Inspection Tasks for Onsite Wastewater Systems

Tuesday, September 10, 2024

This program is made possible under a cooperative agreement with US EPA.

Imagine you are assigned to develop an onsite wastewater inspection program for your community.

Some Questions You Might Ask

1. What standards do I use?
2. How often are inspections required?
3. What components need to be inspected?
4. What is the goal of onsite wastewater inspection?
5. How do I know when the system is functioning properly?
6. What variables can affect the performance of onsite systems?

What we will cover

1. Basic design standards
2. Initial site inspection concepts
3. Septic tank inspection tasks
4. Leachfield inspection
5. Common problems

Poll 1 Up Next

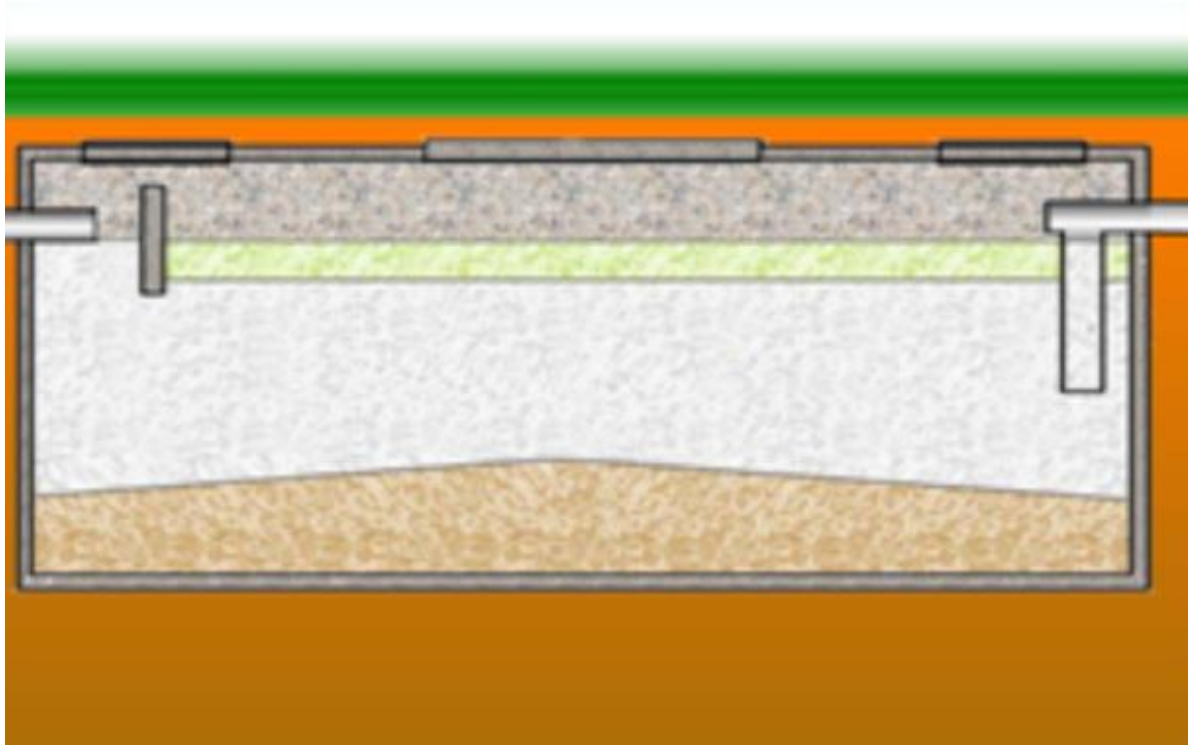
Remember Safety

- Protect yourself from infection and contamination with gloves and eye protection.
- Protect yourself from trips and falls – keep the open risers in front of you.
- Always inspect septics with a partner.
- Do not place your head inside of riser inspection ports because of the potential for toxic gases.

Onsite treatment processes

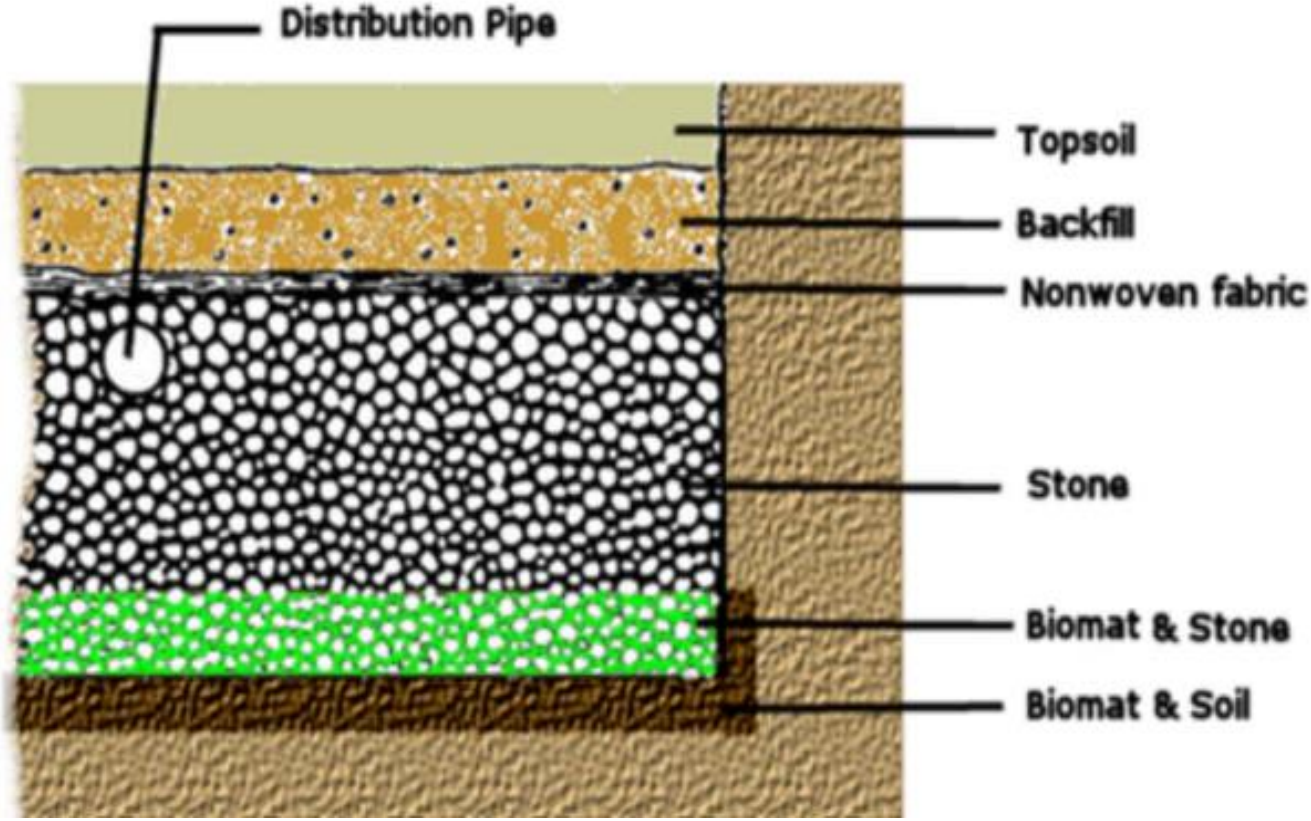
Septic Tank

- Separates solids from liquids
- Anaerobic decomposition of solids

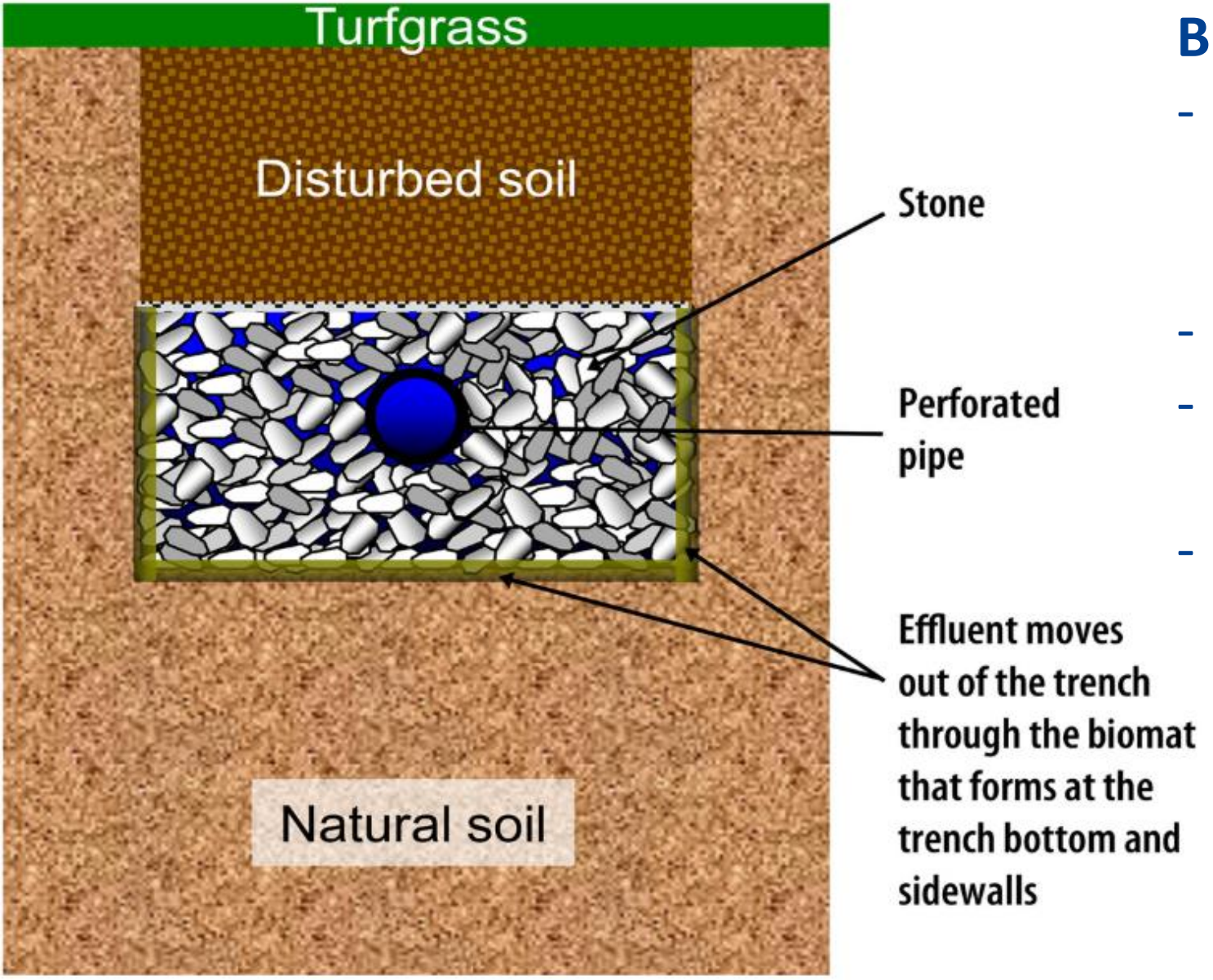


Leachfield (soil)

- Liquid flows through perforated pipes into soil
- Biological matt provides filtration and aerobic treatment



Biomat



Biological Mat

- Consists of a variety of microorganisms that creates a biological treatment system
- Adsorption and filtration
- Where 99% of drain field treatment occurs
- Develops at bottom of the trench where flow meets the soil

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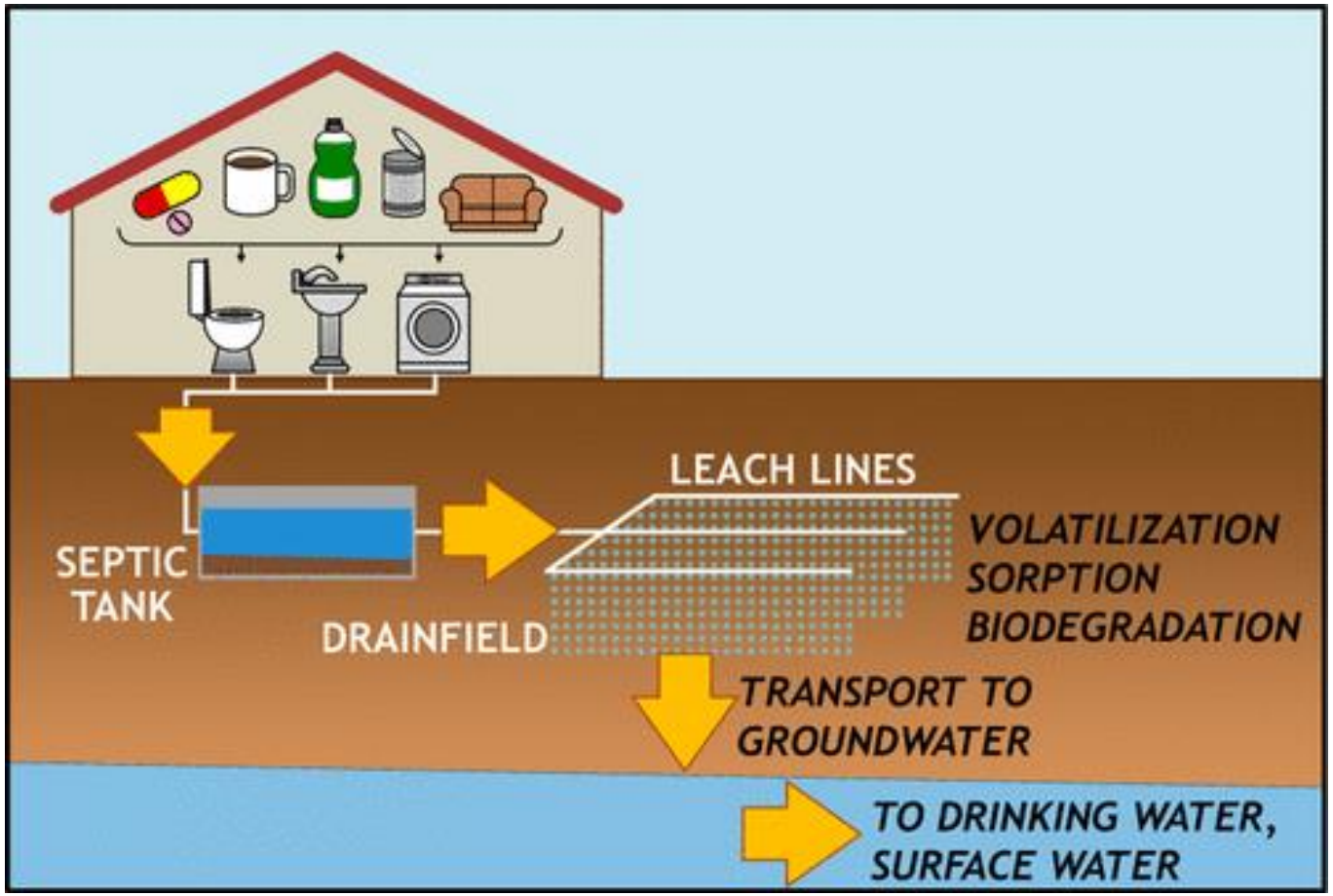
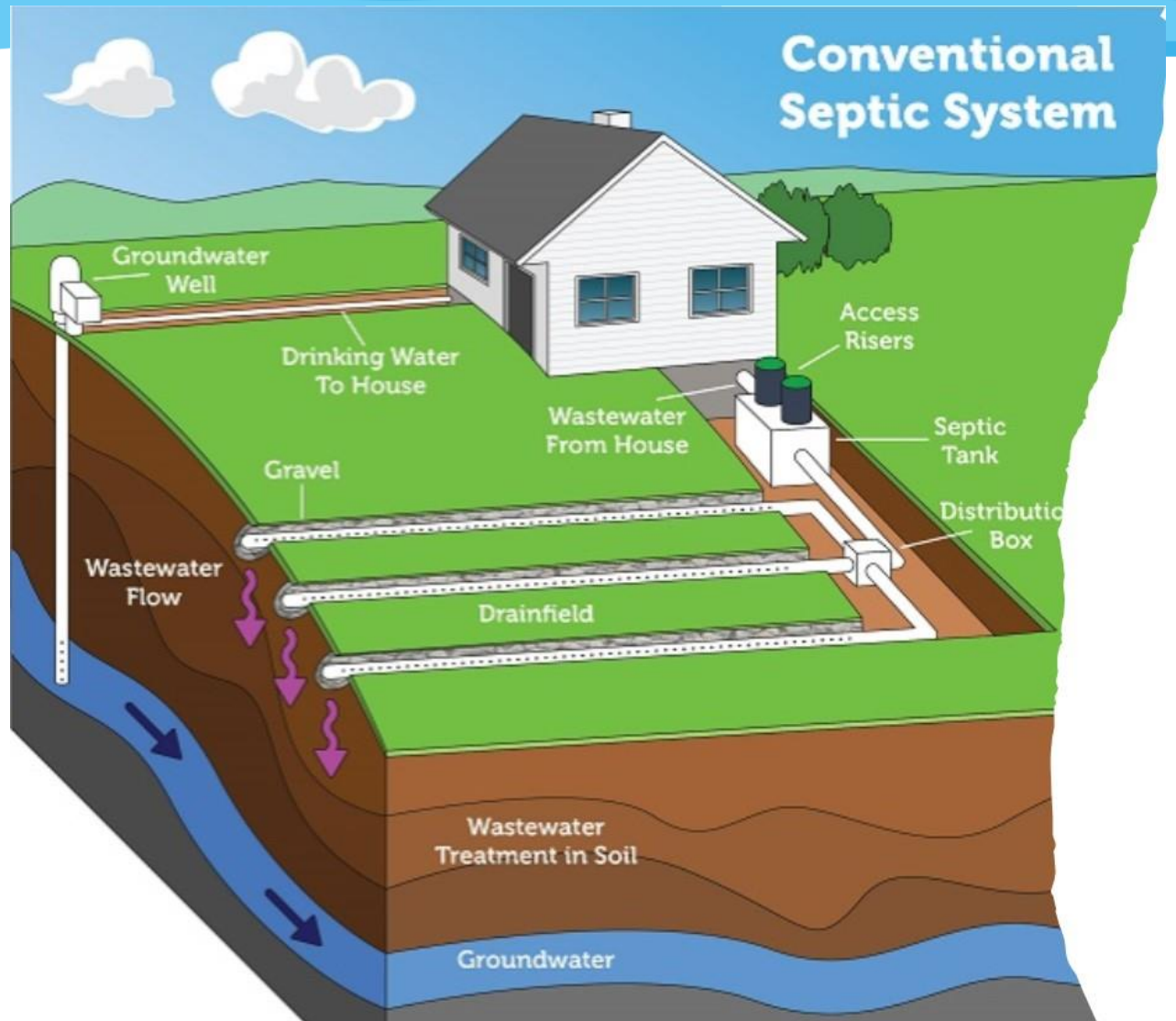
Inspection Triggers

