

A to Z



April 2-4, 2019

Mystic Marriott Hotel

Groton, Connecticut



NOWRA Instructors and Class Information

- Instructors
 - John Buchanan, University of Tennessee
 - Sara Heger, University of Minnesota
 - Randy Miles, University of Missouri
 - Tom Fritts, Residential Sewage Treatment
- Presentation handouts

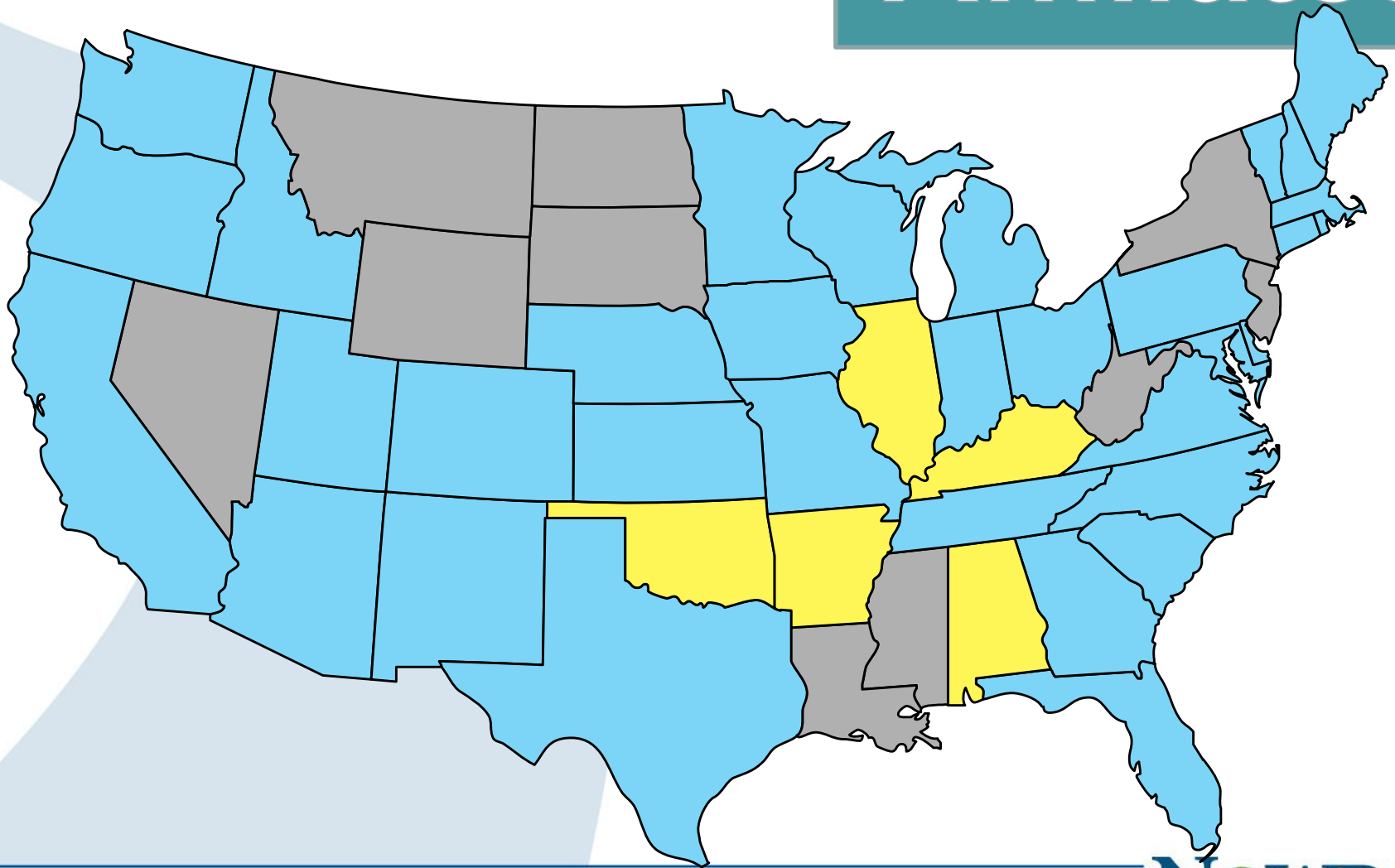


Goals & Mission

To strengthen and promote the onsite and decentralized wastewater industry through activities that support recognition and promotion of professionalism for industry practitioners.



