

ONLINE COURSE FAECAL SLUDGE MANAGEMENT
DEVELOPED BY UNESCO-IHE AND SANDEC
JANUARY 2016

Key note 3.1: Methods and Means of Faecal Sludge Collection and Transportation

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Related course material | Chapter 04 in the FSM book;
Presentation
Assignment

UNESCO-IHE INSTITUTE FOR WATER EDUCATION

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Presentation Outline

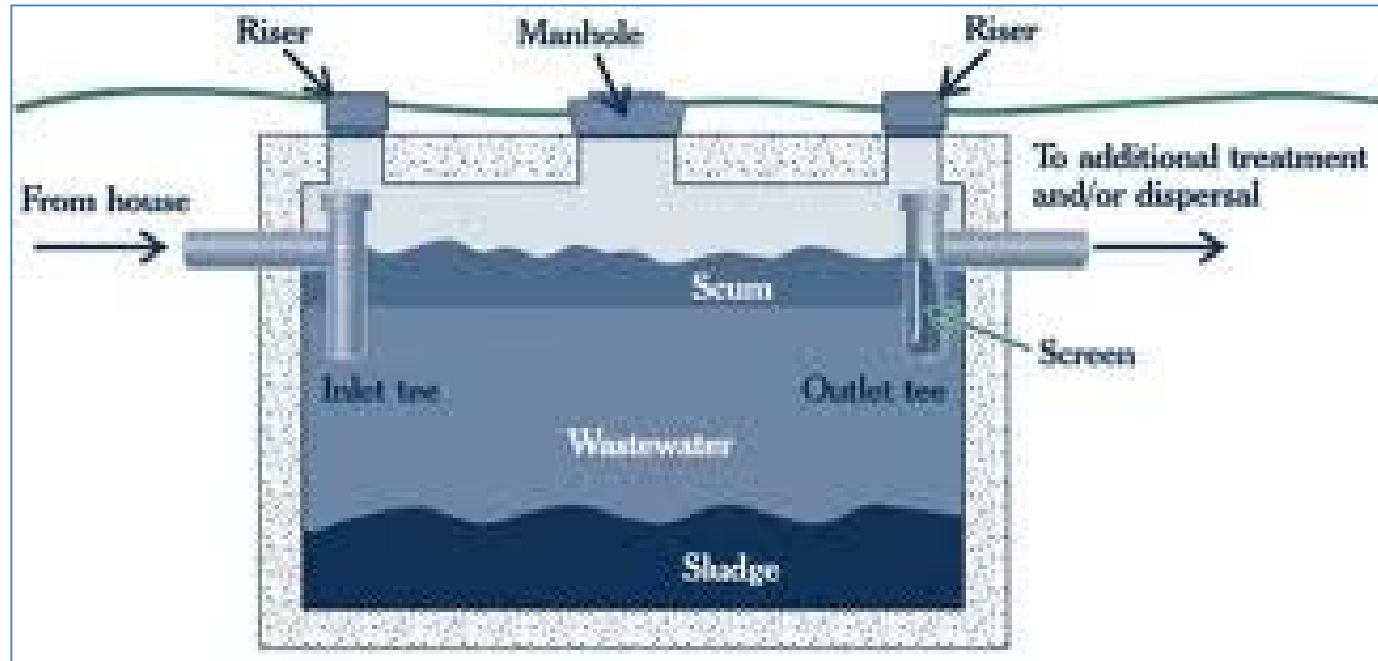
- I. Service models of desludging – Scheduled vs. demand-based collections programs
- II. Rapid Technical Assessment – Determining conditions in coverage area
- III. Transfer stations
- IV. Modeling the collections program – design flow, number of trucks, estimating the cost of the collections program
- V. The motor pool



First some background

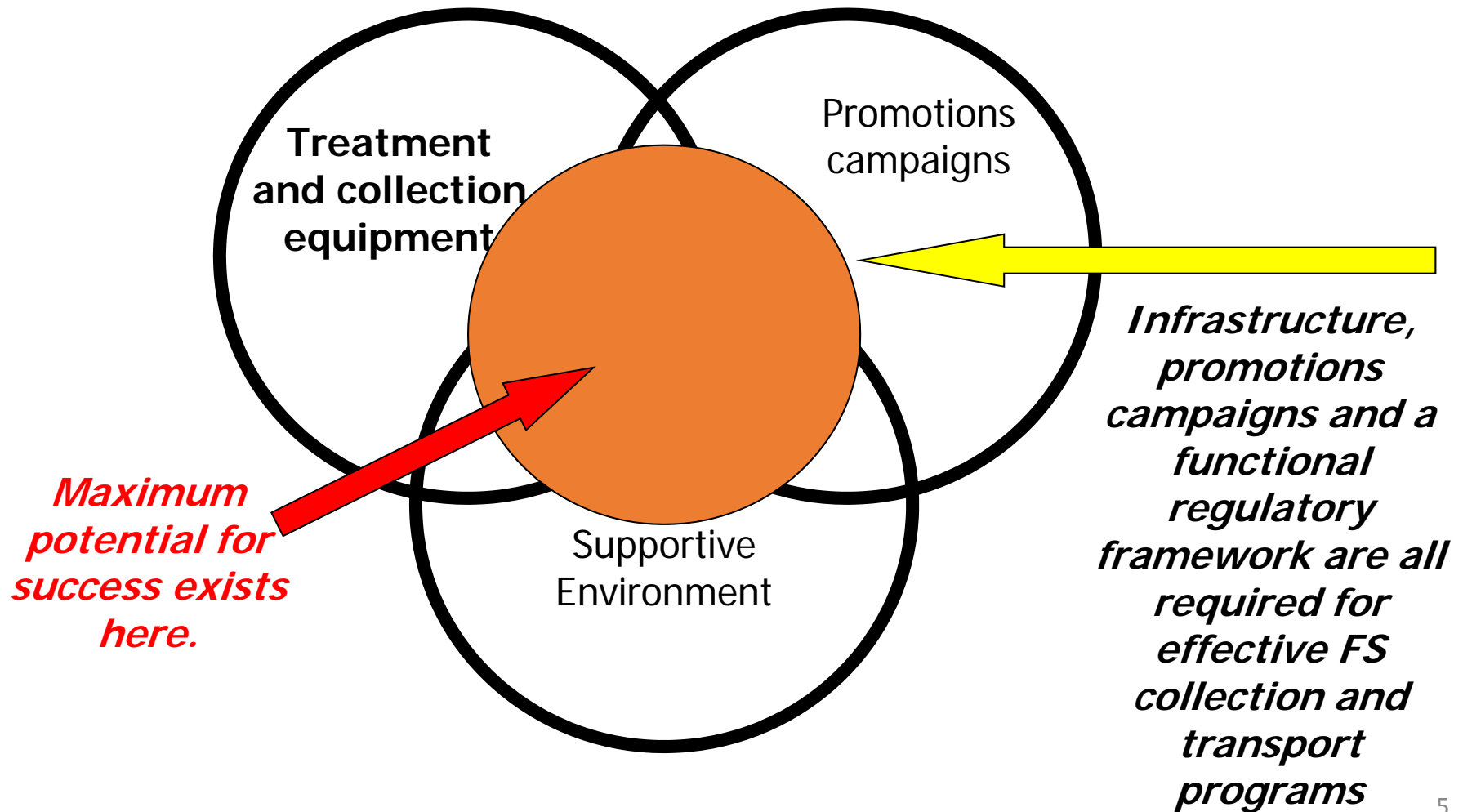
The importance of a well rounded program, based on good **technology** choices and coupled with **promotions** campaigns and a sound **regulatory** framework are required for sustainable collection and transportation programs.