- Initial construction before backfill
- Property purchase by new owner
- Property additions, expansions
- Complaints or groundwater issues
- Time-based planned inspections



Site evaluation



Site Evaluation

- Property set-backs
- Trees, rocks, interfering elements
- Contour and elevation of site
- Existing or proposed buildings, roads (10ft)
- Locations of streams, wells, etc. (50 ft +)

Soil (geological) evaluation

Soil type

Percolation testing (.4 to .7 gpd/ft^2)

Depth to limiting factors

Cultural evaluations

- Distance from burial sites, etc.

Design Specifications

OWNER'S NAME & ADDRESS:

SYSTEMS SPECIFICATIONS		
Septic Tank/Holding Tank Capacity	Gals.	☐ N/A
Septic Tank/Holding Tank Manufacturer		☐ N/A
Effluent Filter Manufacturer		☐ N/A
Effluent Filter Model		☐ N/A
Pump Tank Capacity	Gals.	☐ N/A
Pump Tank Manufacturer		☐ N/A
Pump Manufacturer		☐ N/A
Pump Model		☐ N/A

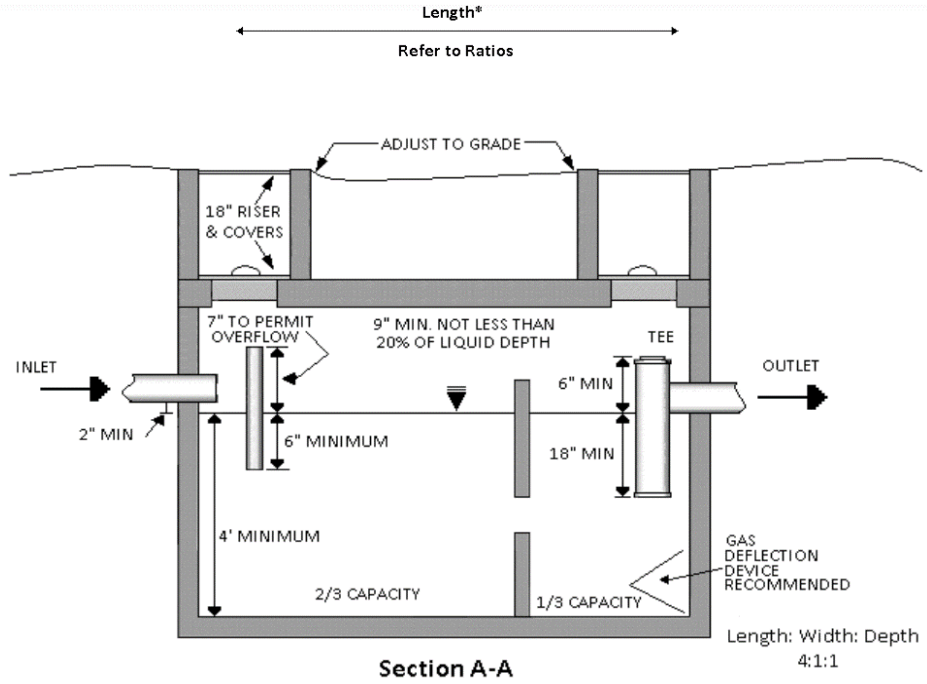
Pretreatment Unit ☐ N/A _____ Manufacturer

☐ Sand/Gravel Filter	☐ Peat Filter
☐ Mechanical Aeration	☐ Wetland
☐ Disinfection	☐ Other

Dispersal Cells (s)

☐ In-Ground (gravity)	☐ In-Ground (pressurized)
☐ At-Grade	☐ Mound
☐ Drip-Line	☐ Other

Original as-built drawings, specification, construction details, and locations of onsite system components can help when evaluating problems.



Parameters

DESIGN PARAMETERS

Number of Bedrooms		☐ NA
Number of Public Facility Units		☐ NA
Estimated (average) flow		gal/day
Design (peak) flow = (Estimated × 1.5)		gal/day
Soil Application Rate		gal/day/ft^2
Standard Influent/Effluent Quality	Monthly average	
Fats, Oil & Grease (FOG)	≤30 mg/L	
Biochemical Oxygen Demand (BOD_5)	≤220 mg/L	☐ NA
Total Suspended Solids (TSS)	≤150 mg/L	
High Strength Influent/Effluent	Monthly average*	
Fats, Oil & Grease (FOG)	≥30 mg/L	
Biochemical Oxygen Demand (BOD_5)	≥220 mg/L	☐ NA
Total Suspended Solids (TSS)	≥150 mg/L	
Pretreated Effluent Quality	Monthly average	
Biochemical Oxygen Demand (BOD_5)	≤30 mg/L	
Total Suspended Solids (TSS)	≤30 mg/L	☐ NA
Fecal Coliform (geometric mean)	≤10^4 cfu/100ml	
Maximum Effluent Particle Size	⅛ in dia.	☐ NA
Other:		☐ NA

- Information about how system was originally designed can help managers determine if modifications are needed for future property development
- Helps to determine maintenance and inspection frequencies
- More able to assist the system owner when there are problems
- Specifications and Parameters can help to determine if original loading estimates are still valid

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Maintenance Planning

MAINTENANCE SCHEDULE

SERVICE EVENT	SERVICE FREQUENCY			
Inspect Condition of Tank(s)	At Least Once Every	Months	Year(s) **Maximum 3 Years**	
Pump Out Contents of Tank(s)	When combined sludge and scum equals one-third(1/3) of tank volume			
Inspect Dispersal Cell(s)	At Least Once Every	Months	Year(s) **Maximum 3 Years**	
Clean Effluent Filter	At Least Once Every	Months	Year(s)	
Inspect Pump, Pump Control & Alarm	At Least Once Every	Months	Year(s)	☐ N/A
Flush Lateral and Pressure Test	At Least Once Every	Months	Year(s)	☐ N/A
Other:	At Least Once Every	Months	Year(s)	☐ N/A
Other:	At Least Once Every	Months	Year(s)	☐ N/A

Estimating pumping frequencies

Tank Size (gallons)	Household Size (number of people)									
	1	2	3	4	5	6	7	8	9	10
1000	12.0	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250	16.0	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500	19.0	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750	22.0	11.0	6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000	25.0	12.0	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250	29.0	14.0	9.1	6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500	32.0	16.0	10.0	7.5	5.9	4.8	4.0	4.0	3.0	2.6

Note: The frequencies estimated are based on a minimum 24-hour wastewater retention time and 50 percent digestion of the solids entering the tank. More frequent pumping would be needed if garbage disposals were utilized.

Example: For 1750 gallon septic tank with a household size of 4 people, the estimated pumping frequency is every 5 years.

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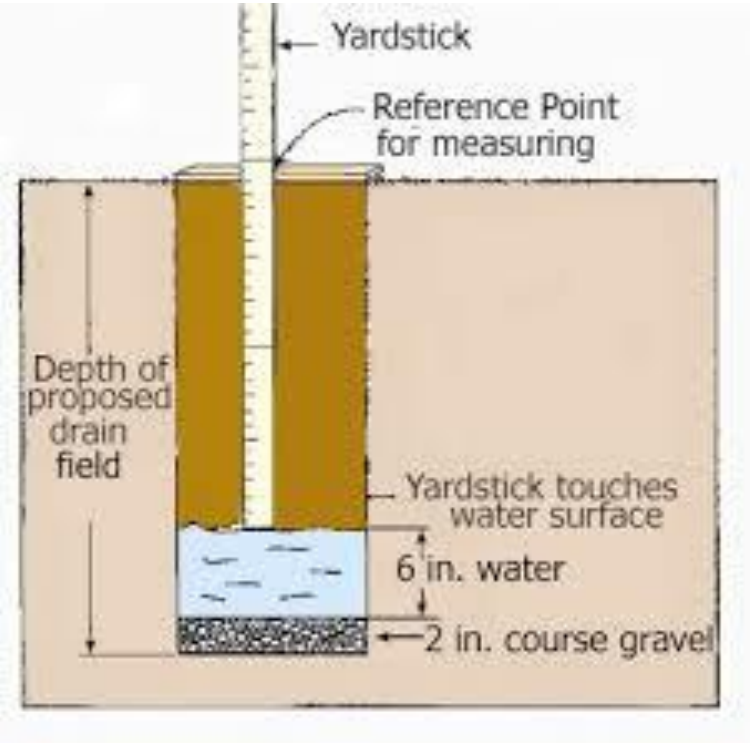
Perc Test

1. At least three holes are dug around the perimeter of and one in the middle of the proposed drain field.
2. Holes 6 to 8 inches in diameter and to the proposed depth of the trench
3. After pre-soaking, holes are filled to a specified level (i.e. 8-inch level) and the water level drop is measured in minutes per inch.

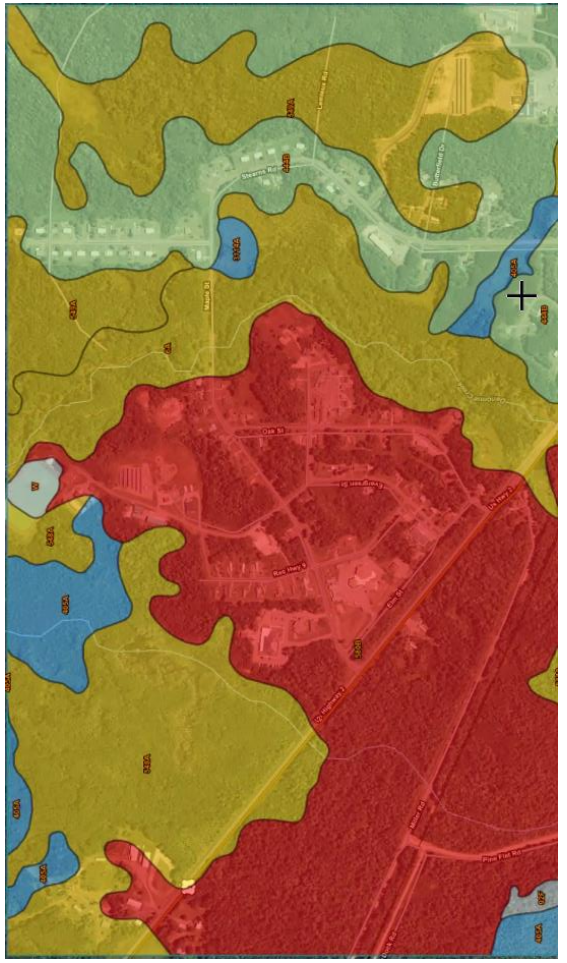


- The percolation rate should be slow enough to treat the effluent before it reaches the ground, but fast enough to drain before the system backs up.