Affiliates



NOWRA

Blue = NOWRA Affiliates • Gold = Non-affiliated • Grey = No Association

Online Learning Academy

Log on to:

www.pathlms.com/NOWRA

People Caring About Water

NOWRA National Onsite Wastewater Recycling Association

NOWRA

Welcome to the NOWRA Online Learning Academy

Whether you are new to the onsite/decentralized industry or continuing your professional development, you have come to the right place! Taught by experts in the industry, NOWRA's Academy offerings cover the fundamentals of the profession as well as advanced training in multiple topics. Offerings include those developed from a national perspective and those meeting specific state requirements. The courses included can be taken at a discounted rate as a **Member** or at a higher rate as a Nonmember of NOWRA. You can become a member of NOWRA through one of its state affiliates or if one does not exist in your area directly through NOWRA. More information can be found at: [NOWRA Membership](#).


Our Mission

To strengthen and promote the onsite and decentralized wastewater industry through activities that support recognition and promotion of professionalism for industry practitioners; implementation of best management practices throughout the industry that provide sustainable wastewater infrastructure solutions; achieve greater public awareness of the economic, environmental, and public health benefits of onsite and decentralized facilities; and to serve the public interest.

Who We Are

The National Onsite Wastewater Recycling Association (NOWRA) is the largest organization in the U.S. dedicated to educating and representing members within the onsite and decentralized industry. Our members include educators, regulators, engineers, contractors, manufacturers, suppliers, service providers, and other parties in the protection of North America's water resources and the environment. All segments of the industry are represented on NOWRA's Board of Directors that provide broad perspectives to promote and sustain our industry and service to the public. NOWRA headquarters is located in Alexandria, Virginia, with local constituent groups throughout the U.S. and Canada.

NOWRA was founded in 1992 to educate and serve its members and the public by promoting sound federal, state, and local policies; to improve standards of practice, and increase public recognition of the need for and benefits of onsite and decentralized wastewater infrastructure. Decentralized systems provide effective and more affordable wastewater treatment solutions where traditional central sewerage systems might be impractical or unsuitable. These systems can sustainably serve a single home, a neighborhood, or an entire community including commercial and industrial facilities.



Lobbying Objectives

- 1. Increase market share 30% to 35%**
- 2. Secure a larger share of existing federal funding**
- 3. Get EPA to change policies**

Congratulations

NOWRA MEMBERS!

**America's Water Infrastructure
Act passed Congress
on October 12, 2018**

Thank you to NOWRA's Federal Lobbying Board of Governors who supported this effort!



National Onsite Wastewater
Recycling Association







NOWRA ACT

To better facilitate wastewater treatment and recycling to millions of people in the United States by deploying greater use of cost-effective, efficient decentralized systems and for other purposes.

It is the sense of Congress that providing communities with the knowledge and resources necessary to fully utilize decentralized wastewater systems can provide affordable wastewater treatment and recycling to millions of people in the United States.

The NOWRA Act Will Do Three Things



NOWRA ACT

To better facilitate wastewater treatment and recycling to millions of people in the United States by deploying greater use of cost-effective, efficient decentralized systems and for other purposes.

It is the sense of Congress that providing communities with the knowledge and resources necessary to fully utilize decentralized wastewater systems can provide significant benefits to millions of people in the United States.

SEC. 1. SHORT TITLE

SEC. 2. SENSE OF CONGRESS

Require EPA to create a Wastewater Technology Clearinghouse which shall update their wastewater technical information assistance programs to include information about cost-effectiveness of onsite and decentralized treatment systems. They are further required to disseminate this information to communities and other stakeholders seeing federal funding for wastewater treatment.

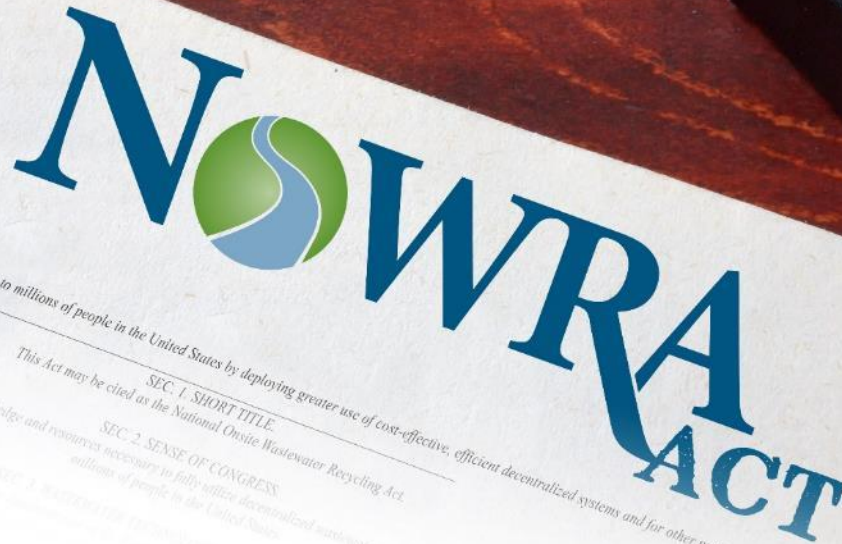
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2

Require communities of 2,500 people or fewer self-certify that they have considered onsite and decentralized systems before they make a treatment decision.