Septage, Faecal Sludge, Effluent



- Septage: the sludge, scum and liquid in a containment tank
- Faecal sludge: the solid matter that accumulates at the bottom of the tank
- Effluent: the liquids that flow out of the tank or pit into the environment

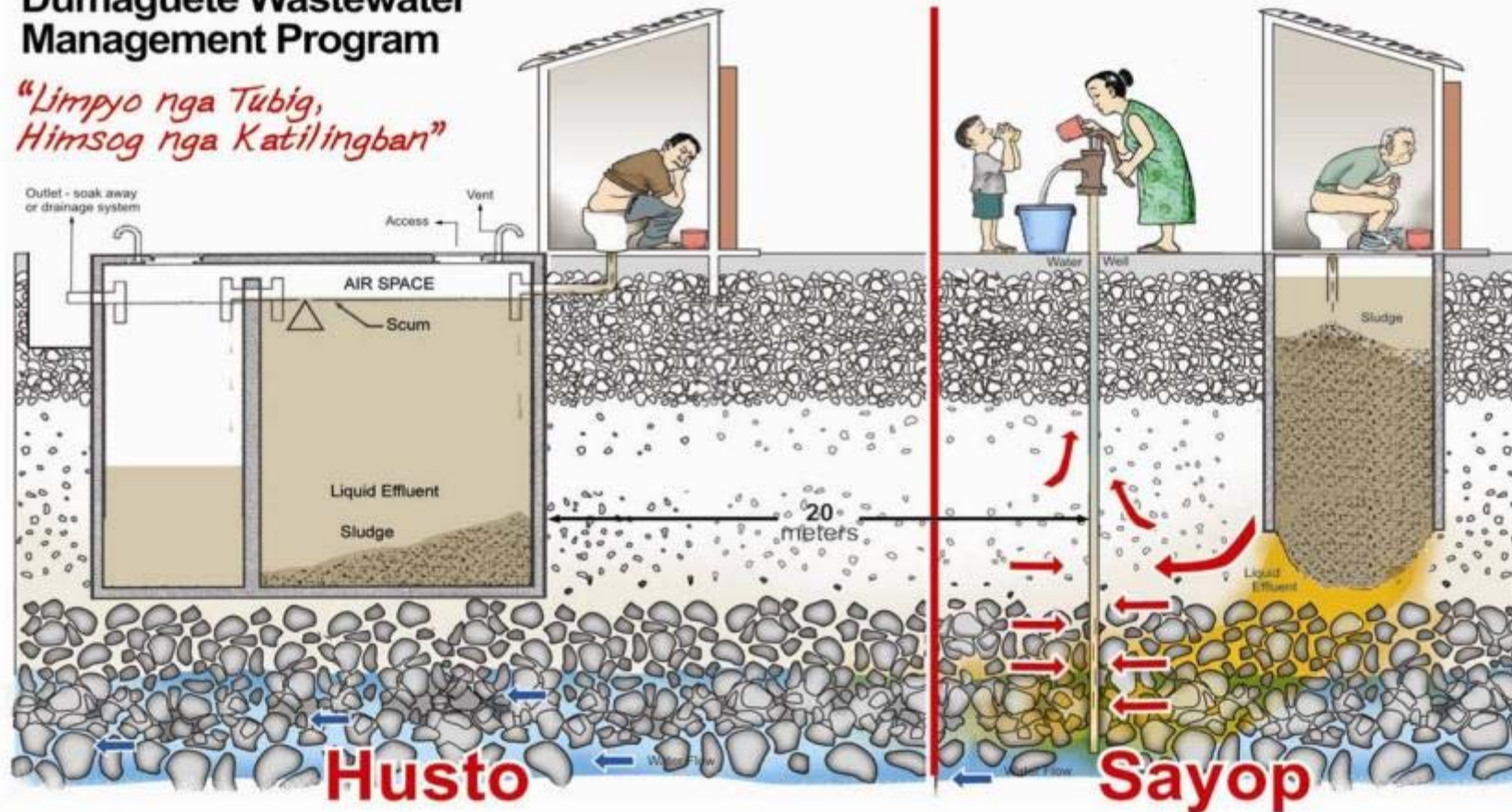
Three components of successful Fecal Sludge Management programs



Ang Husto nga Septic Tank

Dumaguete Wastewater
Management Program

*"Limpyo nga Tubig,
Himsog nga Katilingban"*



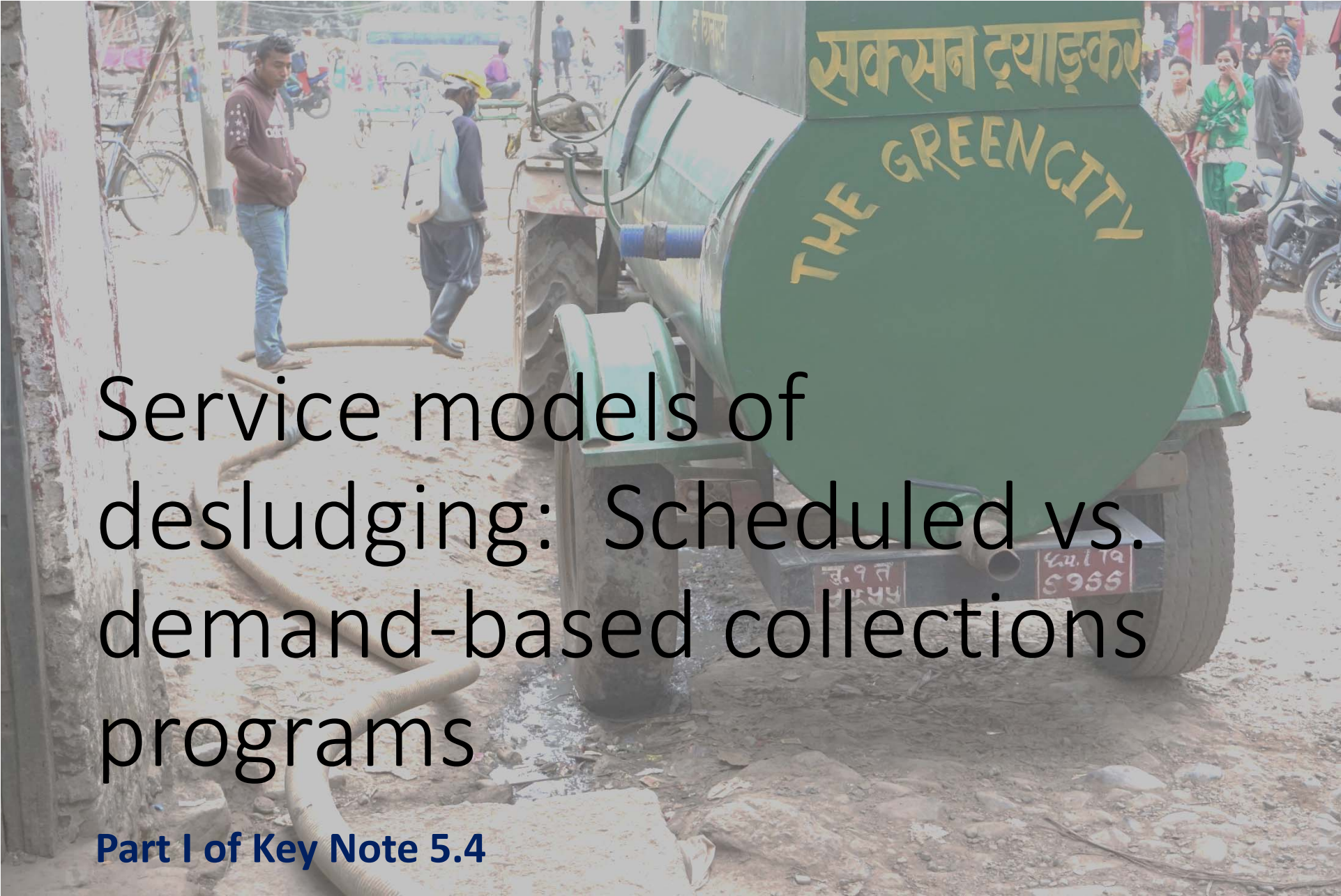
Example of a promotions output. You don't need to be a linguist to understand the **"right"** and **"wrong"** septic tank. This poster is used to increase awareness and eventually, willingness to participate in the program and pay for services.

Local Ordinance on Septage Management

- Applicability
- Standard designs
- Desludging requirements
- Fee Schedule
- Incentives
- Penalties for non-compliance



Reference: Dumaguete City Septage Management Ordinance



Service models of desludging: Scheduled vs. demand-based collections programs

Part I of Key Note 5.4

Scheduled desludging service

Scheduled desludging:

- Regular and periodic collection service
- Block by block desludging
- Supported by user fees collected by water utility or government (monthly water bill surcharge or quarterly tax)
- Service may be by public or private sector
- If private sector, payments made to contractor based on volume delivered to the treatment plant
- Missed (re-scheduled) or extra service available for an additional charge

Benefits

- May provide service before a problem exists
- Generally more cost effective through program efficiency
- Perceived as more affordable as payments are spread out over time

Detriments

- Requires ongoing promotions and incentives to encourage participation
- Different sludge accumulations rates and FS storage capacities makes it difficult to select an “optimal” frequency.

Service providers are paid by the government or utility based on volume. This is an incentive to make sure the waste is brought to the treatment plant. Inspections at the time of service by the local enforcement agency can be used to initiate the upgrading process.