Soil evaluation and percolation test results

Typical Perc Test Results

- Sandy soil – 1 to 8 inches percolation per hour
- Loams and silt - 1 to 2.4 inches per hour
- Clays – 0.17 inches per hour (*about 6 hours for 1-inch of perc*)
- Acceptable range is approximately 5 to 60 minutes per inch (MPI)



Sizing of system

Percolation rate inch	Absorption area per bedroom	Loading rate per square foot[1]
less than or equal to 10 minutes[2]	150 square feet	1.0 gallon
11 to 30 minutes	200 square feet	0.8 gallon
31 to 45 minutes	265 square feet	0.45 gallon
46 to 60 minutes[3]	300 square feet	0.4 gallon
61 to 120 minutes[3,4]	600 square feet	0.2 gallon

200 x .8 = 160

600 x .2 = 120

Number of bedrooms	Minimum tank liquid capacity
1 to 3	1,000 gallons
4	1,250 gallons
5	1,500 gallons

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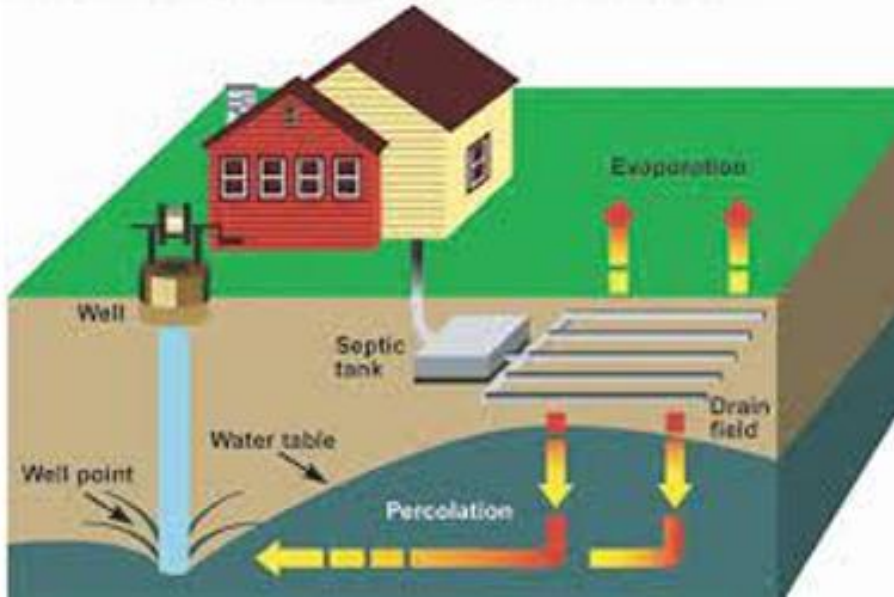
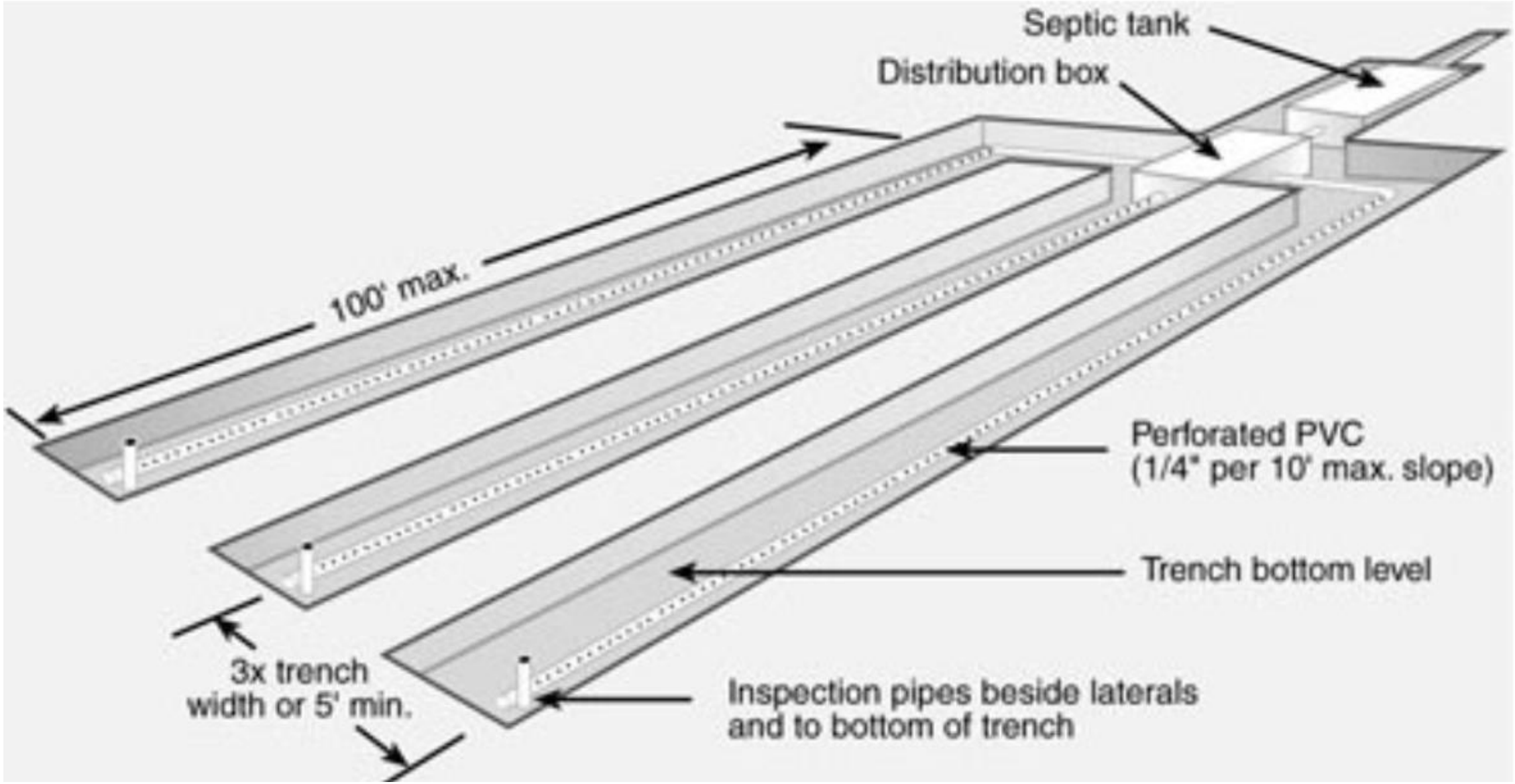
Rules of thumb for rough estimates of daily flows and system size

(1) Daily Combined Wastewater Flow Formula = 150 gal/day per bedroom.
(2) Every gpd = 1 linear foot of drainfield
(3) Tank size is 2.5 X's daily flow -

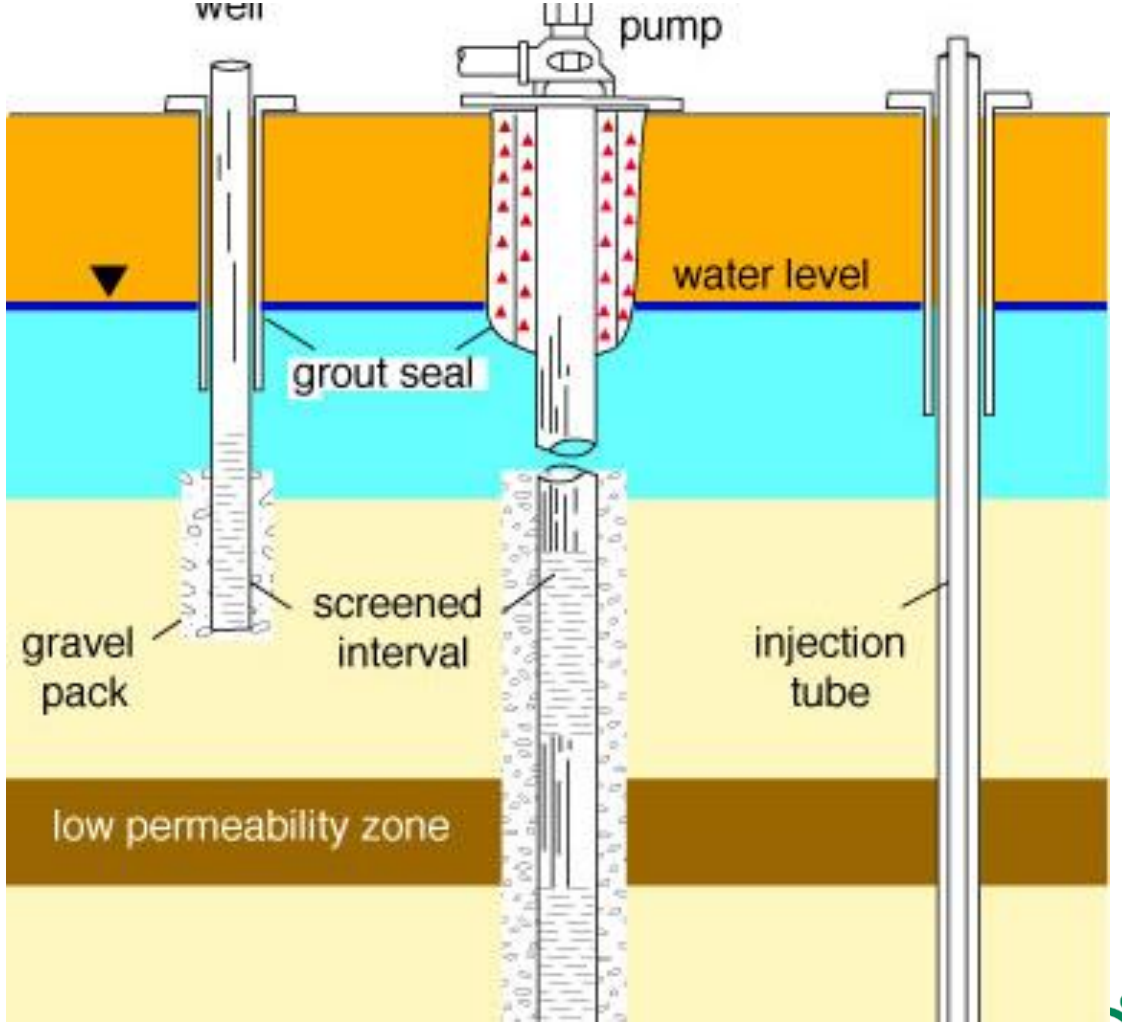
Estimates for a three-bedroom house with combined flows

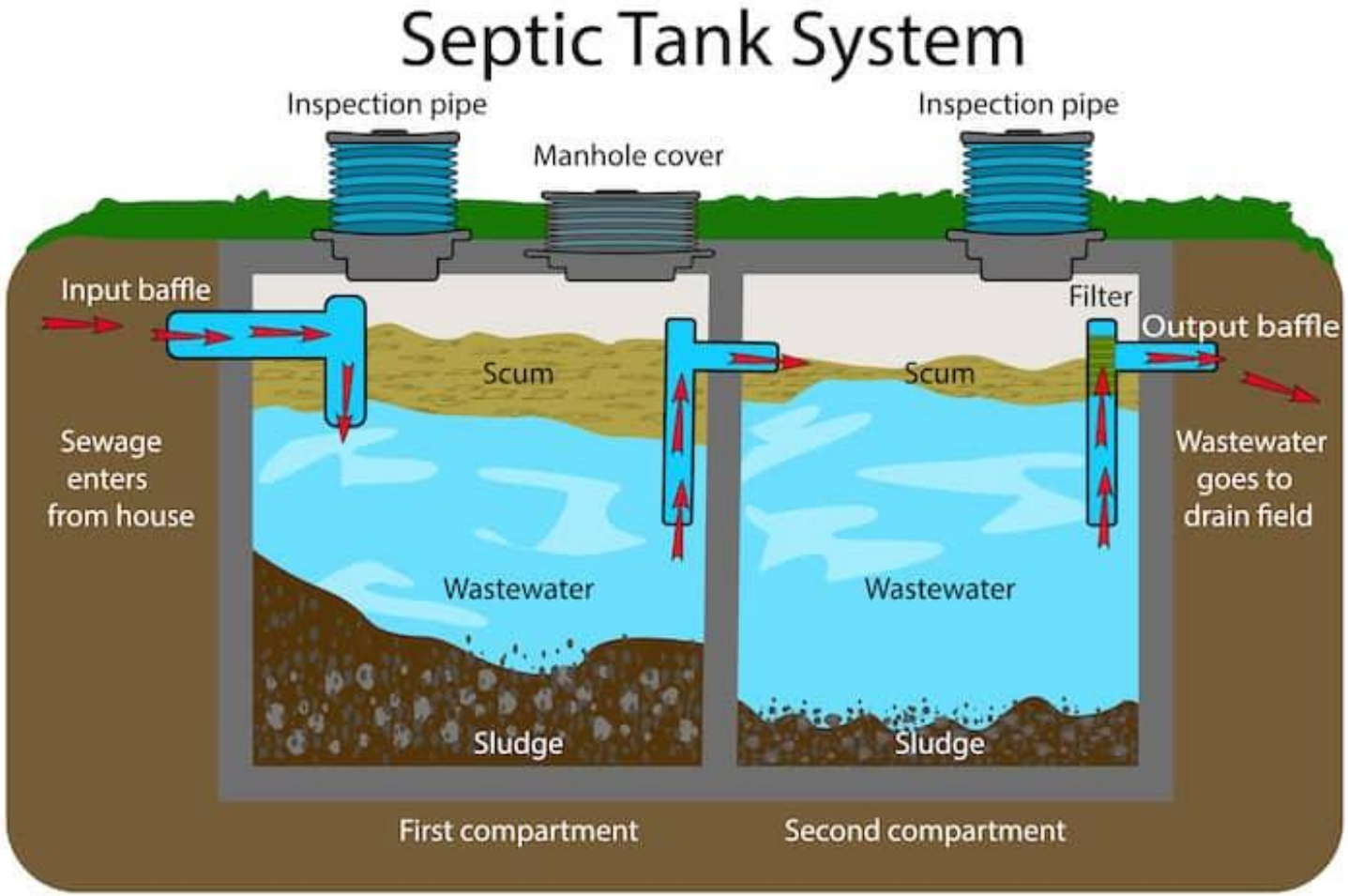
- Total estimated flow = 150 gpd x 3 = **450 gpd**
- 450 gpd = 450 linear feet of drain field line (5 –lines)
- Septic tank volume 450 gal x 2.5 = **1,125 gpd**




Septic tank
Distribution box
100' max.
Perforated PVC
(1/4" per 10' max. slope)
Trench bottom level
3x trench
width or 5' min.
Inspection pipes beside laterals
and to bottom of trench