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The logo for the National Onsite Wastewater Recycling Act (NOWRA ACT). The word "NOWRA" is in a large, blue, serif font, with a stylized globe icon (green and blue) replacing the letter 'O'. Below it, the word "ACT" is in a smaller, blue, serif font. The logo is printed on a white document that also contains the title and purpose of the act.

To better facilitate wastewater treatment and recycling to millions of people in the United States by deploying greater use of cost-effective, efficient decentralized systems and for other purposes.

Congress that providing communities with the knowledge and resources necessary to fully utilize decentralized wastewater systems can provide significant benefits to millions of people in the United States.

This Act may be cited as the National Onsite Wastewater Recycling Act.

SEC. 1. SHORT TITLE.

SEC. 2. SENSE OF CONGRESS.

SEC. 3. WASTEWATER RECYCLING ACT.

3

NOWRA ACT

To better facilitate wastewater treatment and recycling to millions of people in the United States by deploying greater use of cost-effective, efficient decentralized systems.

SEC. 1. SHORT TITLE

SEC. 2. SENSE OF CONGRESS

One year after the bill's passage, EPA must provide a Report to Congress which describes

- How much SRF money has gone to deploy decentralized systems.
- The barriers to greater usage of onsite and decentralized technologies
- The cost-savings and environmental benefits of further deployment of these technologies
- What EPA is doing to help states identify eligible projects which are using decentralized technology.

Annual Conference

IN 2019

ALL ROADS LEAD TO Colorado!

Save the Date!

2019 ONSITE WASTEWATER
MEGA-CONFERENCE
OCTOBER 13-16, 2019

Loveland, Colorado

A partnership between NOWRA and CPOW (Colorado Professionals in Onsite Wastewater)

A to Z Septic System Treatment Overview

Sara Heger

From outdoor plumbing to water reuse

EVOLUTION OF WASTEWATER TREATMENT

GOALS

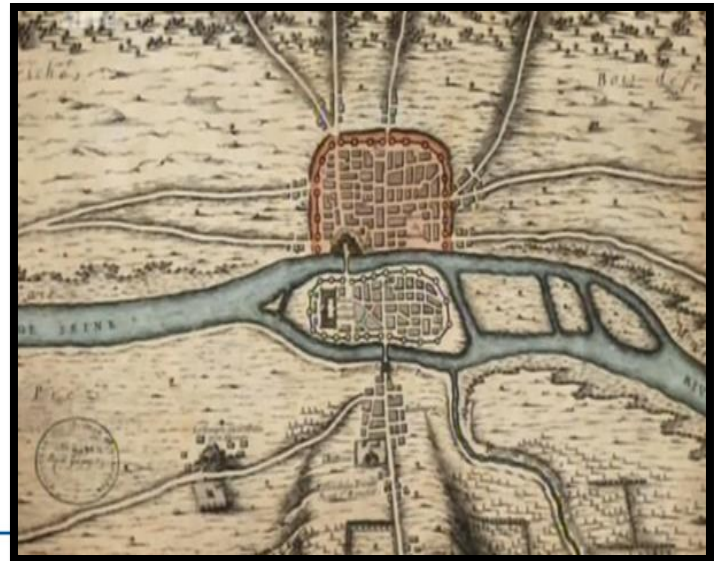
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Truly Lets Start at the Beginning

Deuteronomy 23:13 NIV

”As part of your equipment have something to dig with, and when you relieve yourself, dig a hole and cover up your excrement.”