Demand - based desludging service

Demand - based desludging:

- Customers call the service provider directly to request service
- Service may be performed by public or private sector
- Direct relationship between the customer and the service provider. If private sector service provider, the local government or utility not involved.
- Innovations include “call centers” where calls are received by a clearing house that submits desludging requests to multiple contractors for bidding.

Benefits

- Provides users more control over their facilities as they determine when to request the service

Detriments

- Containment tanks may be full long before the call for service is made
- Lump sum payments at the time of service may be perceived as very expensive
- Generally more costly as there is no efficiency in transportation
- Limited opportunities for inspection at the time of service.

Service providers are paid by the government or utility based on volume. This is an incentive to make sure the waste is brought to the treatment plant.

A worker wearing a yellow hard hat, a dark long-sleeved shirt, and dark trousers with reflective stripes is working on a green structure. The structure has yellow Hindi text on it. The background shows a residential area with multi-story buildings and a large palm tree. The image is semi-transparent, allowing the text to be overlaid.

Rapid Technical Assessment – Determining conditions in the coverage area

Part II of Key Note 5.4

INNOVATION – Rapid Technical Assessment (RTA)

A statistical survey mechanism used to obtain data about on-site wastewater system characteristics in a given community in terms of:

- Containment tank volume
- Accessibility by vacuum truck or other vehicle type
- Average distance from the community served to the treatment plant
- Average time it will take to deliver the load
- Additional time it might take based on site conditions
- Additional tools that might be required to perform the desludging (extra hose, booster pumps)

Surveys can be conducted generally in less than one week providing information at a pre-feasibility study level.

Use of hand held Smartphone or tablet makes data collection easy



Rapid technical assessments strategy

To conduct the assessment, teams:

- Deploy to predetermined neighborhoods, wards or districts with similar characteristics
- Interview and ask questions of the building owner
- Use technical skills and local knowledge of construction practices to make the assessments
- Upload data to central database for analysis

A team of enumerators from SNV Nepal receives training on the use of the Akvo Flow data collection system. The questions are in English and the local language for ease of the enumerators.

This example program is in support of a scheduled desludging program being implemented by Birenranagar Municipality in Western Nepal.



Main questions to answer during the RTA

- Is there a septic tank, pit or holding tank? If so, where is it?
- What is the distance between the truck parking and the tank or pit?
- What is the rise or fall between the truck parking and the tank or pit?
- How big is the tank or pit?
- How many people use the toilet?
- Has it ever been desludged before? If so, when and at what cost?
- How far is the site from the treatment plant
- How long will it take for the truck to get to the site?
- Is the site accessible to desludging trucks?
- If the site is not accessible, how far to the nearest parking area?
- Where will the desludging truck park when it gets to the site?
- Where does the “greywater” or “sullage” flow (sinks, laundry, shower)?
- What happens to the drainage once it flows from the house?
- Is an upgrade needed, and if so, will the upgrade be possible?

RTA Step 1 - What type of toilet is in use?

- Drop through
- **Pour flush**
- Automatic cistern flush
- **Automatic water utility flush**
- Ecosan
- **No toilet is used**

The type of toilet will impact upon the volume and characteristics of the waste in the tanks or pits.

A pour flush toilet should have some type of p-trap or water seal. Keeps odors out of the structure.

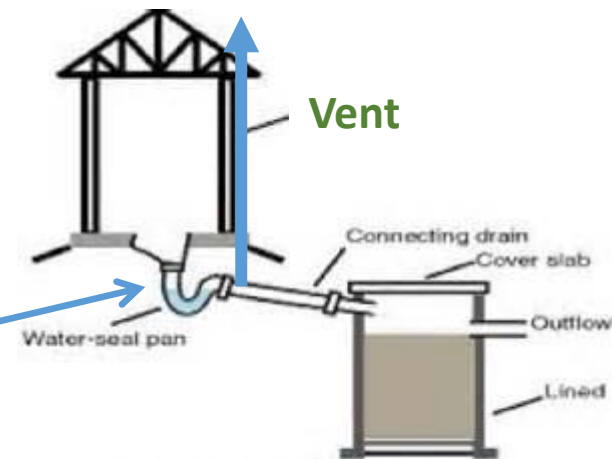
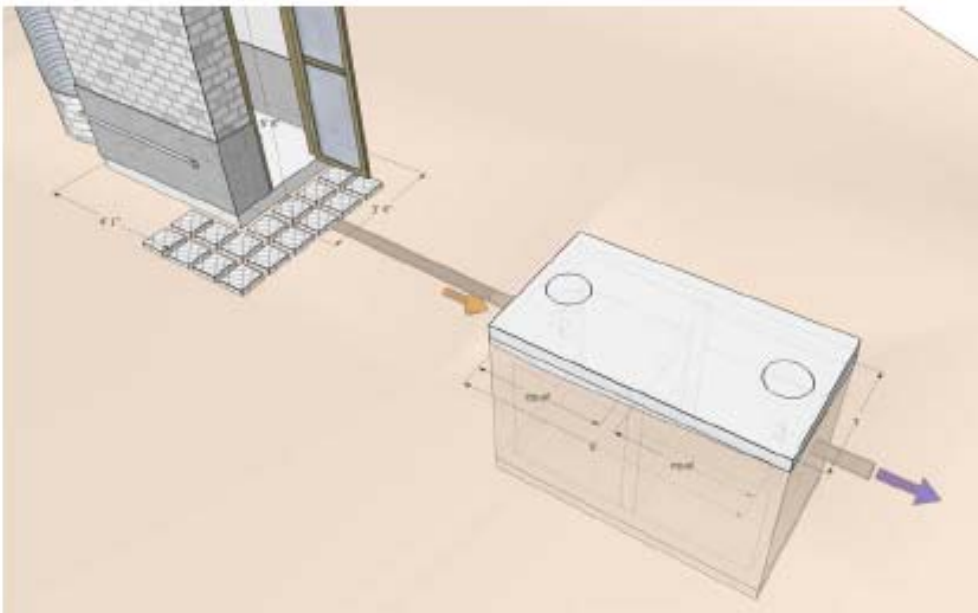


Figure 9: Pour flush latrine pan.

RTA Step 2 – Type of containment

Determine the type of containment system in use:

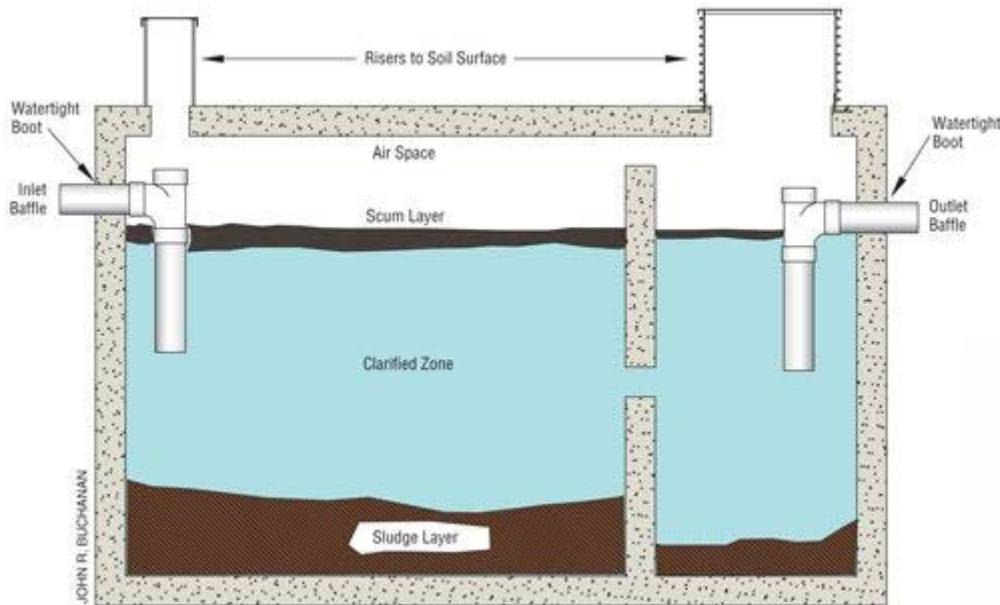
- Soakage pit/well
- **Holding vault**
- Septic tank
- **None of the above**
- Combinations of the above



“Containment” may or may not occur, especially if the tank or pit is full of sludge or designed with overflow pipes. These conditions will also be determined to the extent possible as an output of the RTA.