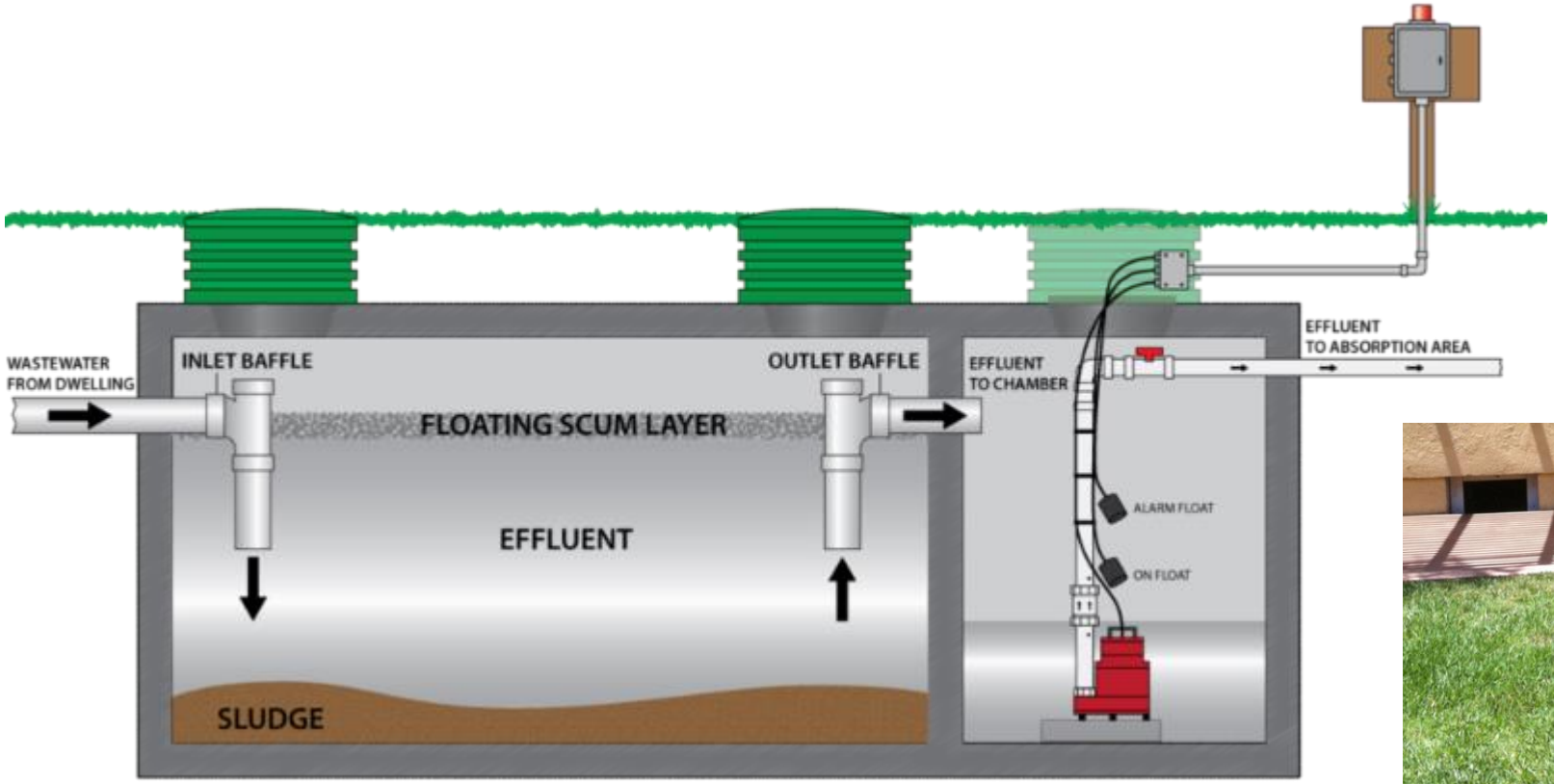
Inspecting drainfields





Septic Pumping

- Recommended when combined sludge and scum equals one-third(1/3) of tank volume
- Periodic measurements to predict sludge and scum accumulation
- Distance of sludge and scum to riser intake


WASTEWATER
FROM DWELLING
INLET BAFFLE
OUTLET BAFFLE
FLOATING SCUM LAYER
EFFLUENT
SLUDGE
EFFLUENT
TO CHAMBER
EFFLUENT
TO ABSORPTION AREA
ALARM FLOAT
ON FLOAT

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Poll #2

Poll #2

Why are records important when diagnosing problems in onsite wastewater systems?

a. To compare original intended design with current loading rates.

b. To validate that ineffective systems have been grandfathered in.

c. To make provision for older systems that contaminate water supplies.

d. To find the original installer and hold them accountable.

e. All of the above.

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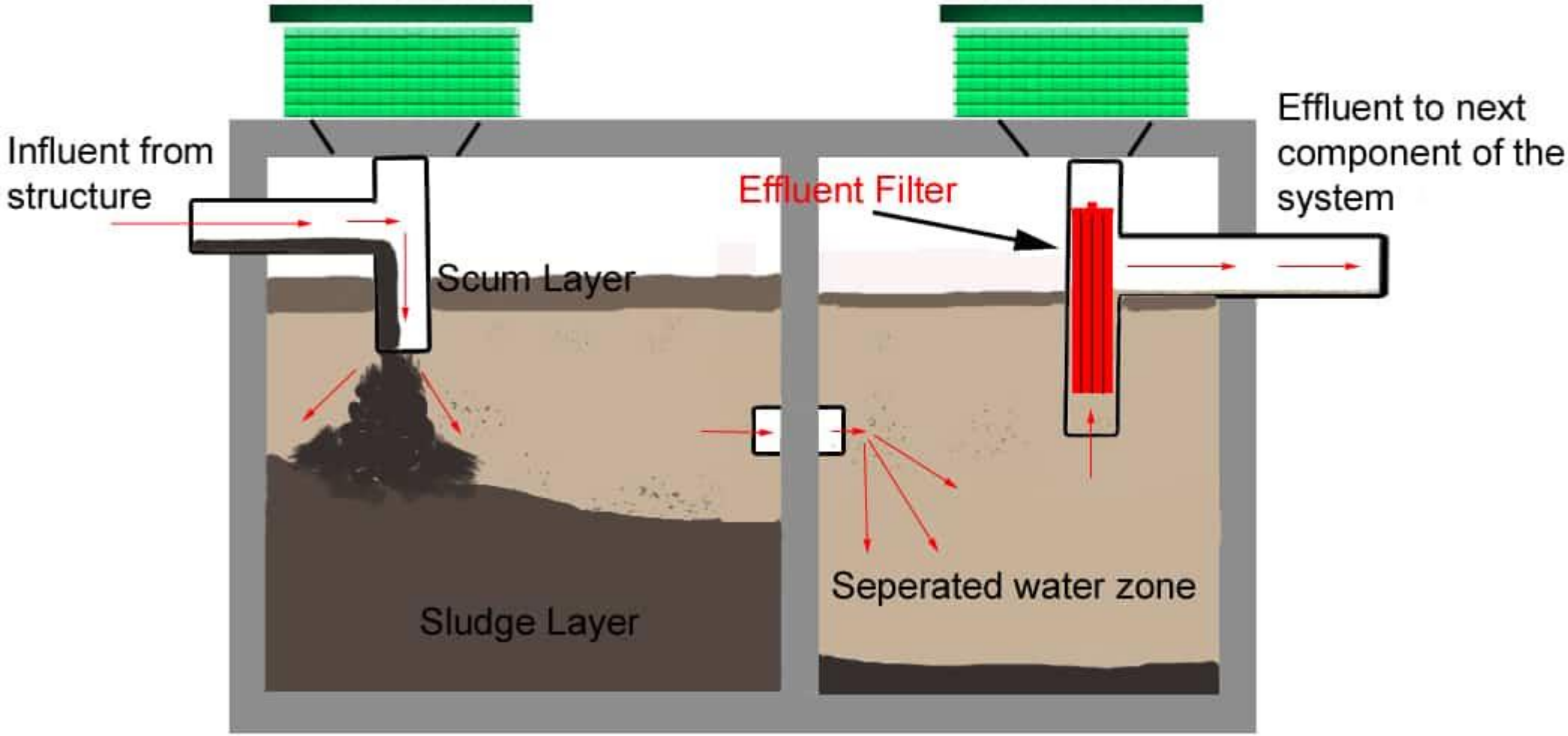
DOUBLE COMPARTMENT SEPTIC TANK



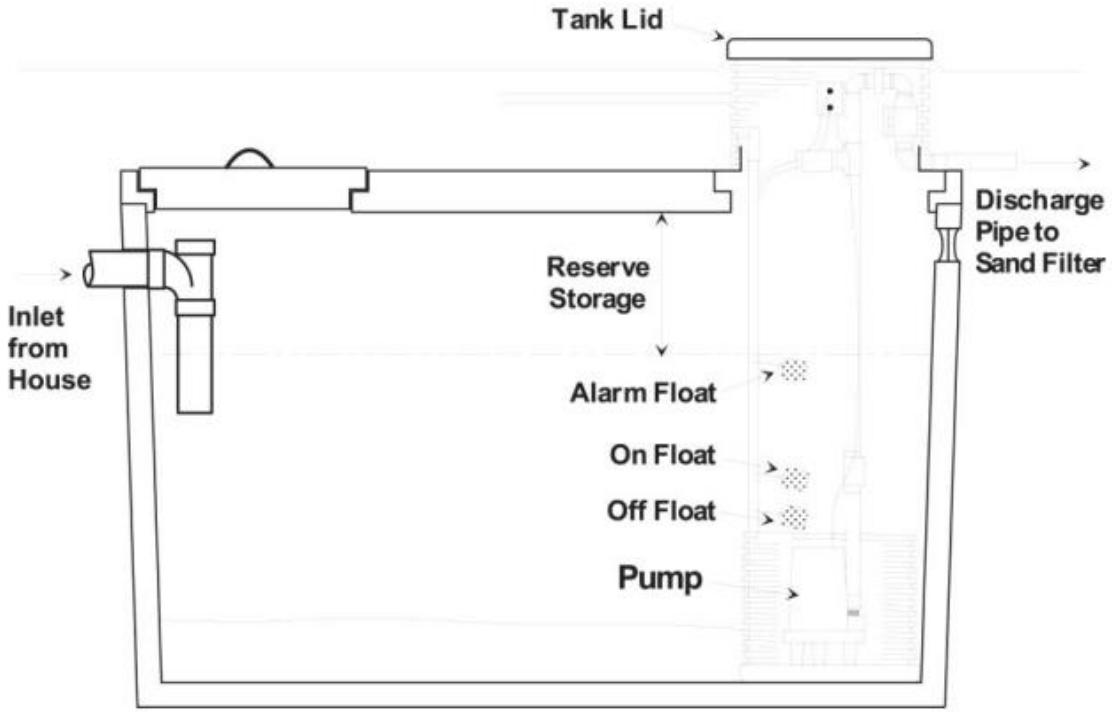
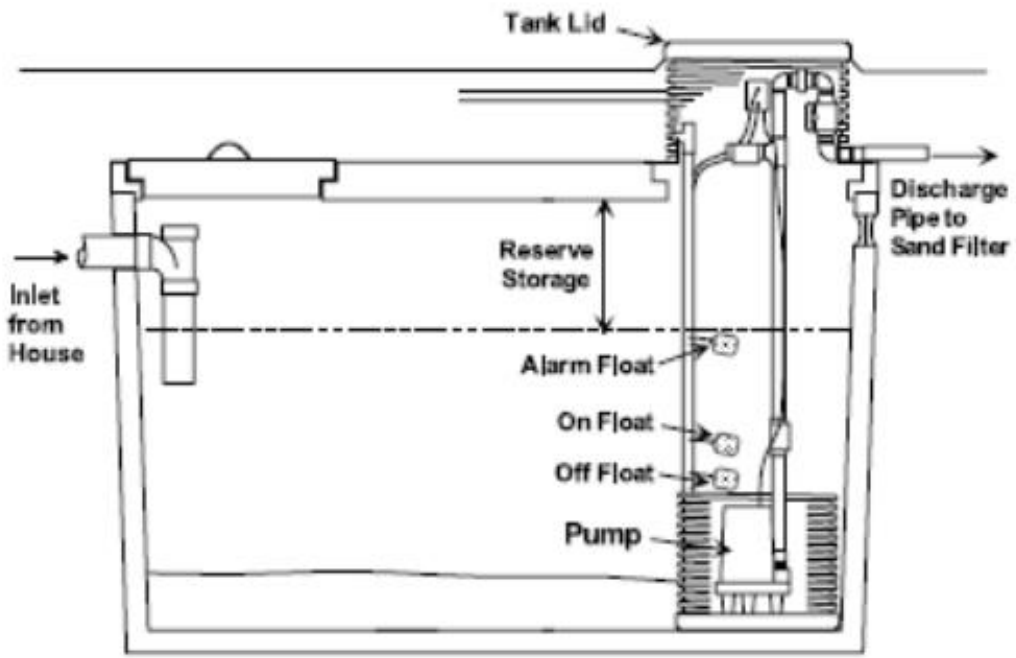
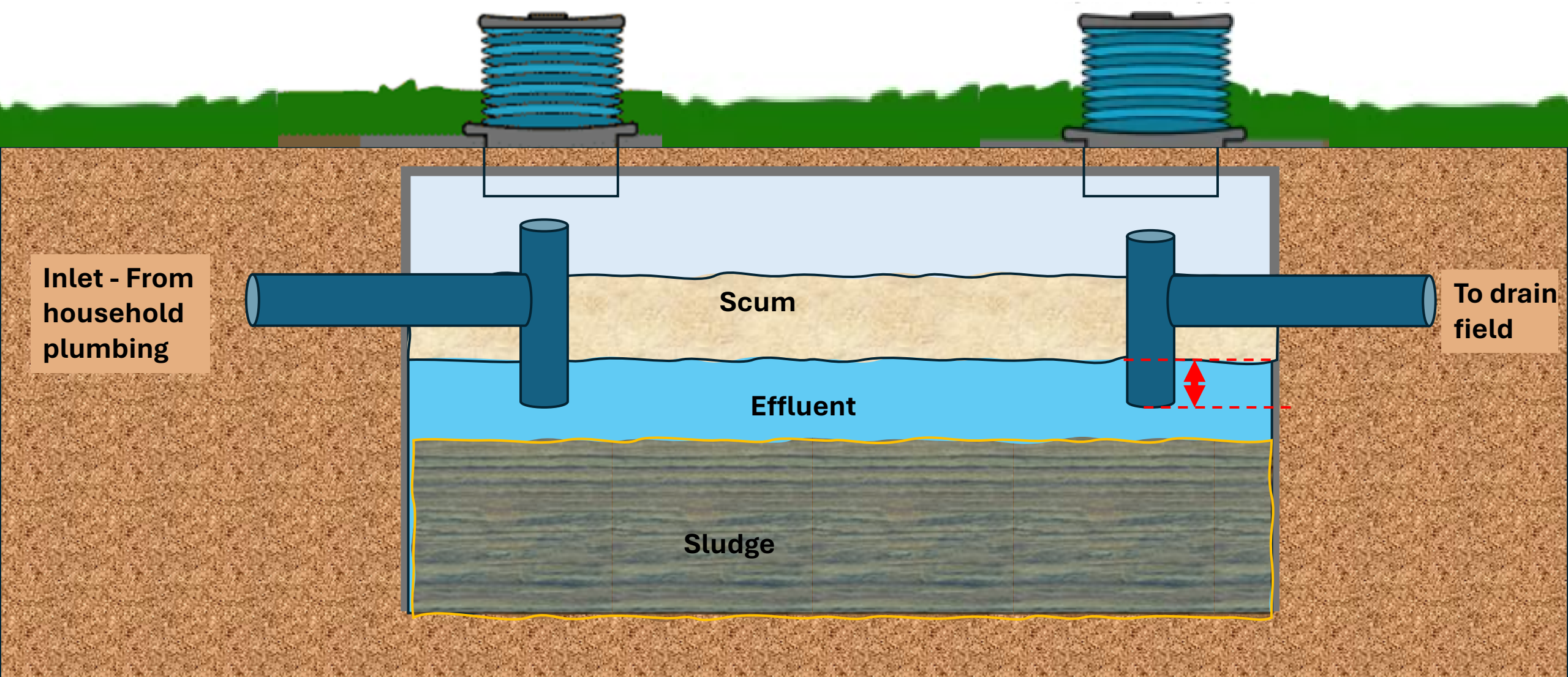
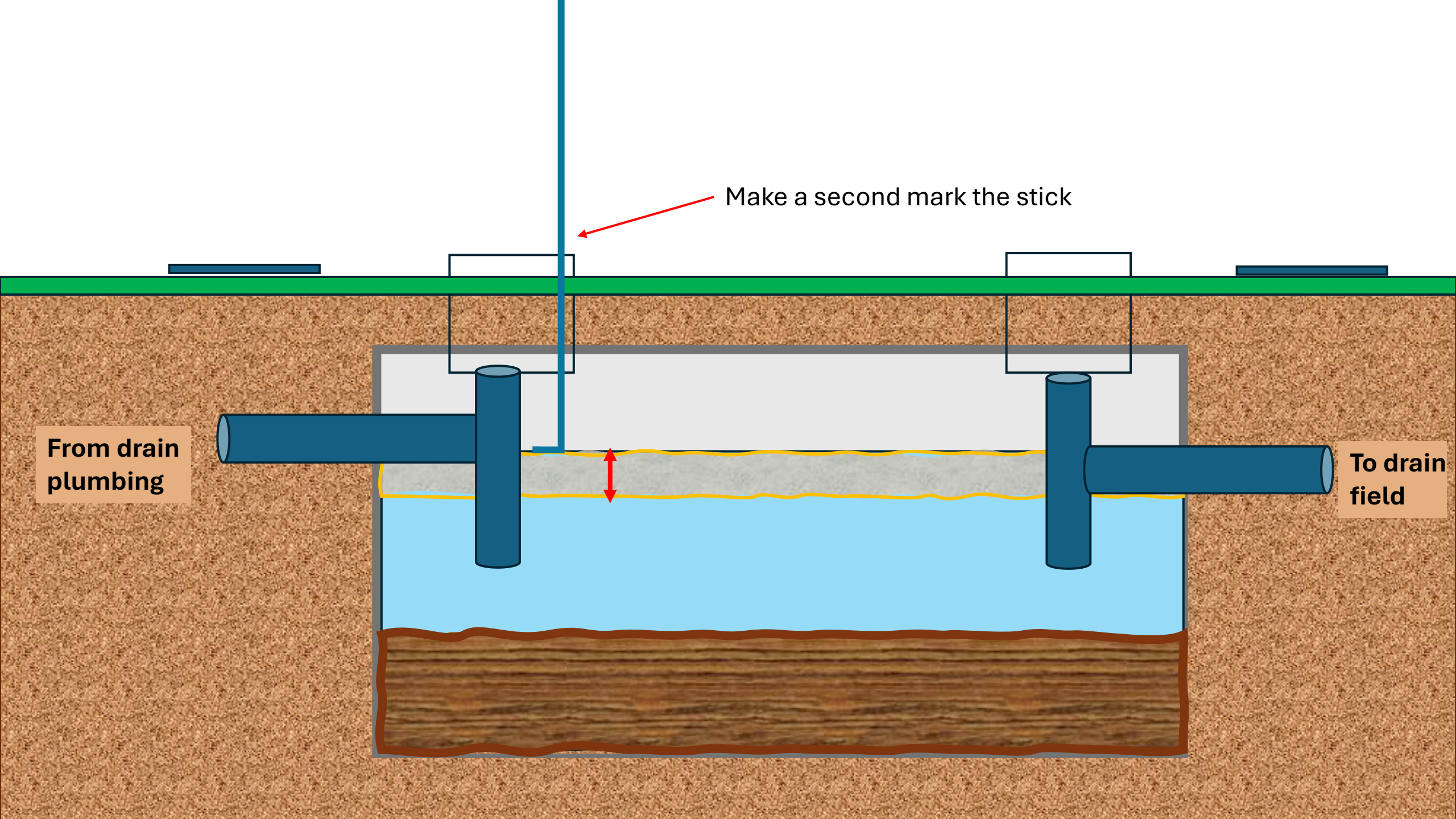