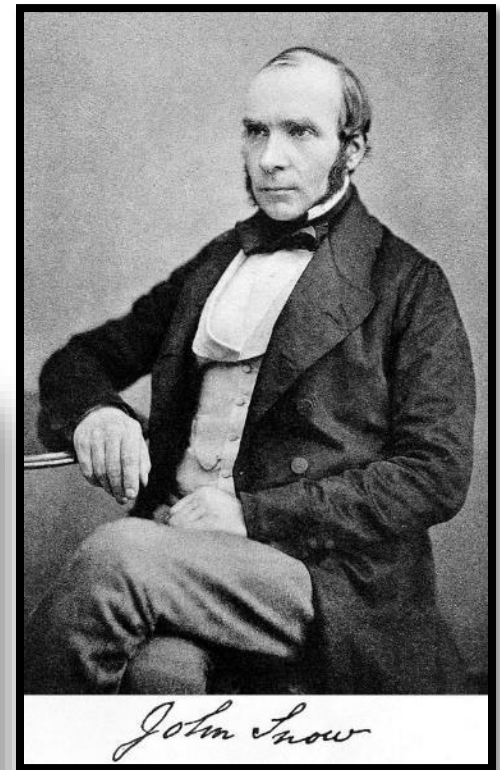
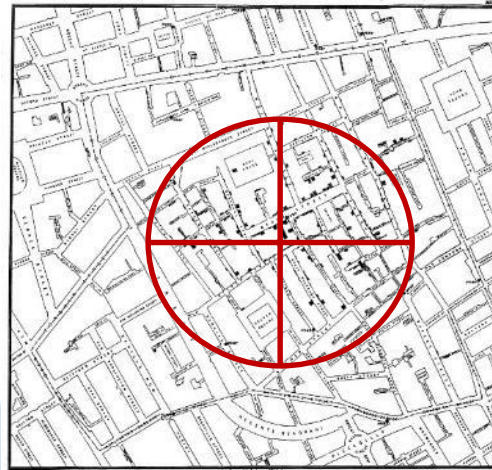


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Public Health

Historical Perspective

- **John Snow**
 - Father of Epidemiology
 - London 1854 cholera outbreak
 - 500 fatal cases, 10 days
 - Linked to Broad St. pump
 - First link to water
- **Robert Koch**
 - 1883 isolated bacterium
 - *Vibrio cholerae*



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Onsite Sewage Disposal

~1900's Construction of Privies was a major milestone in reducing illness from water-borne diseases

EH Risks

Cholera
Typhoid
Dysentery
Hepatitis
Eutrophication of Lakes



(To Be Tacked Inside of the Privy and NOT Torn Down.)

Sanitary Privies Are Cheaper Than Coffins



For Health's Sake let's keep this Privy CLEAN. Bad privies (and no privies at all) are our greatest cause of Disease. Clean people or families will help us keep this place clean. It should be kept as clean as the house, because it spreads more disease.

The User Must Keep It Clean Inside. Wash the Seat Occasionally

How to Keep a Safe Privy:

1. Have the back perfectly screened against flies and animals.
2. Have a hinged door over the seat and keep it CLOSED when not in use.
3. Have a bucket beneath to catch the Excreta.
4. VENTILATE THE VAULT.
5. See that the privy is kept clean inside and out, or take the blame on yourself if some member of your family dies of Typhoid Fever.

Some of the Diseases Spread by Filthy Privies:
Typhoid Fever, Bowel Troubles of Children, Dysentery, Hookworms, Cholera, some Tuberculosis.
The Flies that You See in the Privy Will Soon Be in the Dining Room.

Walker County Board of Health

Peopl

Outdoor Plumbing: the pit privy

- Goal: designated place
- No carrier needed to convey waste
- Waste applied directly to the soil
- Public health concerns addressed
- Management: relocate



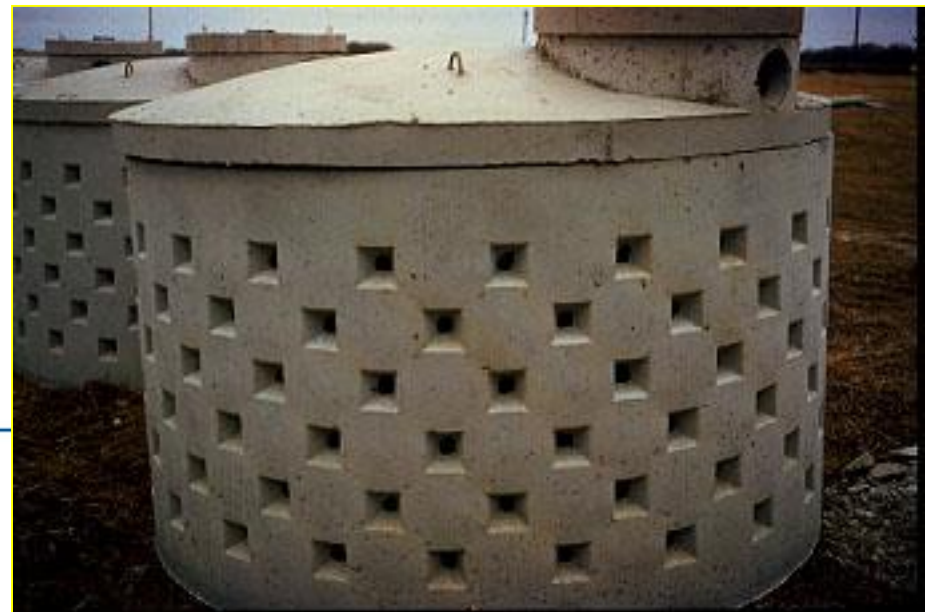
Indoor Plumbing

- Convenience
- Water carrier to convey waste out of facility
- ‘Collection system’
- Public health and pathogens
- Management: keep pipe flowing