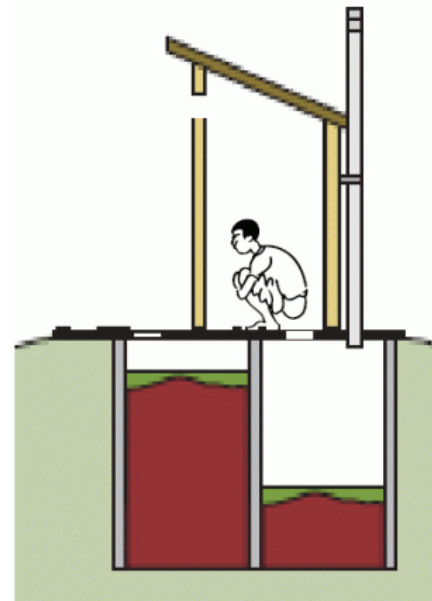
In this image, a septic tank is used for containing the faecal sludge, while the effluent is discharged to the environment

Is there a soakage pit/well, holding tank or septic tank?

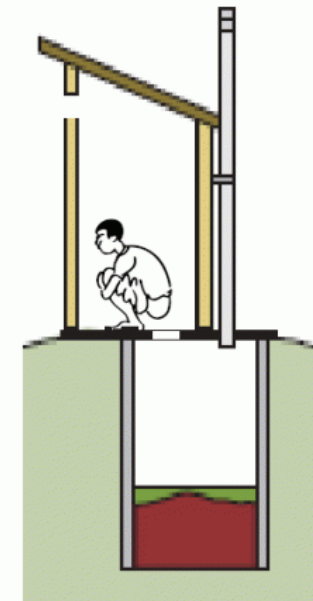


Proper septic tank: It has at least 2 compartments and is sealed at the bottom. It has access ports (man holes) over each compartment and a proper outlet structure.

Pit: note the two different types of pit toilets shown, single and double pit. Like septic tanks, there are many varieties.



Twin pit latrine



Ventilated improved pit latrine

INNOVATION – Onsite dewatering systems



A mobile sludge dewatering truck is used to pump septic tanks, separate the faecal sludge from the liquids, and send the liquids back to the tank. High capital cost, but much more efficient in transferring solids than regular vacuum trucks.

RTA Step 3 - Is the site accessible to desludging trucks?

- Are the streets wide enough for a truck to pass?
- Are there any weight restrictions on the roads or bridges?
- Are there any seasonal flooding issues to be aware of?
- Are there places to turn a big truck around?

Hint 1: Ask the home owner or occupant. They have been living there and may have some knowledge about the conditions of roads or seasonal access issues.

Hint 2: Pay attention to the road conditions on your way to the site. Look for narrow streets, tight turns or low bridges, which might impede access by the truck.



Be aware of narrow roads



Look for bridges that may wash out or have weight limits

RTA Step 4 – Accessibility of the tank or pit



This step considers the accessibility of the tank or pit for the desludging hose. It indicates how easy or difficult it will be to perform the desludging. Helps estimate the amount of time it will take to perform the service.

Presence or absence of manholes, distance from the truck parking, and elevation of the tank vs. the truck parking are all conditions that affect accessibility

Locating the tank or pit

- Finding the tank is not always easy. It might be buried in the yard or under the house.
- **Hint: Ask the homeowner or occupant. Sometimes they know.**
- Hint: If the house is on piers, look under the house to see where the pipes go. This can give a clue to the location of the tank.
- **If on a slab, look for openings or access ports.**
- Hint: Use the tic-tic-tic method of gently tapping a metal bar on the concrete. When you hear a hollow sound, likely you have found the tank.
- **The image in the center is a septic tank probe used for pushing through soils to locate the tank. See it being used on the right?**



More on septic tanks

This septic tank will be hard to desludge. It will need manholes installed. See the orange caps? These cover inspection pipes and are not suitable for desludging. In this case, proper access ports will need to be installed.



These are plastic septic tanks ready for installation. NOTE: septic tanks are not always concrete and not always shaped like a box!



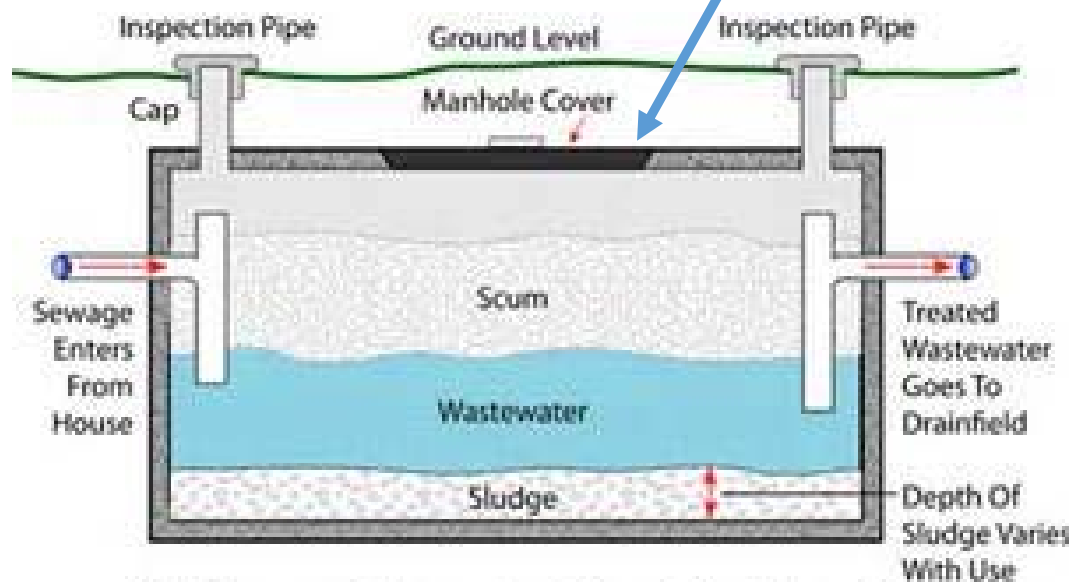
More on septic tanks – manholes and access

Sometimes there are no man holes and all that are found are inspection pipes. It is not possible to pump out a septic tank through these pipes, as all you will do is remove the liquid and leave the solids behind. In this case, the tank must be excavated, and an new man hole (access port) installed.

Point for consideration: No baffle? Is this still considered a septic tank?

Don't use inspection pipes
for pumping

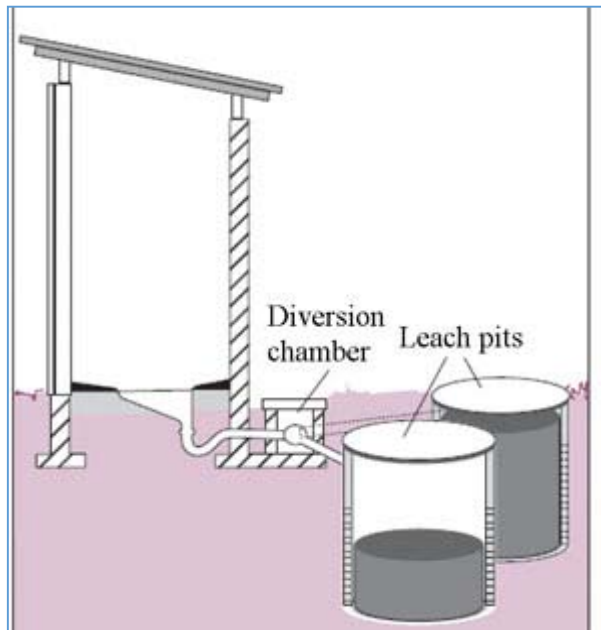
Do use the man hole
for desludging



Schematic of a Septic Tank

More on pits

- Sometimes pits are constructed with concrete rings.
- Homeowners may often know how many rings were installed
- If you know the diameter of the ring, it is easy to find the volume.



Are pits:

- Drop down or offset
- Single or double?
- If double, is there a control valve?

RTA Step 5 – Determining if it will take extra time to desludge

Will it take extra time to desludge the tank or pit? Two conditions are considered that will add extra time each time the system is desludged:

1. Will the workers have to run the hose through the house to access the tank? This will take some extra time to run the hose, and clean up afterwards.
2. Digging for the lid. If the access port lid is buried, this will take some extra time as well.

Here, workers have to dig for the manhole, taking extra time that must be accounted for.



Is water available at the site?

Operators will often add water to the pit or tank as they break up the solid masses with hand tools.

Easy availability of water to the site will aid in the desludging process.