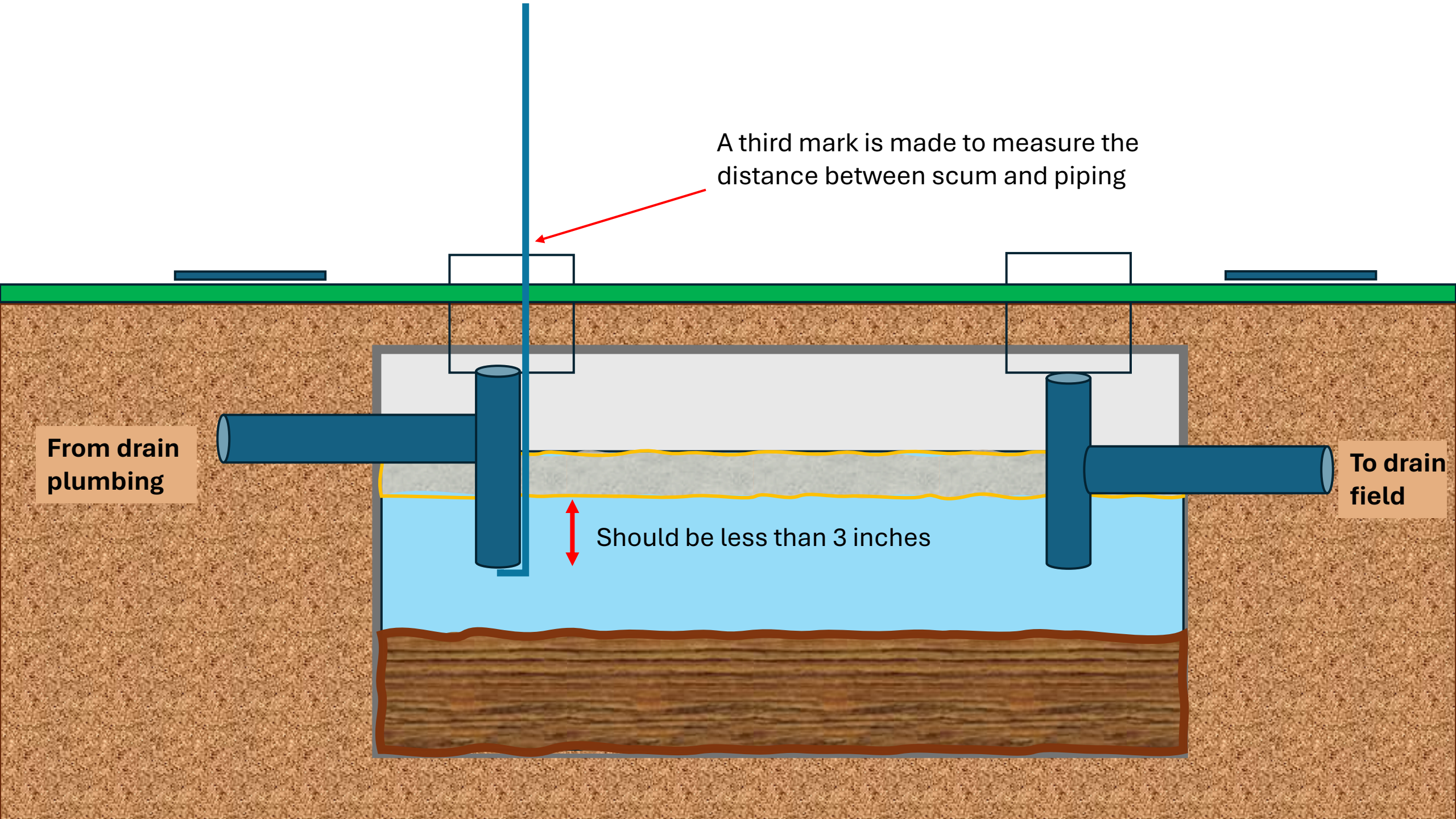
Image: Diagram of a pump tank.



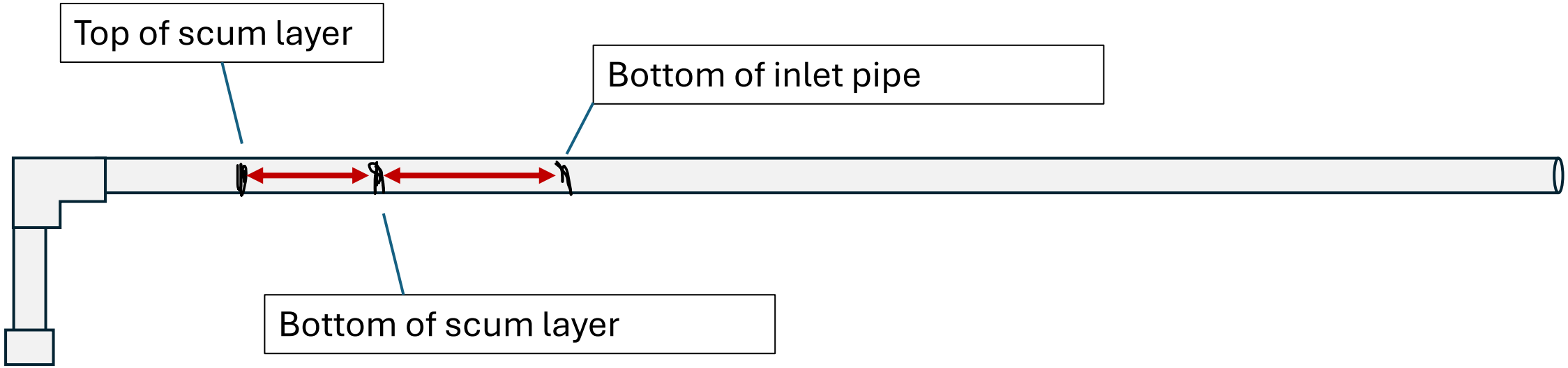
Also, scum and sludge in septic tanks should be prevented from entering the outlet piping. The bottom of the scum layer should be at least 3 inches or more above the outlet piping.




Make a second mark the stick
From drain plumbing
To drain field

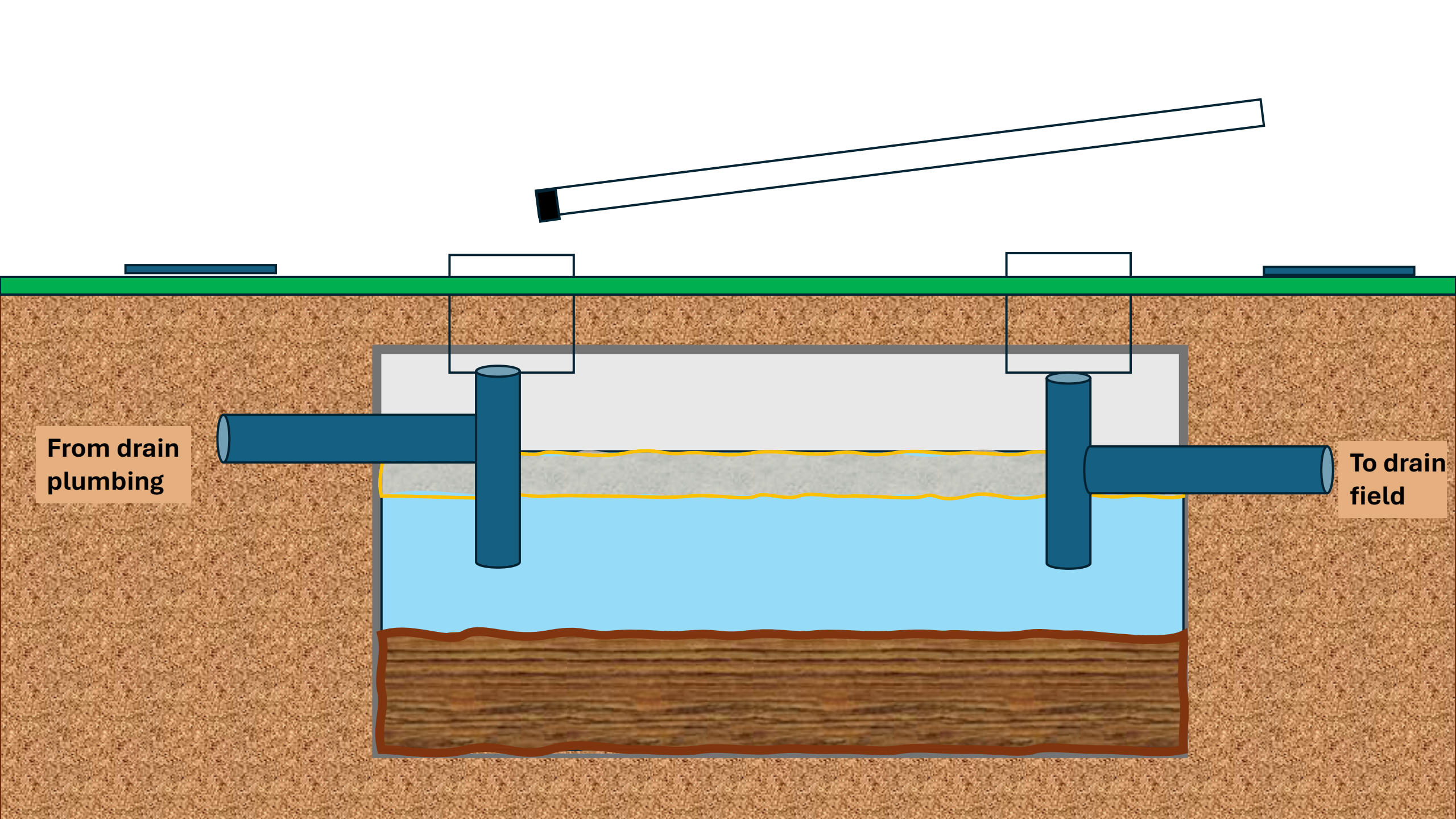

A third mark is made to measure the distance between scum and piping
From drain plumbing
To drain field
Should be less than 3 inches