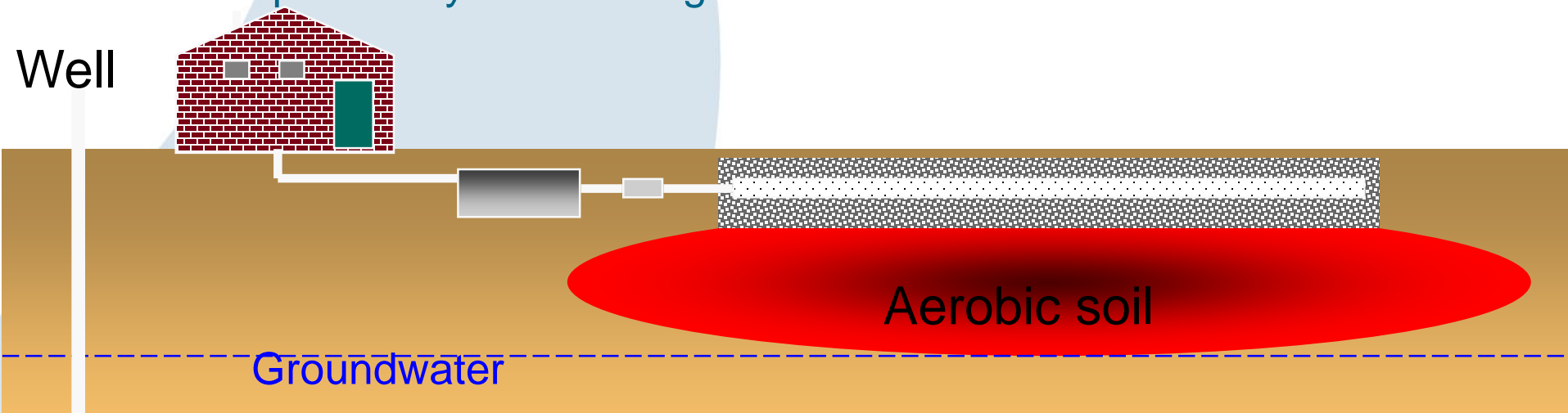
Disposal

- Goal: limit human contact
 - Keep wastewater below ground
 - Disposal options
 - Public health
 - “Disposing” of pathogens
 - Treatment?
 - Management:
 - ~~install, flush and forget~~
- People Caring About Water**



Septic Tank & Soil Treatment Area

- Evolving goal:
 - Disposal: effluent goes away versus
 - Dispersal: TREATMENT
- Public health AND environmental issues addressed
- Management:
 - Disposal: often none at all;
 - Dispersal: System management is critical



Goal: Treatment AND Dispersal

- Address environmental concerns in addition to public health concerns
- Technological advancements now allow removal of:
 - Pathogens
 - Solids
 - Nutrients
- System management is vital to treatment
- Goal is now **DISPERSAL**
 - Hydrologic cycle

Reuse

- Goal: careful use of a valuable resource
- Wastewater vs. water
- Potable vs. Non-potable uses
 - Landscape reuse
 - Toilet flushing
 - Some areas are looking at it as potable
- Management: O&M