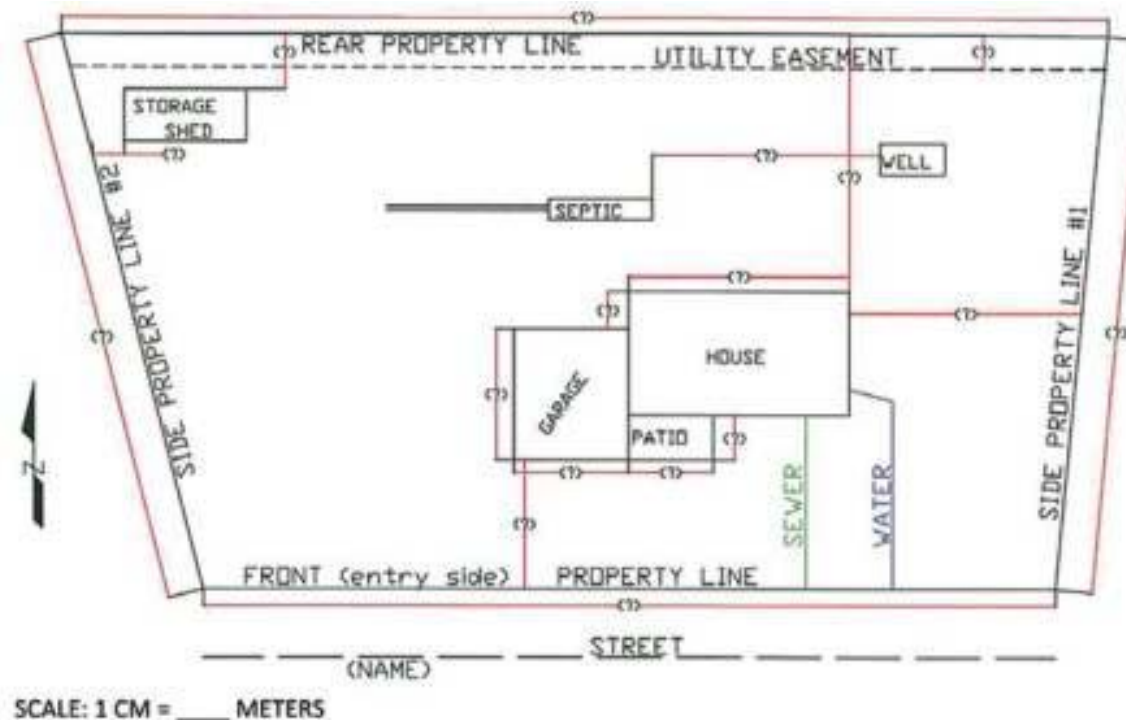
In this image the operator has the vacuum truck in reverse and is pumping water from the truck back into the tank. He then uses the long handle iron bar to break up the masses.



RTA Step 6 – Determine where the vehicle will park

- Is there a designated parking place on the property or right out in front?
- Is the parking area located off the road so that the truck won't block traffic?
- Is the parking area level?

Hint: Desludging trucks carry about 50 meters of hoses, so the truck will need to park as close to the tank or pit as possible. Look at the overall property. Sometimes, as in the drawing below, there is no truck parking place. This is important to note.



If a site is inaccessible by truck, where is the nearest parking?

- If the truck can not access the site, manual desludging with pumps, buckets, barrels, and motorcycle tankers will be required.
- Organized crews will empty the tank and transport the waste to a location where it can be transferred to the truck for delivery to the treatment plant.

- How far is it from the site to a truck parking area?
- How long will it take a motorcycle tanker to drive from the site to the parking area?

Sludge transfer stations are larger tank trucks that carry's the faecal sludge load from the community to the treatment plant at designated times - it may make the process more efficient.

RTA Step 7 - Distance between parking and tank or pit?

- Let's review: We already know a lot about septic tanks, we know how to find the tank, and we know where the truck should park. Now we need to figure out how far away the tank is from the where the truck will park.
- We already know where the truck will park, and we know where the septic tank or pit latrine is located. Now we need to measure the distance.

HINT: When measuring the distance, it is OK to pace it. First measure your own paces by taking ten paces and measuring that and divide by 10. Close enough.

Remember, pace the distance using the same route the driver will use to lay out their hoses.



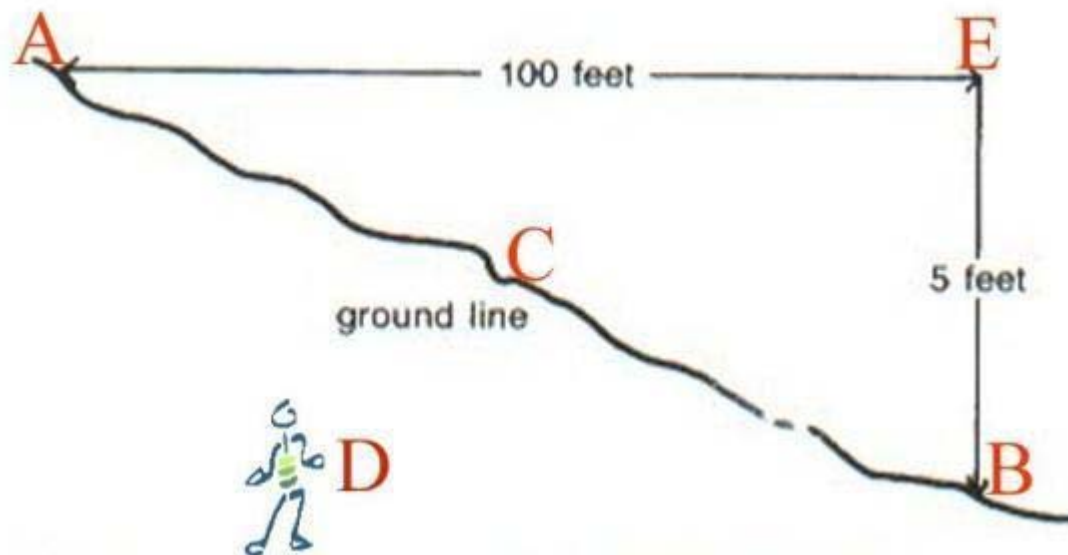
Accessibility – Extra hoses and booster pumps



During the **Rapid Technical Assessment**, teams look for conditions that may require extra hose or booster pumps, such as long hose runs, or the need to pump uphill from the tank to the truck parking area.

RTA Step 8 - Rise or fall between parking and the tank or pit

It is important to know the elevation gain if the land from the tank to the truck is sloping. This is because typical vacuum trucks can only pump up 4 meters (as measured from the bottom of the tank or pit to the inlet of the truck).



If you know the height of your eye when standing, site along a builder's level to see where the ground intersects the level plane. Then measure the distance to that spot. This gives the "rise" over the "run"

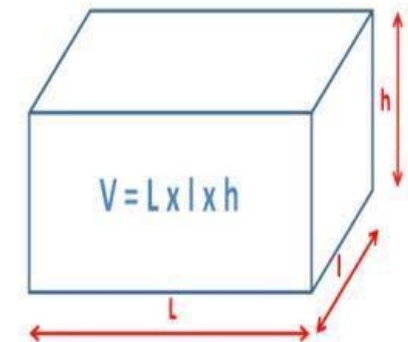
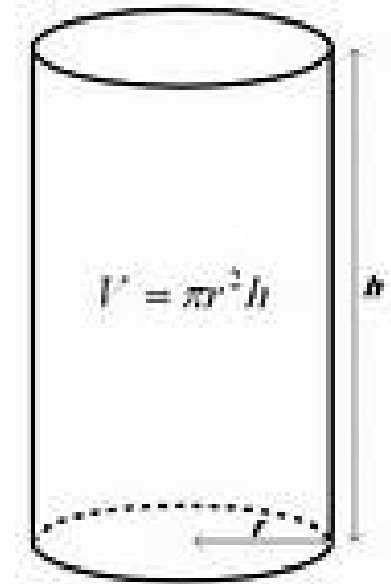
RTA Step 9 - What is the volume of the tank or pit?