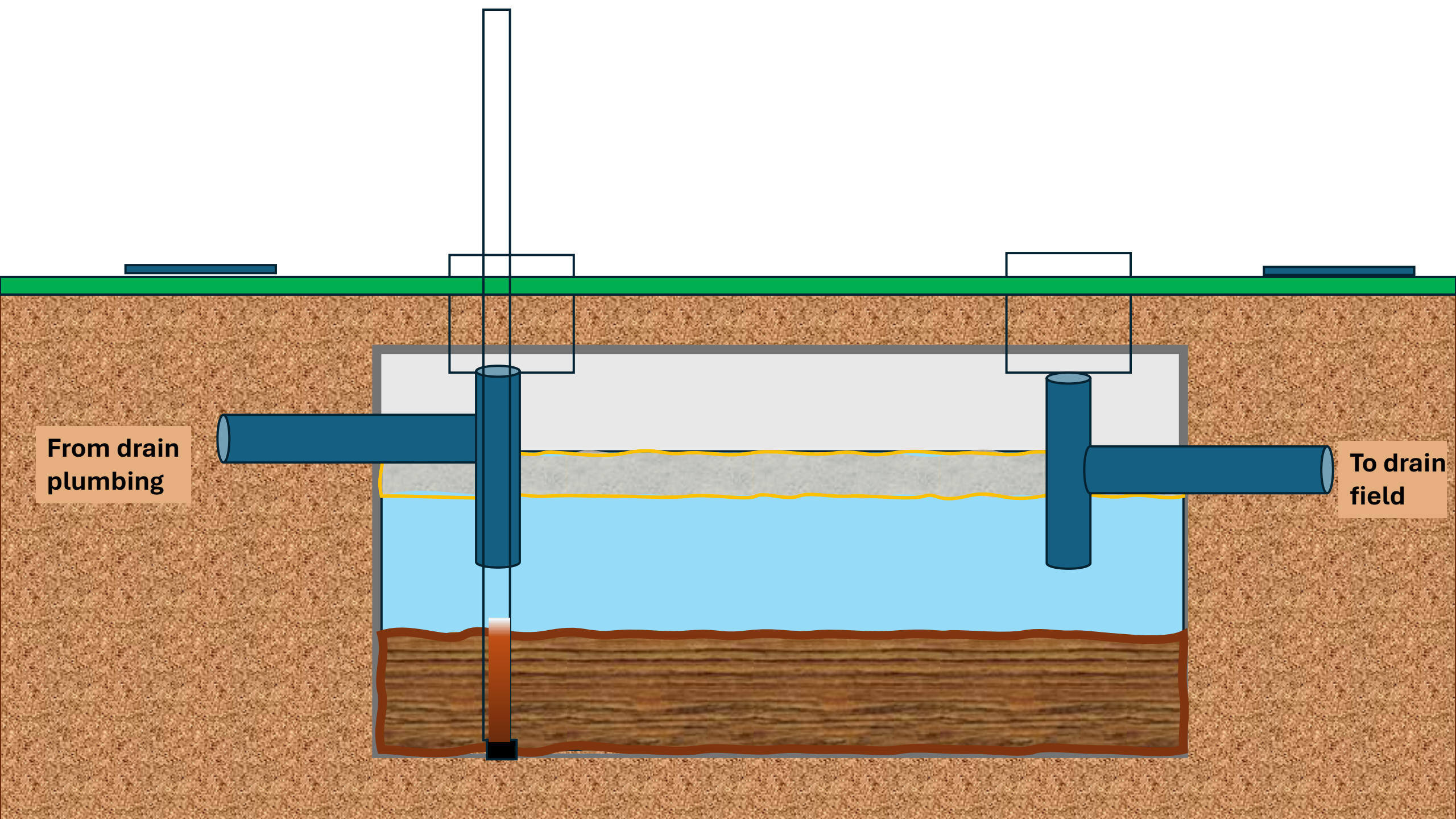
Scum Measurements

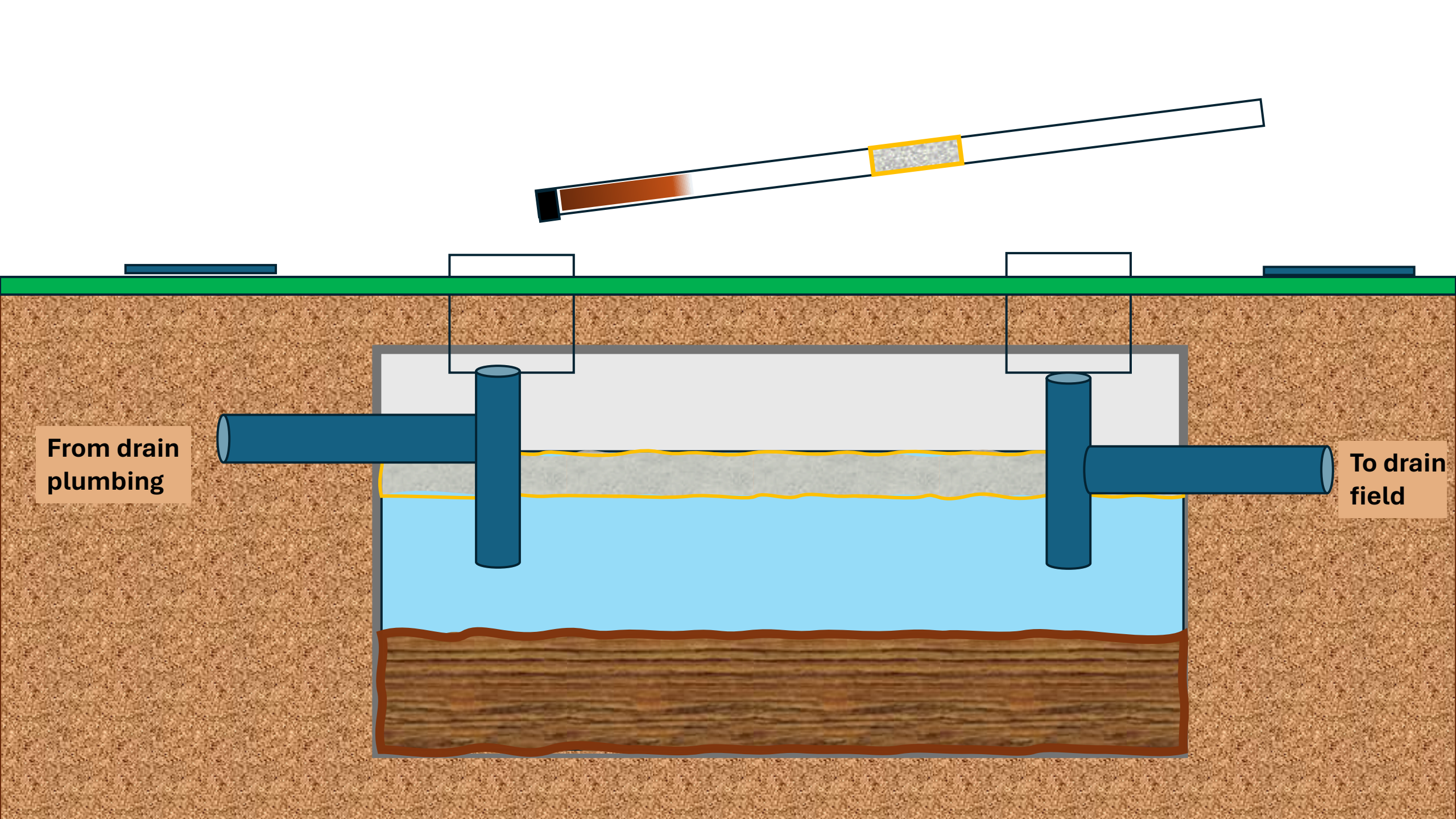


- Distance between top and bottom of the scum layer gives you the thickness of the scum layer.
- Distance between the bottom of the scum layer and bottom of inlet pipe gives information about how close scum is from interfering with liquid flow.

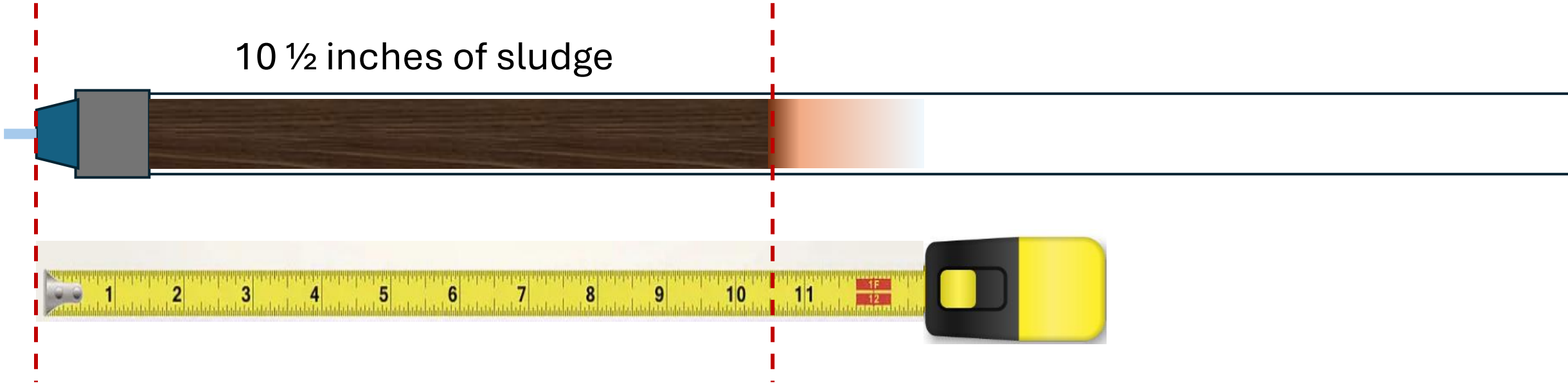
Sludge judge sample

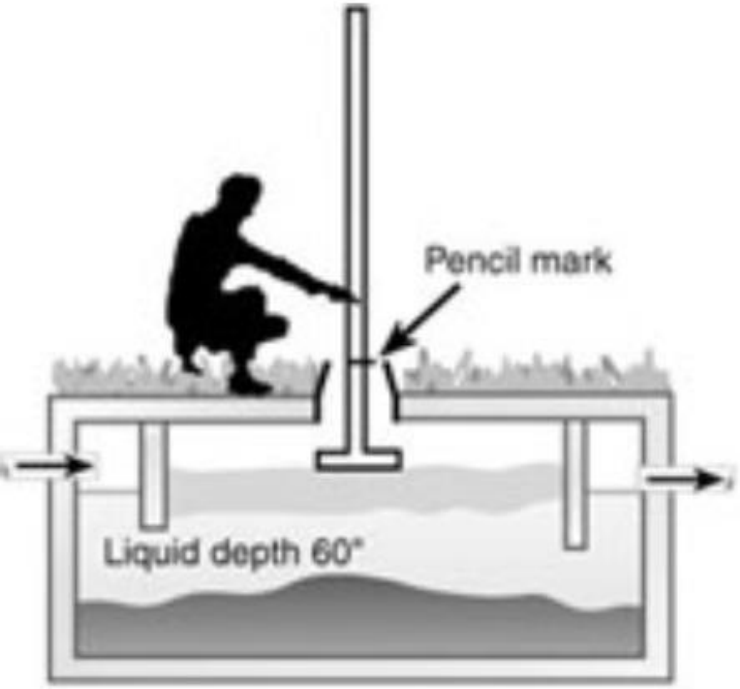

From drain plumbing
To drain field

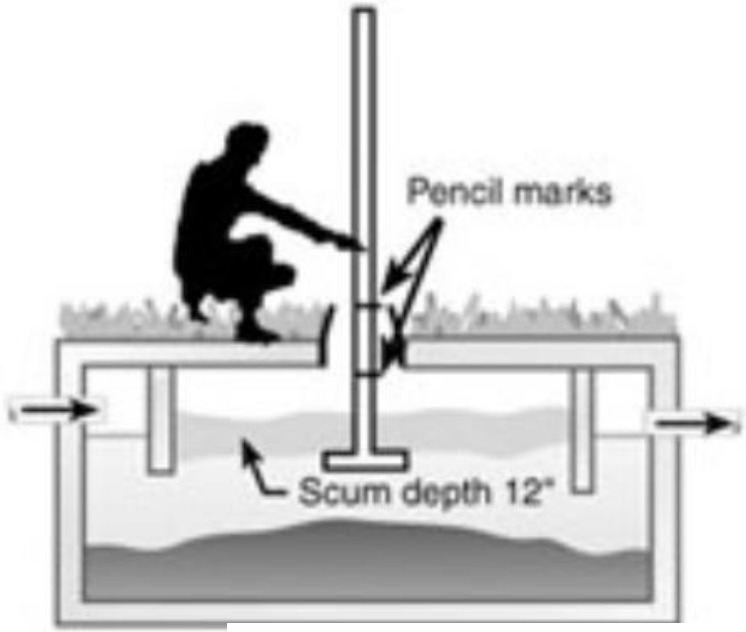

From drain plumbing
To drain field

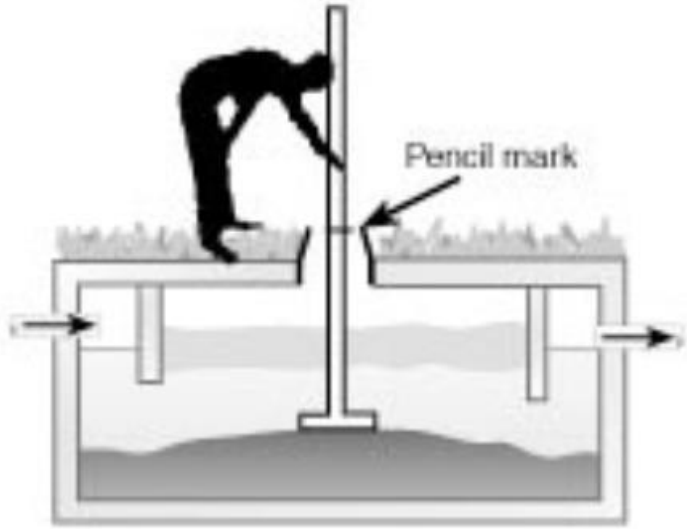

From drain plumbing
To drain field

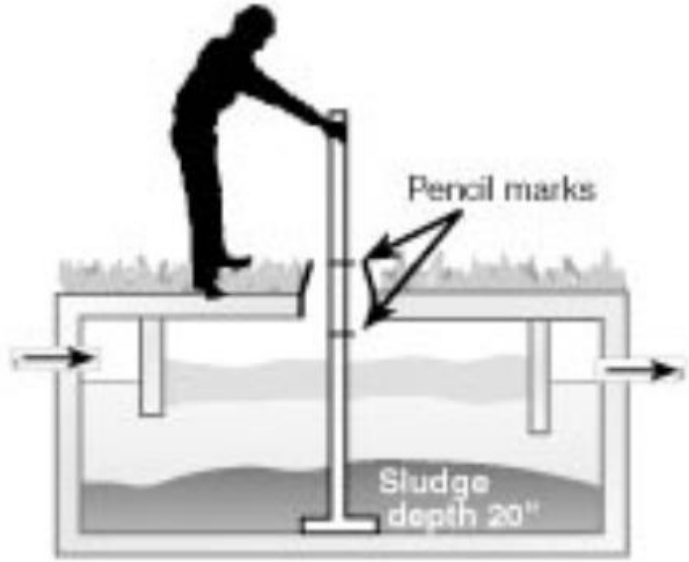
Measuring sludge depth in inches




Pencil mark
Liquid depth 60"

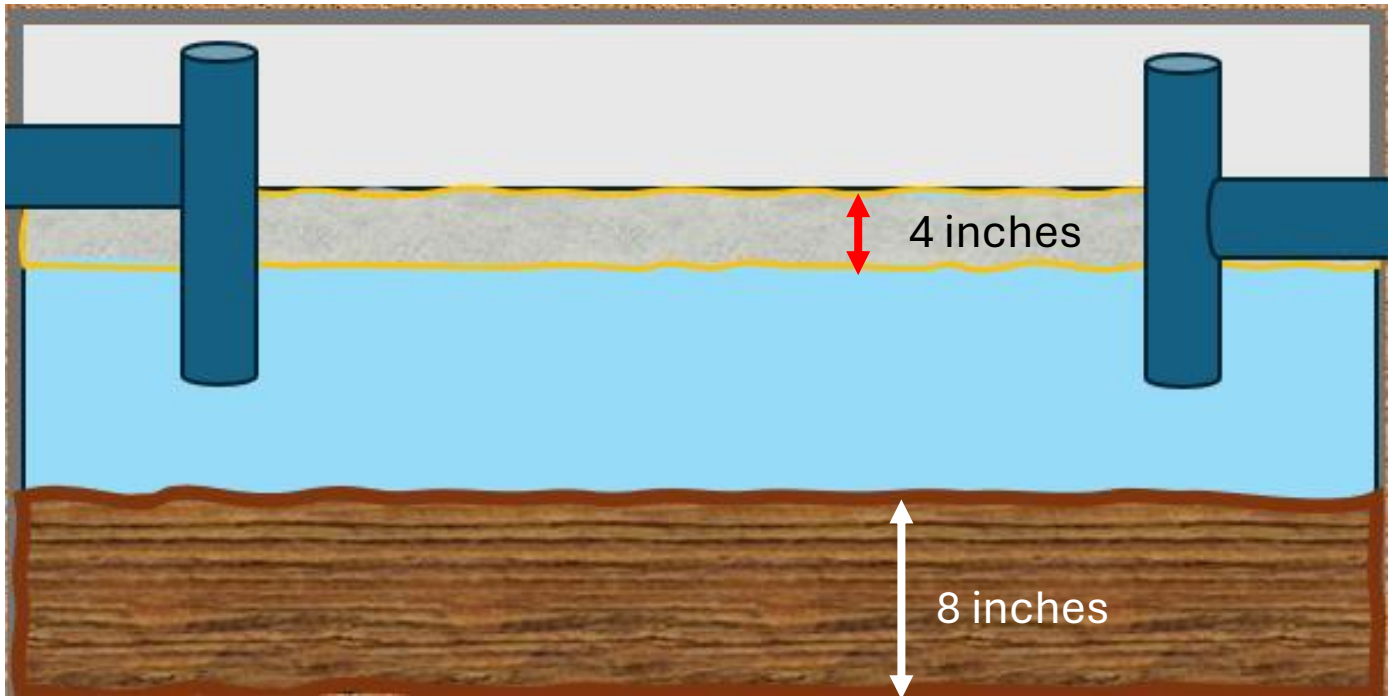

Pencil marks
Scum depth 12"


Pencil mark


Pencil marks
Sludge
depth 20"

Solids percentage to determine tank pumping

When the total solids take up 30% to 1/3 of the septic tank volume it means it is time to pump the tank. Regular inspections can also be used to estimate the rate of solids accumulation. This tank has been in operation for 3 years and is 48 inches deep.