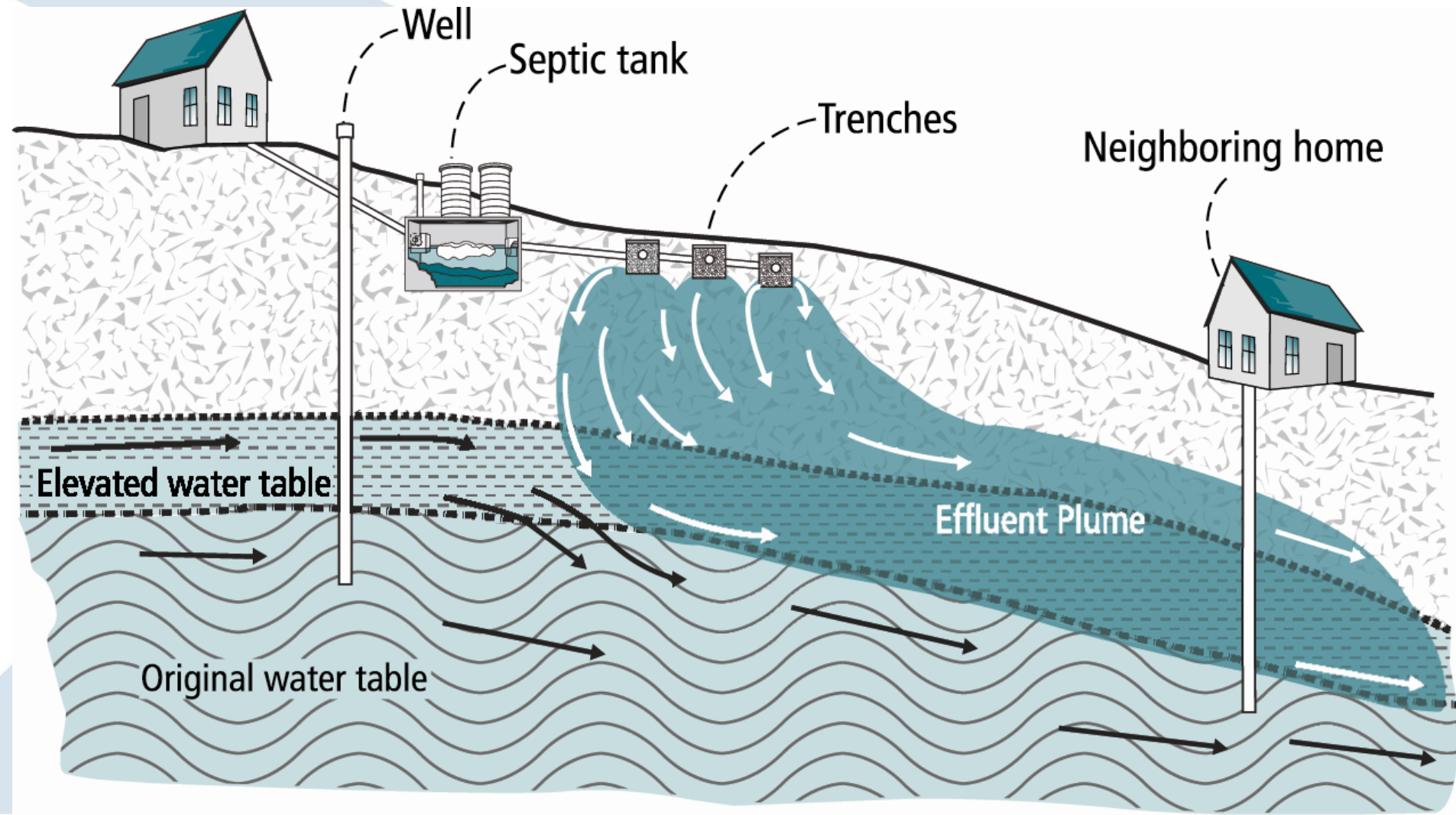
People Caring About Water is even more critical



What is Wastewater?



All wastewater must be treated



So What's in Wastewater?

TABLE 4-1 Chemical and Microbial Quality of Untreated Graywater from Individual and Combined Sources

Parameter	Bathroom	Laundry	Kitchen Sink and Dishwasher	Graywater Combined (excludes kitchen water)
Physical				
Temperature (°C)	29	28-32	27-38	
Turbidity	28-240	14-210		15-140
Total suspended solids (TSS), mg/L	54-200	120-280	240-2,400	
Total dissolved solids (TDS), mg/L	140-1,300			310-930
Electrical conductivity (µS/cm)	82-250	190-1,400		
Chemical				
pH	6.4 – 8.1	8.1-10	6.3-7.4	6.7-7.6
Alkalinity	24-67	83-200	20-340	150-200
BOD ₅ (mg/L)	26-300	48-380	1,000-1,500	125-250
COD (mg/L)	100-630	13-720	3.8-1,400	250-430
Total organic carbon (mg/L)	30-100	100-280	600-880	
Sodium absorption ratio				2.3 - 6
Boron (mg/L)				0.1-1.6
Chloride (mg/L)	9.0-19	9.0-90		22-34
TN (mg/L)	5-17	6-21	0.3-74	0.6-5.2
TP (mg/L)	0.1-4	0.1->100	68-74	
PO ₄ (mg/L)	0.94-49	4-170	13-32	4-35
NH ₄ (mg/L)	<0.1-15	0.04-11	0.005-6	0.15-3.2
NO ₃ (mg/L)	0.28-6.3	0.4-2	0.3-5.8	0-4.9
Anionic surfactants (mg/L)	21	92	6	
Microbial				
Total coliform/100 mL	10 ^{2.7} -10 ^{7.4}	10 ^{1.9} -10 ^{5.2}	10 ⁷ -10 ⁹	10 ^{7.2} -10 ^{8.8}
<i>Pseudomonas aeruginosa</i> /100 ml				1.99 x 10 ⁴
<i>E. coli</i> /100 mL	10 ^{1.6} -10 ^{3.4}	10 ^{1.5} -10 ^{3.9}	10 ^{5.4} -10 ⁹	
<i>Cryptosporidium spp.</i>	no detection	no detection		