- Try to assess the dimensions of the tank or pit. If a septic tank, how long and wide do you assess it is. Use tools like a septic tank probe, or try to find the cleanouts, which can help provide clues.
- Is the tank cross section
Rectangular ____ or
Round ____

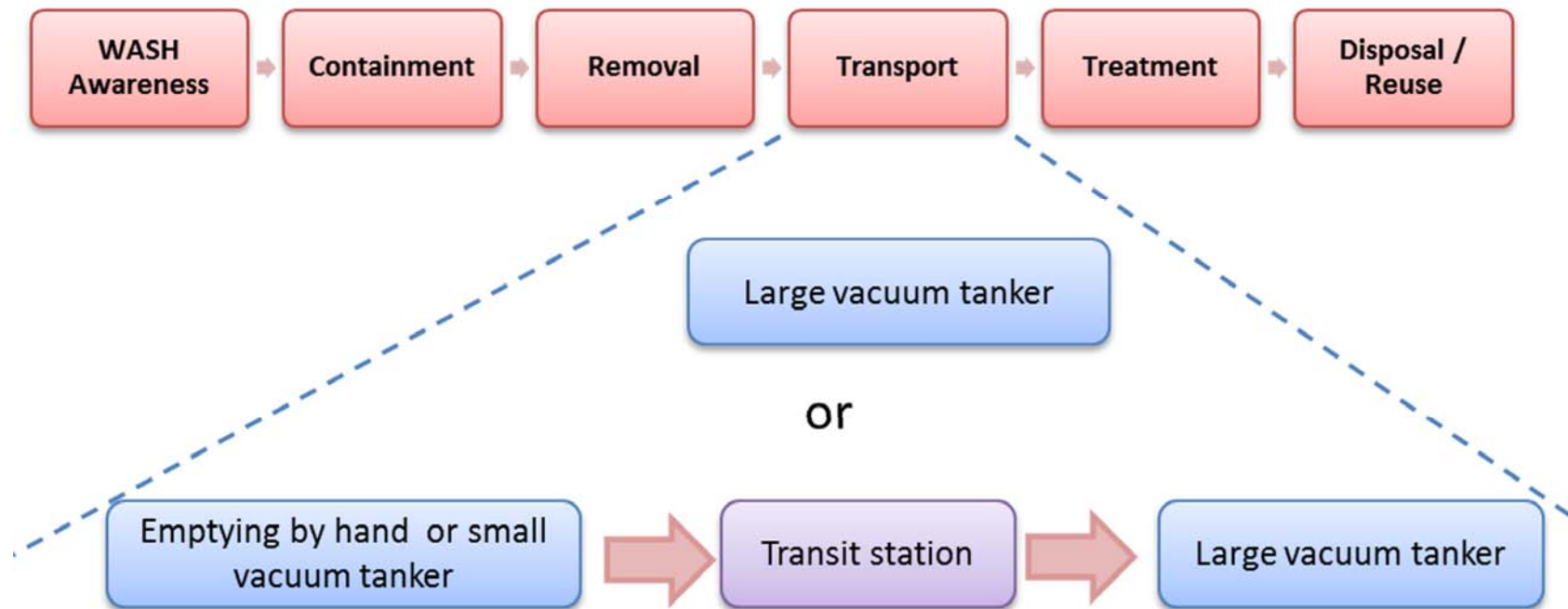
If rectangular: Length = ____ Height = ____ Depth = ____

If round: Diameter = ____ Depth = ____

Unless you pump the tank, you will not really know the depth. You can estimate by discussing with the owner or applying your knowledge of the local building customs and conditions.



Modes of collection and transport



After removal of the faecal sludge, it must be safely delivered to the treatment plant.

Vacuum trucks



Vacuum trucks used by Dumaguete City, Philippines. In this case, the local Water District runs the program. They purchase truck bodies and fabricate the tanks themselves. Cost of the tank: about \$4,000.

Vacutug



In 1995 Manus Coffey and Associates Ltd (MCA) and UN-HABITAT designed and built the first prototype in Ireland: the MK I UN-HABITAT Vacutug.

The Vacutug is a pit-latrine exhauster designed to provide a simple and inexpensive method for emptying pit-latrines in areas where access by conventional exhausters is impossible, for instance, because of narrow roads. It is a simple machine, composed of a vacuum tank and a pump/tug assembly.



Vacutug program in Kushtia Bangladesh



Water, Sanitation and Infrastructure Branch,
UN-HABITAT, Nairobi, Kenya,
Tel: 254-2-624538,
Fax: 254-2-623588.
Email: Watsan@unhabitat.org

Kushtia Municipality is a medium sized city with a population of 1,750,000 inhabitants. Like other urban areas in Bangladesh, this municipality also faces the problem of irregular cleaning of latrines and septic tanks and thereby overflow of sewage and clogging of septic tanks especially in narrow and densely populated areas due to lack of modern equipment of sewage collection and disposal.

Manually operated septage carts



Artists conception of a manually operated septage pump cart. Such systems might be applicable in areas where vacuum trucks can not access due to narrow streets.

Manually operated systems might be used in smaller communities where vacuum trucks may be too expensive, or in areas where fuel supplies are limited.

When vacuum trucks can not access the site

Some FS collection programs must rely on other methods of pit or tank emptying when vacuum trucks are not available, or if sites are inaccessible.

The image from researchers in eThekweni (near Durban) South Africa shows a modified Gulper.

A motorized auger that breaks up the sludge and shoots it into barrels placed on the back of a pick up truck.

It uses a lever arm to assist the pumping action, much like the Mark 2 Gulper which was developed by Water for People in 2013.



The eVac System

Portable pit emptying technology, by Partners in Development and the Water Resources Commission.

The eVac system is designed to access the most difficult locations and most restrictive pits. However, for very dry pits, use of manual excavating tools (used from the ground surface" will be required.



Motor and pump mounted on a trolley and are connected by a belt drive. Hoses are attached to a single lid which can be moved between containers in seconds.

RTA Step 10 - Distance and time

The distance and time it will take the truck to drive from the treatment location to the site will have a big impact upon the fleet.

- How far in kilometers – will determine fuel costs, wear on equipment?
- How long – will determine drive times and number of loads that can be hauled in one day.

It might not be possible to tell, especially if the location of the plan has yet to be determined.

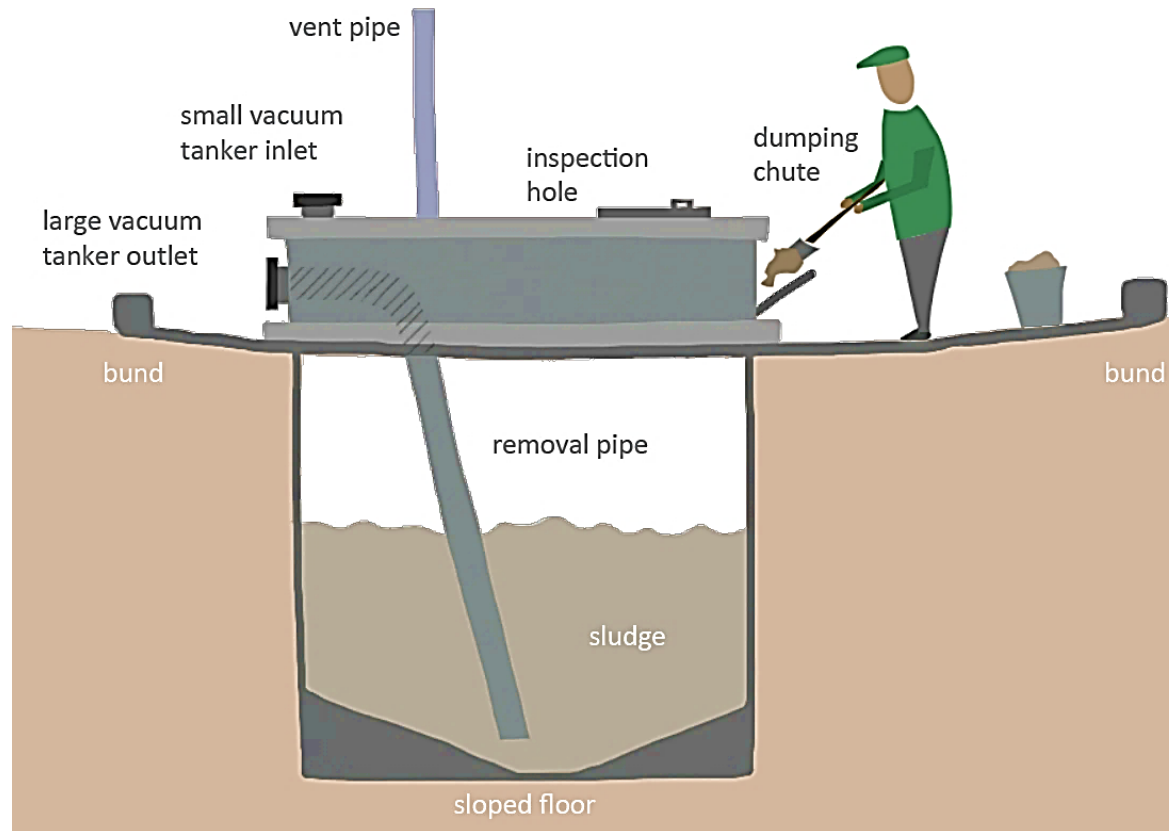
Provide information on traffic or truck bans. This will indicate if a transfer station should be used which may allow trucks to operate easily during off peak hours.