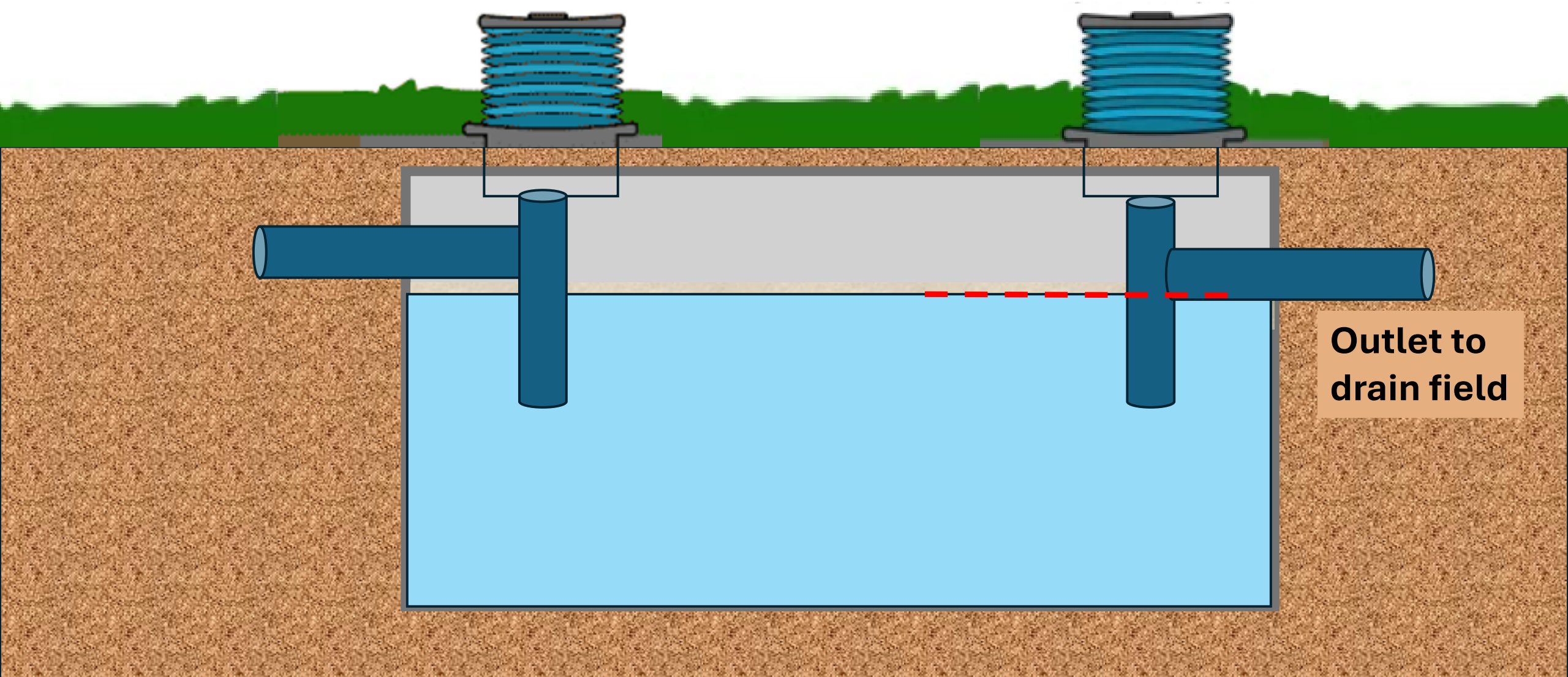


Solids = 4 in + 8 in = **12 inches**

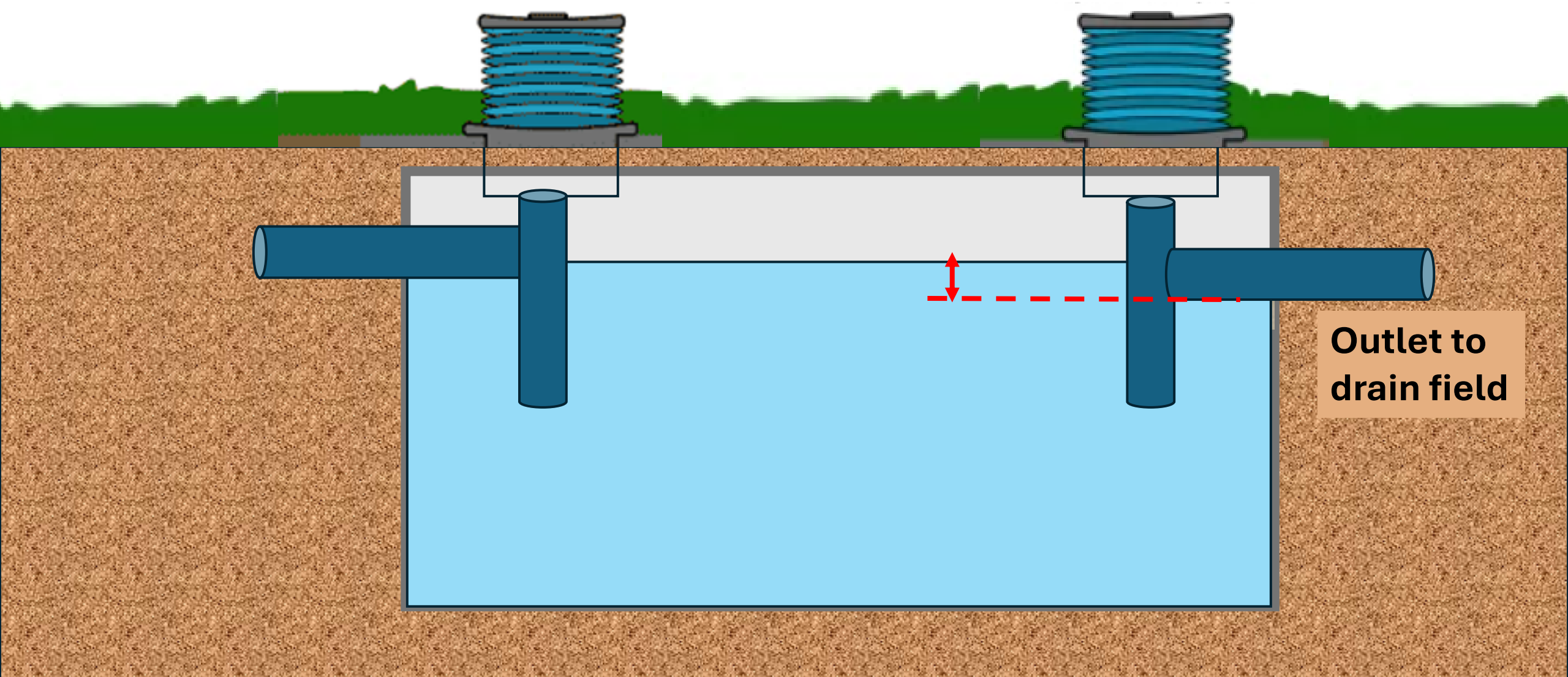
Percent of tank capacity

$\frac{12 \text{ in}}{48 \text{ in}} \times 100\% =$ **25%**

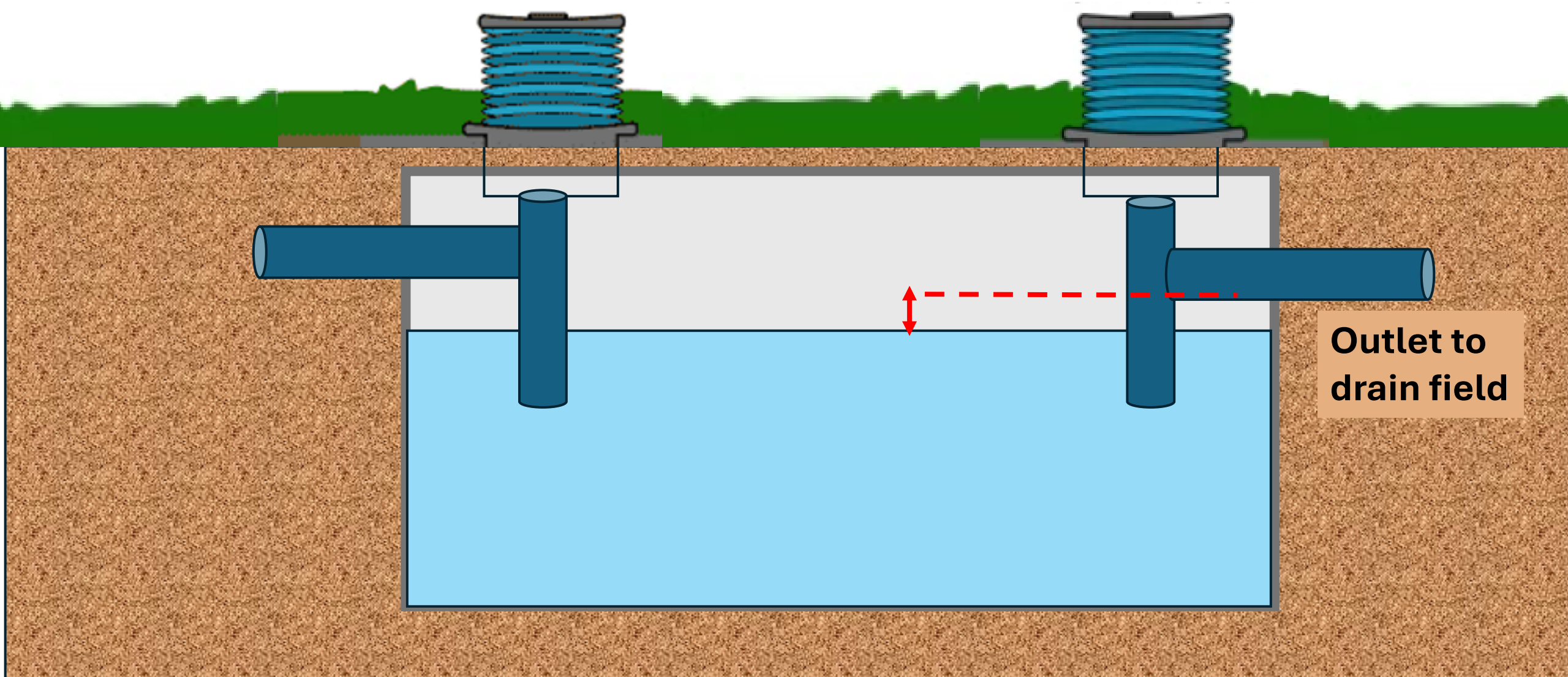
Liquid Level: Should be even with bottom of outlet pipe.



If liquid level is above bottom of outlet pipe, it means the drain field may be saturated or clogged.

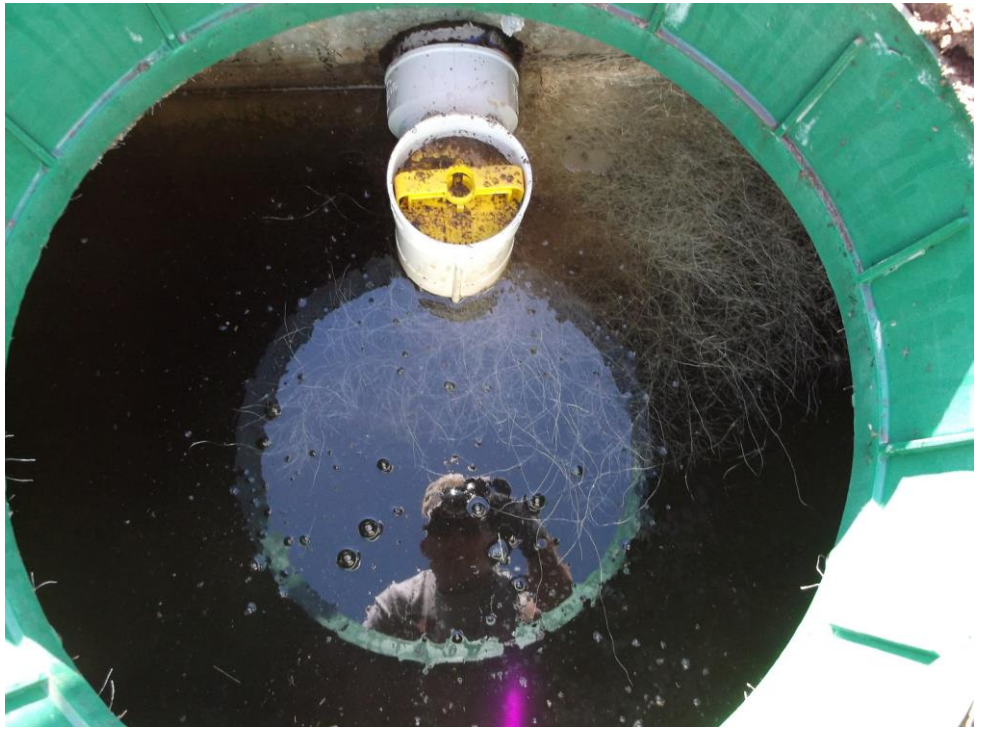


If liquid level is below the bottom of the outlet pipe, the tank may be leaking.