NOTE: Graywater as defined in this report does not include kitchen water.



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Three Approaches to Wastewater Treatment

1) Centralized

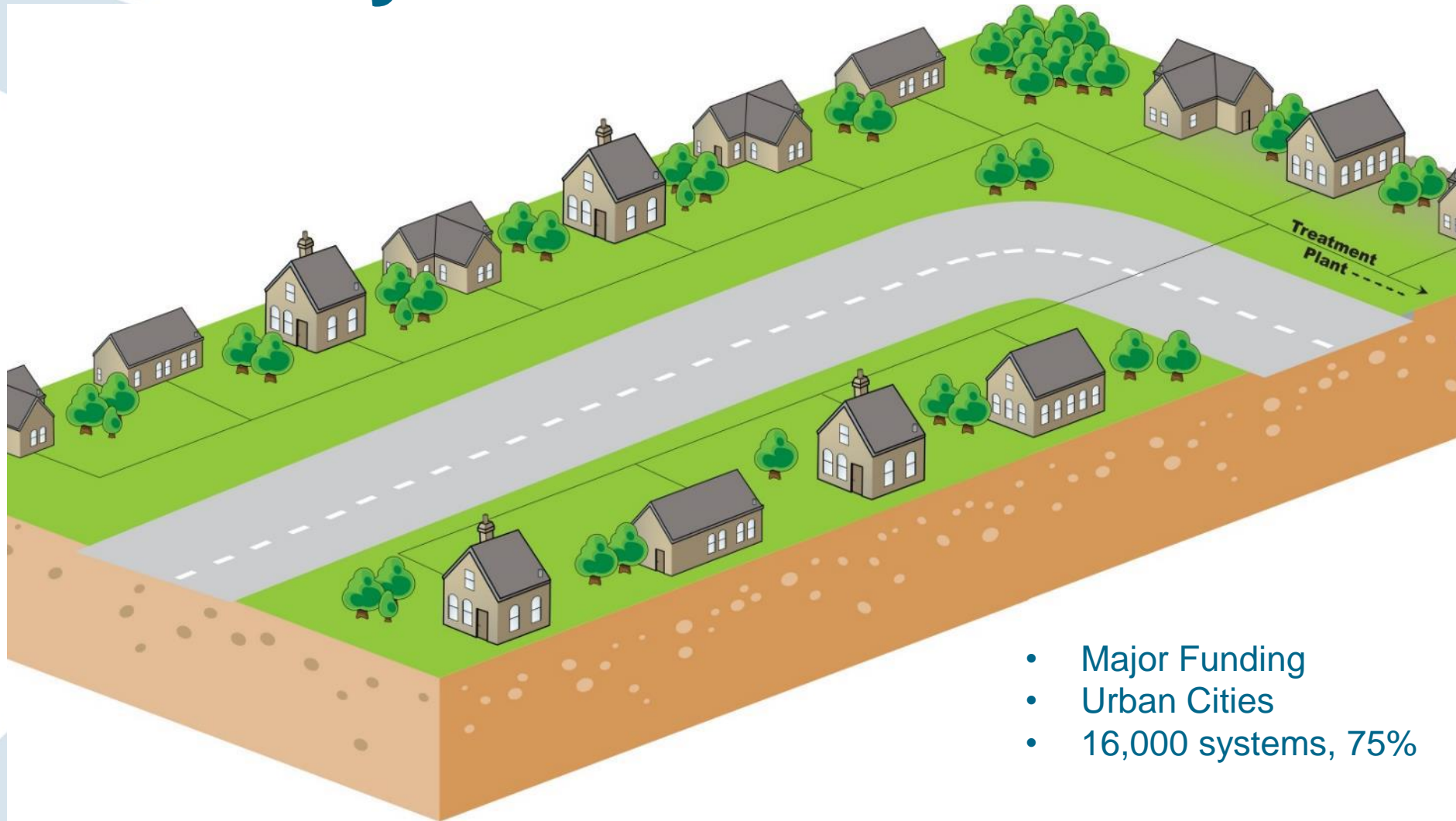
- Collection network for many homes
- Central treatment facility
- Discharge – surface requires state permit

