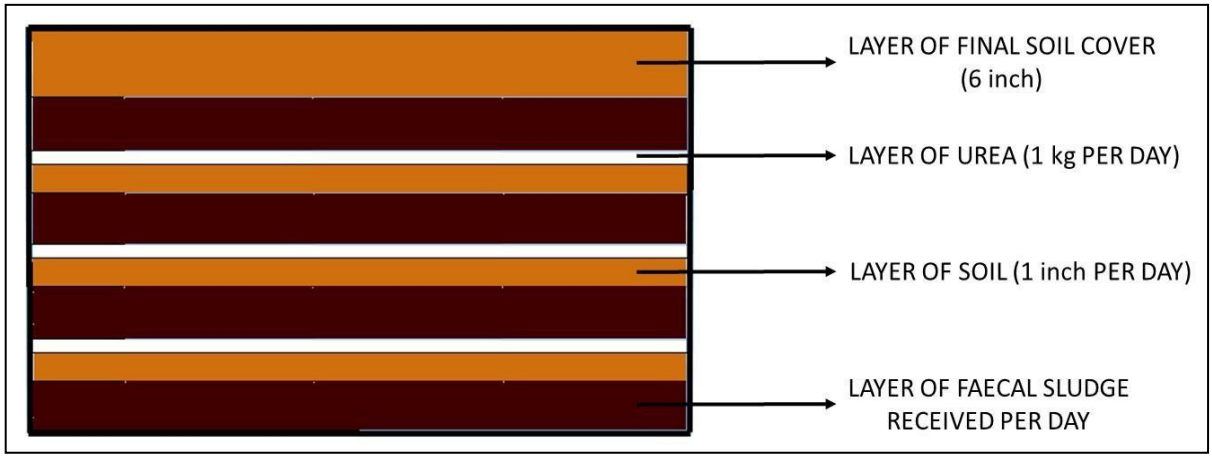
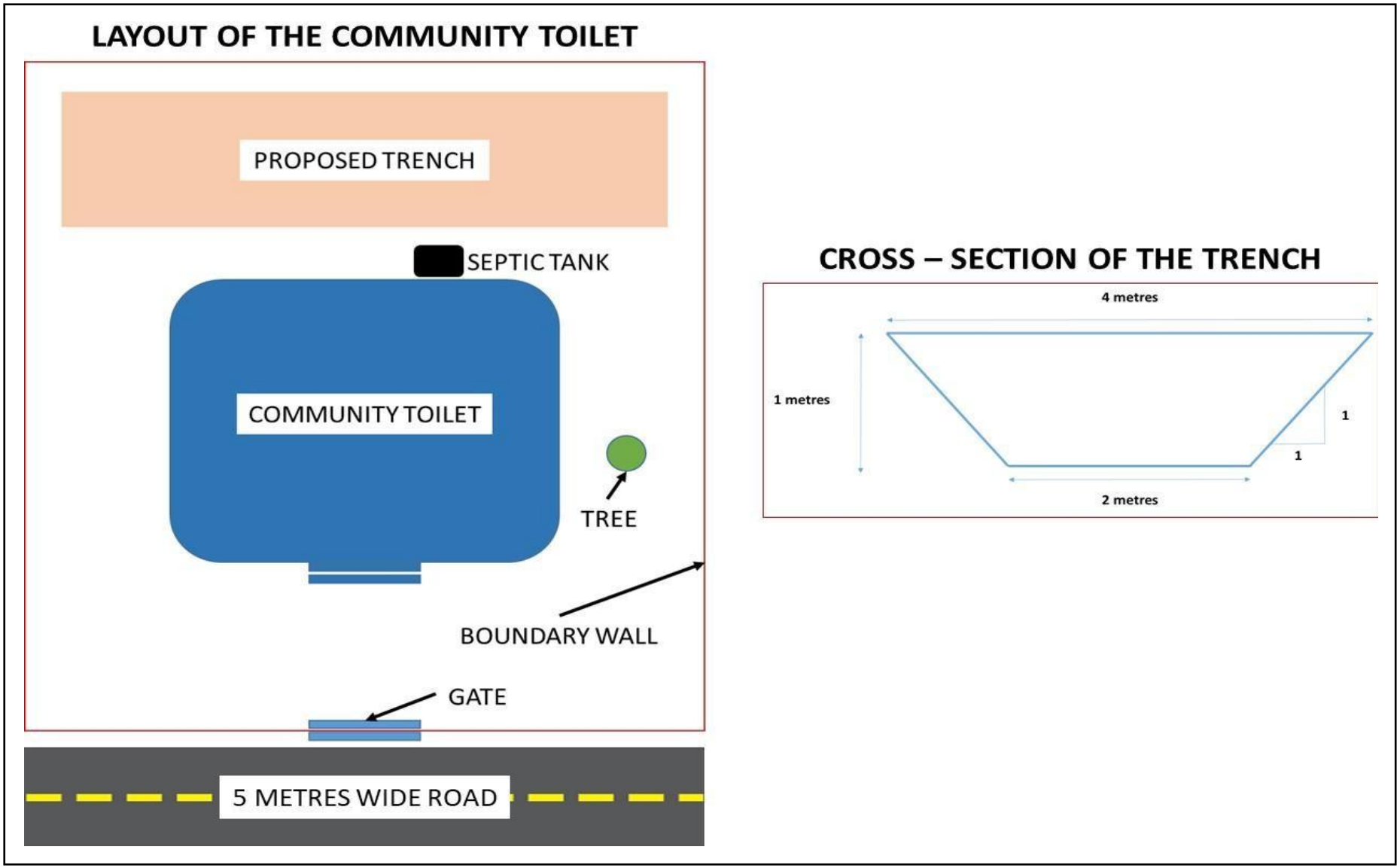


Figure 4: Location and features of identified site

Figure 5: Layout of existing Community Toilet and proposed trench along with cross-sectional design



3 Cost Estimate

Approximate cost of the trenching including design and constructionof the system would be around ₹ 28,000 (Refer Table3 for detailed estimate), whereas the monthly expense of operating the trench is estimated to be ₹ 1,800 (Refer Table4 for detailed estimate).

Capital Expenditure

Table 3: Estimate of capital expenditure for trenching

S. No.	Item Description	Unit	Quantity	Rate	Amount
1.	Hiring Earth Mover (JCB)	Hours	5	1200.00	6000.00
2.	HDPE Linerunderlying sludge	Sq.m	210	35.00	7350.00
3.	HDPE Liner for covering during rain	Sq.m	90	35.00	3150.00
4.	Fencing	Sq.m	16	560.00	8960.00
				Sub-Total	25460.00
	Add 10% for contingencies				2546.00
				Total Cost	28006.00
				Say	**28000.00**

Operational Expenditure

Table 4: Estimate of monthly operational expenditure for trenching

S. No.	Item Description	Unit	Quantity	Rate	Amount
1.	Urea	Kilograms	2	500.00	1000.00
2.	Personnel for adding earth over decanted faecal sludge	Hours	4	200.00	800.00
				Total	**1800.00**