Transfer stations

Part III of Key Note 5.4

Stationary transfer stations



Fixed transfer stations like the installation shown are most appropriate for demand-based desludging programs.

Permanent installations may contribute to excessive:

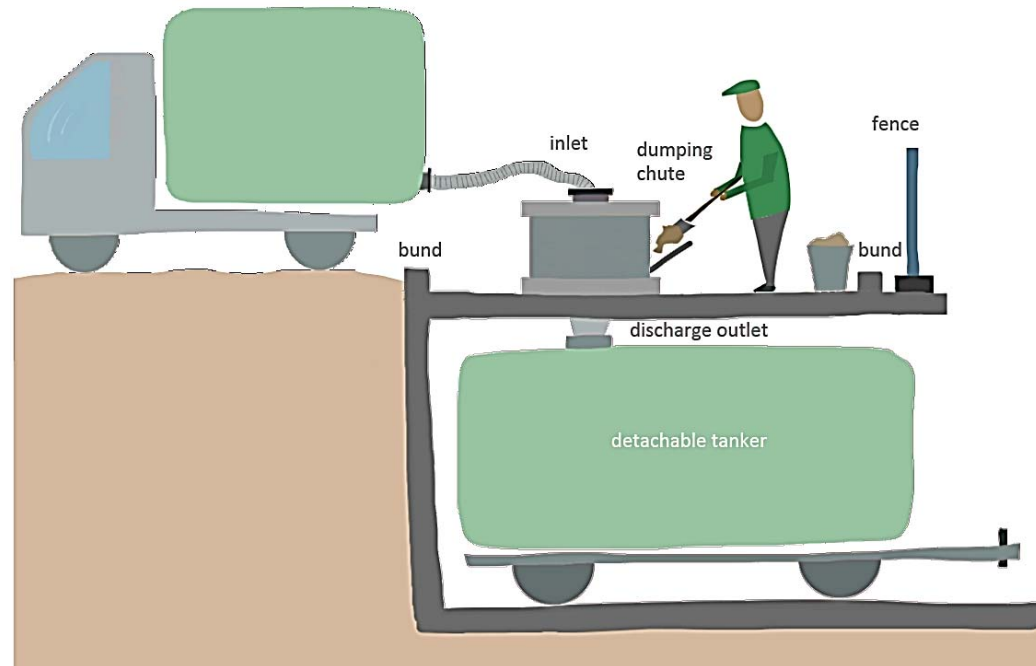
- Odors
- Truck traffic
- Noise

Consultation with the community to avoid Not In My Back Yard (NIMBY) syndrome.

Consider the use of transfer stations when:

- The distance between community and treatment plant is far
- The time it takes to travel from community to treatment plant is long
- Truck ban prohibits trucking during peak hours

Another style of fixed transfer stations



In this version, there is no buried tank. Tender vehicles (*the smaller vehicles or hand carts that feed the transfer tank*) dump their loads directly into a trailer mounted tank, which is then transported to the treatment plant.

Anatomy of a transfer station



Consider incorporating fencing, trash screens and wash-down areas within the transfer station property. If screening is employed, operators must place screenings in covered containers and manage as solid waste.

Fixed transfer station comparison

		Simple transfer station	Modular transfer station	Sewer discharge station	Solid-liquid separation transfer station	Modular solid-liquid separation transfer station
Main features	Siting	Below ground	Above ground	Below ground	Below ground	Above ground
	Constructability	Easy	Moderate <ul style="list-style-type: none"> Split levels and retaining walls 	Moderate <ul style="list-style-type: none"> Connection to sewer main 	Moderate <ul style="list-style-type: none"> Connection to sewer main Holding tank requires separation baffles 	Moderate <ul style="list-style-type: none"> Split levels and retaining walls Connection to main
	Sewer connection	No	No	Yes Discharge of septage	Yes Discharge of liquid	Yes Discharge of liquid
	Security	Lockable	Lockable and fencing	Lockable	Lockable	Lockable and fencing
Operation	Septage discharge	By hand and small vacuum tanker	By hand and small vacuum tanker	By hand and small vacuum tanker	By hand and small vacuum tanker	By hand and small vacuum tanker
	Septage/sludge removal	<ul style="list-style-type: none"> Septage pumped out and removed by a large vacuum tanker. 	<ul style="list-style-type: none"> Septage towed away in a large detachable tanker or alternative container 	<ul style="list-style-type: none"> Septage released to sewer 	<ul style="list-style-type: none"> Liquid released to sewer. Sludge pumped out and removed by a large vacuum tanker 	<ul style="list-style-type: none"> Liquid released to sewer Sludge towed away in a large detachable tanker and alternative container
Maintenance	Daily	<ul style="list-style-type: none"> Basic washing and cleaning 	<ul style="list-style-type: none"> Basic washing and cleaning 	<ul style="list-style-type: none"> Basic washing and cleaning 	<ul style="list-style-type: none"> Basic washing and cleaning 	<ul style="list-style-type: none"> Basic washing and cleaning
	Monthly	<ul style="list-style-type: none"> Compacted sludge excavated by hand. 		<ul style="list-style-type: none"> Compacted sludge excavated by hand. Remove any sewer blockages 	<ul style="list-style-type: none"> Compacted sludge excavated by hand 	
	As required		<ul style="list-style-type: none"> Mechanical maintenance of tanker and motorised vehicle 	<ul style="list-style-type: none"> Replace the non-return valve at regular intervals 	<ul style="list-style-type: none"> Replace the non-return valve at regular intervals 	<ul style="list-style-type: none"> Replace the non-return valve at regular intervals Mechanical maintenance of

Mobile transfer station



A mobile transfer station is simply a large septage tanker that accepts waste from smaller vehicles for transfer from the community to the treatment plant.

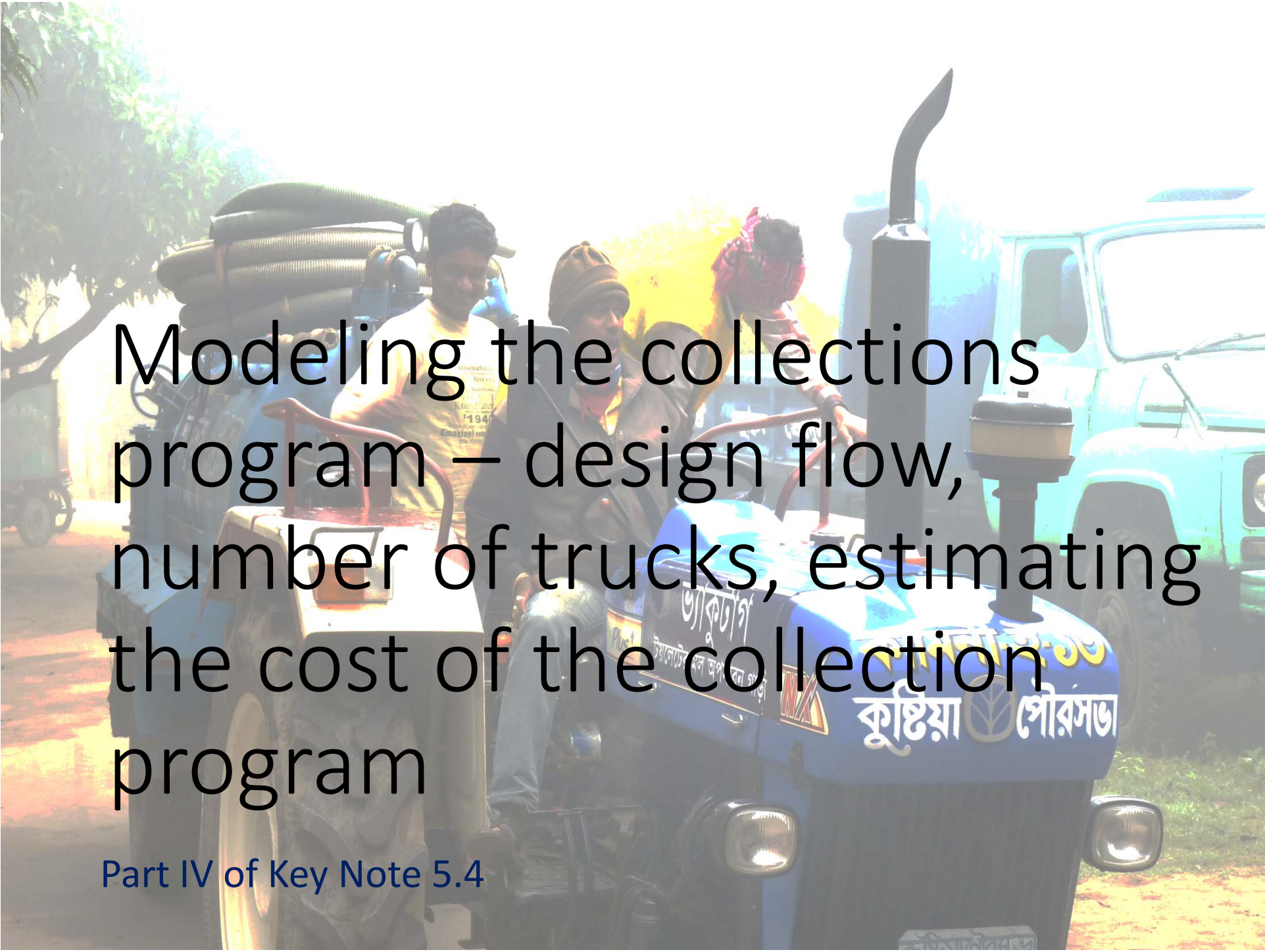
Mobile transfer stations are best utilized for scheduled desludging programs. The transfer truck is deployed to the community where the smaller trucks are working and is used to do the hauling to the treatment plant. Can save fuel costs and wear on trucks.