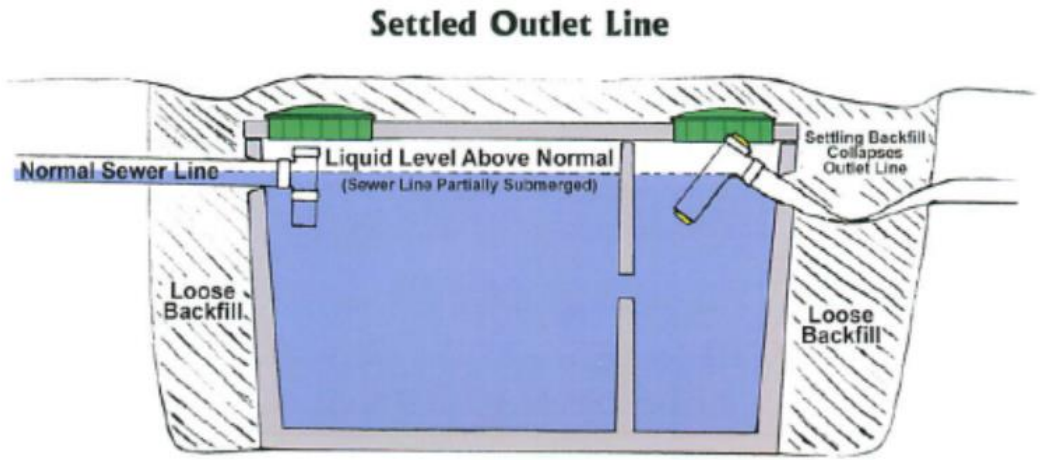


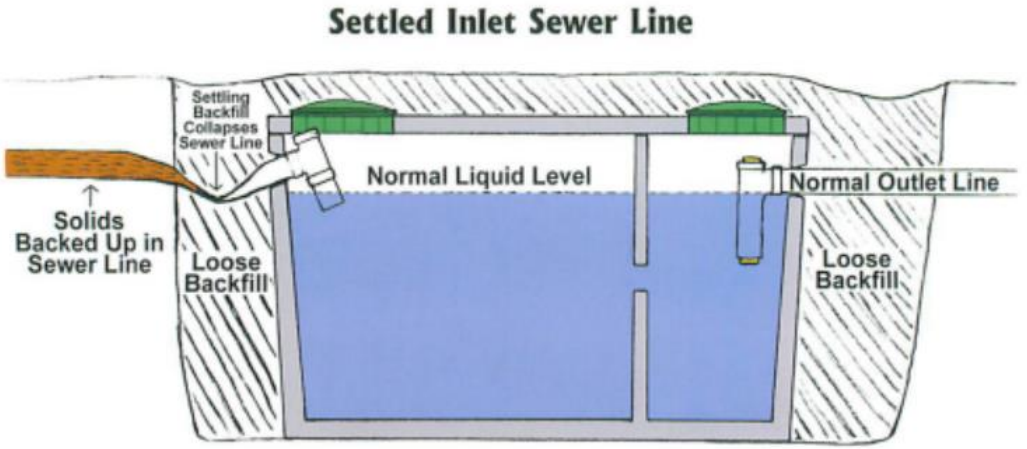

Deterioration of
center baffle wall

Roots



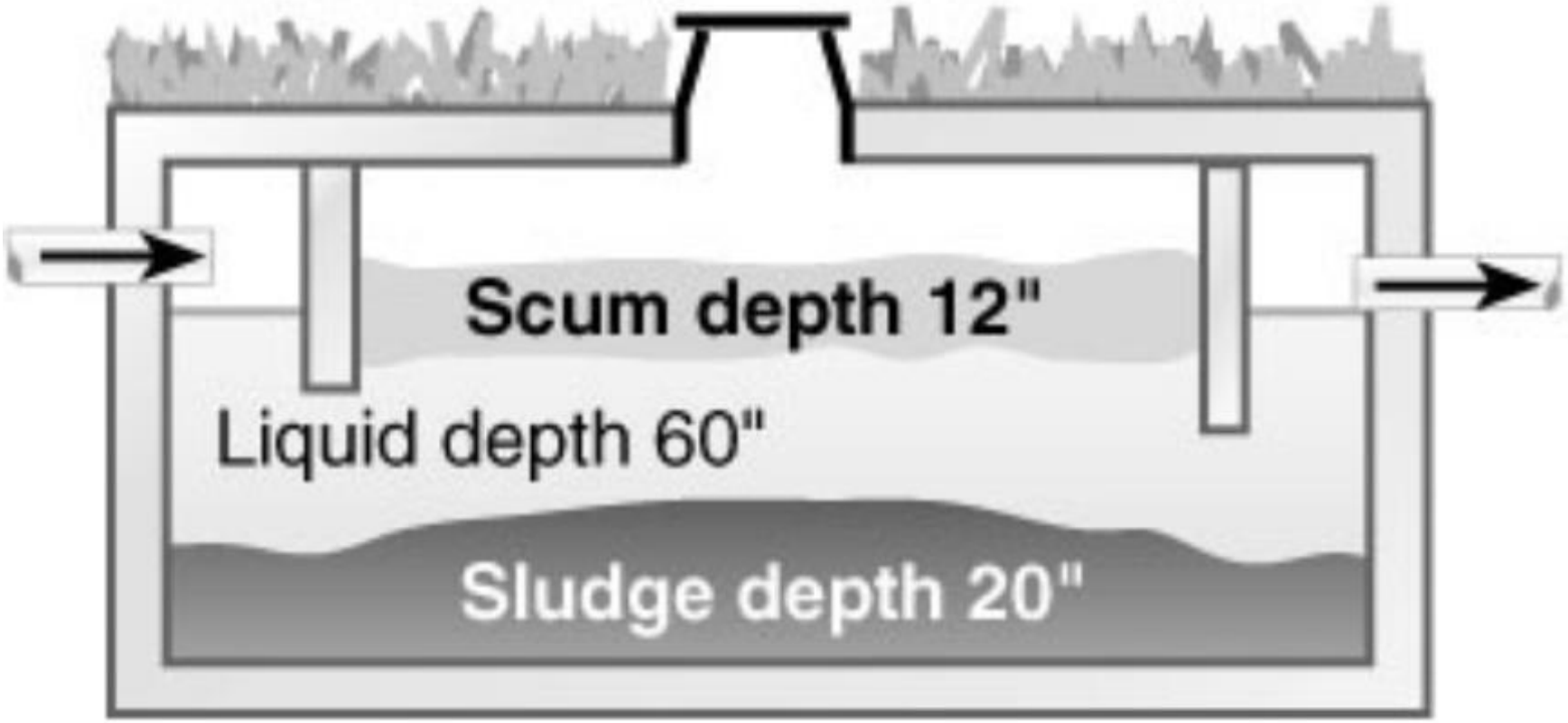
Settled piping





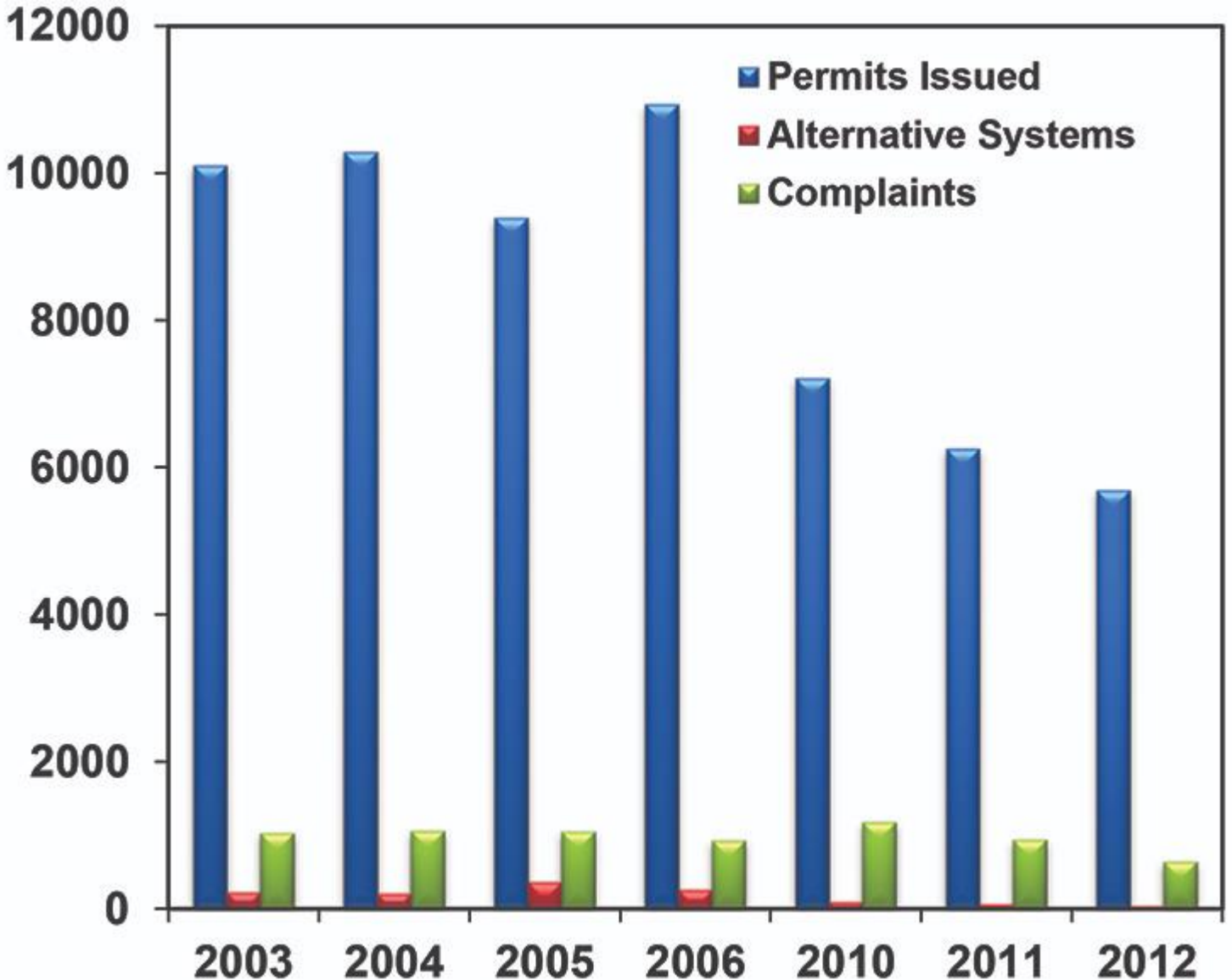
Poll #3

Poll 3: Does this septic tank need to be pumped?



a) Yes
b) No
c) Depends
d) Not sure

Track program performance



Metrics

- Onsite problems per year
- Complaints per year
- Ground water monitoring results
- Number of inspections
- Maintenance or corrective action completed
- Planned maintenance Ratio

Change in culture

Periodic inspections contribute to improved environmental and public health.

"We were just reading about a waterborne illness caused by an onsite wastewater system. How can we ensure that groundwater quality is protected from malfunctioning septic tanks?"

"Perhaps the first step is to develop a consistent inspection program and help educate the public how to keep their systems functioning well."

"Yes, an entire family was hospitalized with e-Coli, and the story also mentions that 30% of all septic systems fail"

Thank you for participating

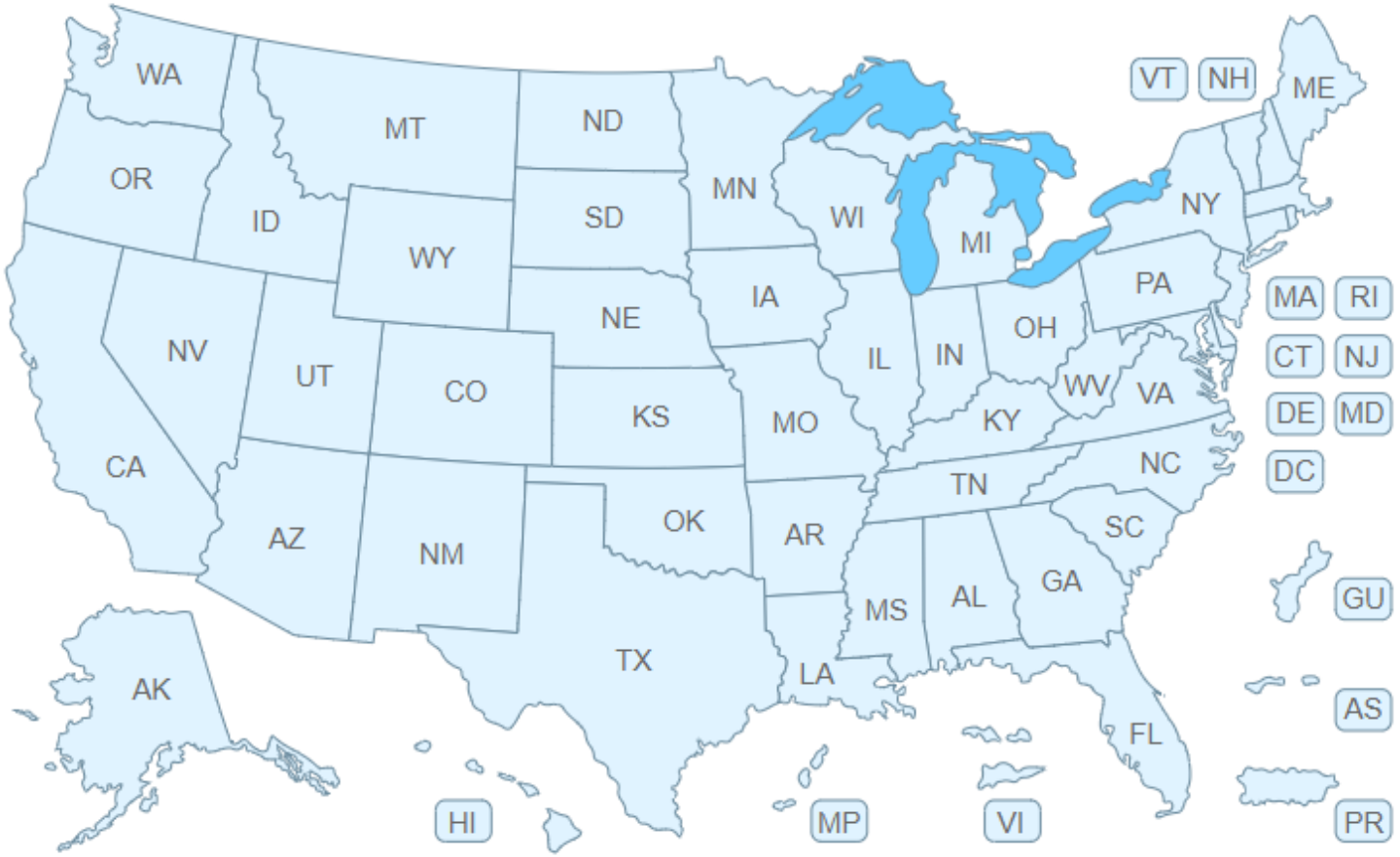
Share 1 thing you enjoyed learning about today in the chat

EFCN Funding Sources by State or Territory

https://efcnetwork.org/resources/funding-tables/

Provides

- Current loan and grant programs
- Eligibilities and terms
- Contact information



Contacts

Environmental Finance Center Network
www.efcnetwork.org

Great Lakes Environmental Infrastructure Center
www.gleic.org

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