General advantages of transfer stations

- Reduces transport distance and makes sludge transport to the treatment plant more efficient, especially where small-scale service providers with slow vehicles are involved
- May reduce the illegal dumping of faecal sludge
- Moderate capital and operation costs
- Costs to the operator can be offset by charging for access permits
- May encourage more community-level emptying solutions
- Potential for local job creation and income generation

General disadvantages of transfer stations

- Requires expert design, location and construction supervision
- May cause blockages and disrupt sewer flow in the case of sewer discharge stations
- The sludge still requires secondary treatment and/or appropriate disposal
- Requires an institutional and regulatory framework for taking care of access fees, connection to sewers or regular emptying and maintenance
- Can lead to bad odours and vermin if not properly maintained
- May inconvenience a few for the benefit of the whole community.
- Access fees to the transfer station may result in an increase in the cost of the pit emptying service and/or prohibit equitable access to the service.



Modeling the collections program – design flow, number of trucks, estimating the cost of the collection program

Part IV of Key Note 5.4

Designing a septage collection program



Septage management toolkits

Type in the information in the yellow boxes below. Find the calculated values for your septage for your program in the blue box at the bottom.									
How many households are there in the coverage area?								22,000	
How many commercial/institutional establishments are in the coverage area								3,500	
What is your compliance target? As a percentage of the homes in the target area, what percentage do you think will participate?								70%	
From the survey data, what per cent of homes have septic tanks?								75%	
From the survey, of the homes that have septic tanks, what is the percent of the tanks that are desludgable?								75%	
From the survey, what is the average volume of residential septic tanks in the target community?								4.5	
From the survey, what is the average volume of commercial/institutional septic tanks in the target community?								10	
Septic tanks should be desludged every 3 to 5 years. What is the target desludging frequency for your program?								5	
How many days a week will your program operate?								5	
The design flow of your septage treatment facility is					60		cubic meters per day*		Working Working
					1,233		cubic meters per month		
					14,796		cubic meters per year		

This toolkit is used to determine the design flow from information gathered during the **Rapid Technical Assessment**. Once the design flow is known, number, volume and costing of the trucks and their operations can be determined.

Number of trucks

Design flow (from Tab 1):							60
Average septic tank volume (from Tab 1):							4.5
Number of tank volumes accommodated in the truck							0.6
Capacity of the truck*							2.5
Number of Loads Per Day per Truck (Fill in the yellow boxes to estimate loads per day)							
Estimated drive time to the home or business							0.5
Estimated time to pump the tank							0.5
Estimated drive time from collection site to treatment plant							0.5
Estimated unloading time at the treatment facility							0.5
Estimated drive time to the next home or business							0.5
Hours of operation per day							10
Number of loads per day per truck							4
Efficiency of trucking operation							0.85
Adjusted loads per day per truck							3.4
Answer: Number of trucks needed:							7

Vary the volume of the truck, hours and days of operation, as well as desludging schedule to see how this impacts upon the number of trucks.

Costing for the collection program

Number of Trucks (from Tab 2)	7			
Number of trips per day (from Tab 2)	3.4			
Number of days a week the program operates (from Tab 1)	5			
Average distance (KM) per round trip	10			
Total km per truck per year	50,000			
Cost of the truck	1,200,000			
Cost per year Driver/mechanic	132,000			
Cost per year Laborer/helper	109,000			
	Unit	Number of units	Cost per unit	Total
Truck Operating Costs				
Drivers Mechanics - one per truck (SG-7)	Cost/year	1	132,000.00	937,865.55
Laborers/Helpers - Two (2) per truck (Admin Aide-SG-3)	Cost/year	2	109,000.00	1,548,899.16
Annual Fuel Cost (12 km per liter and 22 Pesos per liter)	Cost/yr	4,166.67	22.00	651,295.52
Annual Truck Maintenance				
-Truck engine Oil (oil change every 3,000 km)	Cost/year	17	200.00	23,683.47
-Vacuum pump engine oil (oil change every 3,000 km)	Cost/year	17	100.00	11,841.74
-Tires (new set every 40,000 km, 80,000 pesos per set)	Cost/year	1.25	80,000.00	710,504.20
-Hoses (new set every 25,000 km, 22,000 pesos per set)	Cost/km	2.00	22,000.00	312,621.85
-Other parts and minor repair (P 15,000 per 40,000 km)	Cost/km	1.25	15,000.00	133,219.54
-Tune-ups (1 time per year)	Cost/Tune-up	1	8,000.00	56,840.34
-Battery three years	Cost	0.33	5,000.00	11,723.32
-Insurance	Cost/Yr	1	80,000.00	568,403.36
-Registration	Cost/Yr	1	10,000.00	71,050.42
Sub-Total Vacuum Truck Operating Costs				5,037,948.46
Vacuum Truck Depreciation (7 yr straight line method)	Cost/Yr	7	171,428.57	1,218,007.20
<i>Replacement Cost of Vacuum Truck</i>	Cost/Truck		1,200,000.00	
			may also last even beyond 7yrs-practical given lesser % of service	
Vacuum Pump (@ STF-site) Depreciation (4 yr straight line method)	Cost/Yr	1	9,750.00	9,750.00
<i>Replacement Cost of 1-unit Centrifugal Water/vacuum Pump</i>	Cost/Water pump		39,000.00	
Operating Costs - Septage Collection				6,265,705.66
Cost of collection per cubic meter				423.47

In this example the costs are in Philippine pesos. Users insert costs for labor and consumables based on local conditions.

A photograph showing a line of blue water trucks parked on a street. In the foreground, a man in a blue and yellow polo shirt and dark pants is walking towards the camera, talking on a mobile phone. The trucks are blue with large cylindrical tanks. One truck has a logo that says "CITY OF DUMAGUETE OFFICIAL SEAL". Another truck has a sign that says "HOW'S MY DRIVE? PM. Call 555-5555". The background is filled with green trees.

The Motor Pool

Part V of Key Note 5.4

Motor pool and fleet maintenance safety tips

- Keep maintenance bays clean, neat and free of fire hazards at all times.
- **Maintain vehicle speeds at a minimum, usually 5 to 10 mph, or as posted, when operating within the limits of a maintenance facility. Always use ground guides!**
- Create and post a safety board in an easily accessible area.
- **Ensure eyewash stations and emergency showers are available in areas where personnel use hazardous chemicals.**
- Store petroleum, oil and lubricant products in approved containers and in well-ventilated and marked areas. Frequently inspect storage areas where hazardous materials are stored. Ensure the proper disposal of contaminated oil and POL products.
- **Chemical agent-resistant coating painting will be conducted only by trained and authorized personnel with appropriate personal protective equipment.**
- Ensure spill clean-up supplies are available, to include shovels, dry sweep, brooms, empty containers and protective clothing.



Prepare a written health and safety plan, provide regular training and update the plan as needed.

Mobile transfer station



Keeping equipment in sound operational readiness is the job of the vehicle maintenance staff

Maintenance staff:

- Check trucks daily before they leave the plant
- Perform routine maintenance such as tune ups, rotate tires, replace belts
- Conduct minor repairs on equipment such as hoses and fittings.

Summarizing



There are a number of items to consider when planning for collection and transport of FSM programs. The RTA method can help to carry out an assessment in a structured way. A proper analysis will also provide essential information in the overall Initial Situation Assessment (Chapter 14, Unit 6.1).

Technology is but one component of a successful FS collections and transport program. Promotions campaigns that encourage participation in the program, and a regulatory framework that provides the rules and regulations governing the activities completes the picture.



Thank You!