2) Decentralized

- Individual or small group of homes
- Onsite treatment facilities (near site)
- Soil based dispersal or subsurface discharge

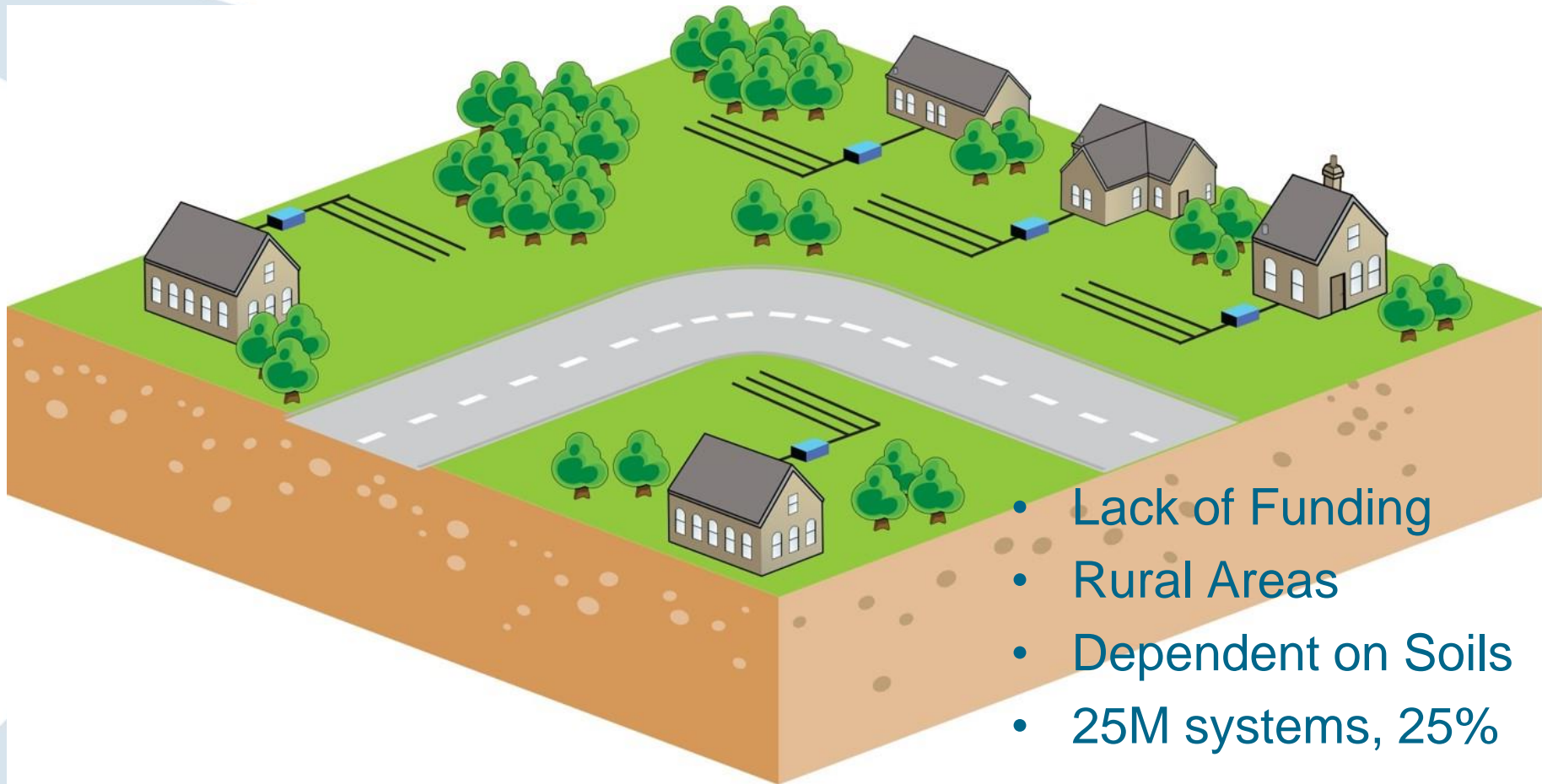
3) Combination

Centralized Systems



- Major Funding
- Urban Cities
- 16,000 systems, 75%

Decentralized Systems



- Lack of Funding
- Rural Areas
- Dependent on Soils
- 25M systems, 25%

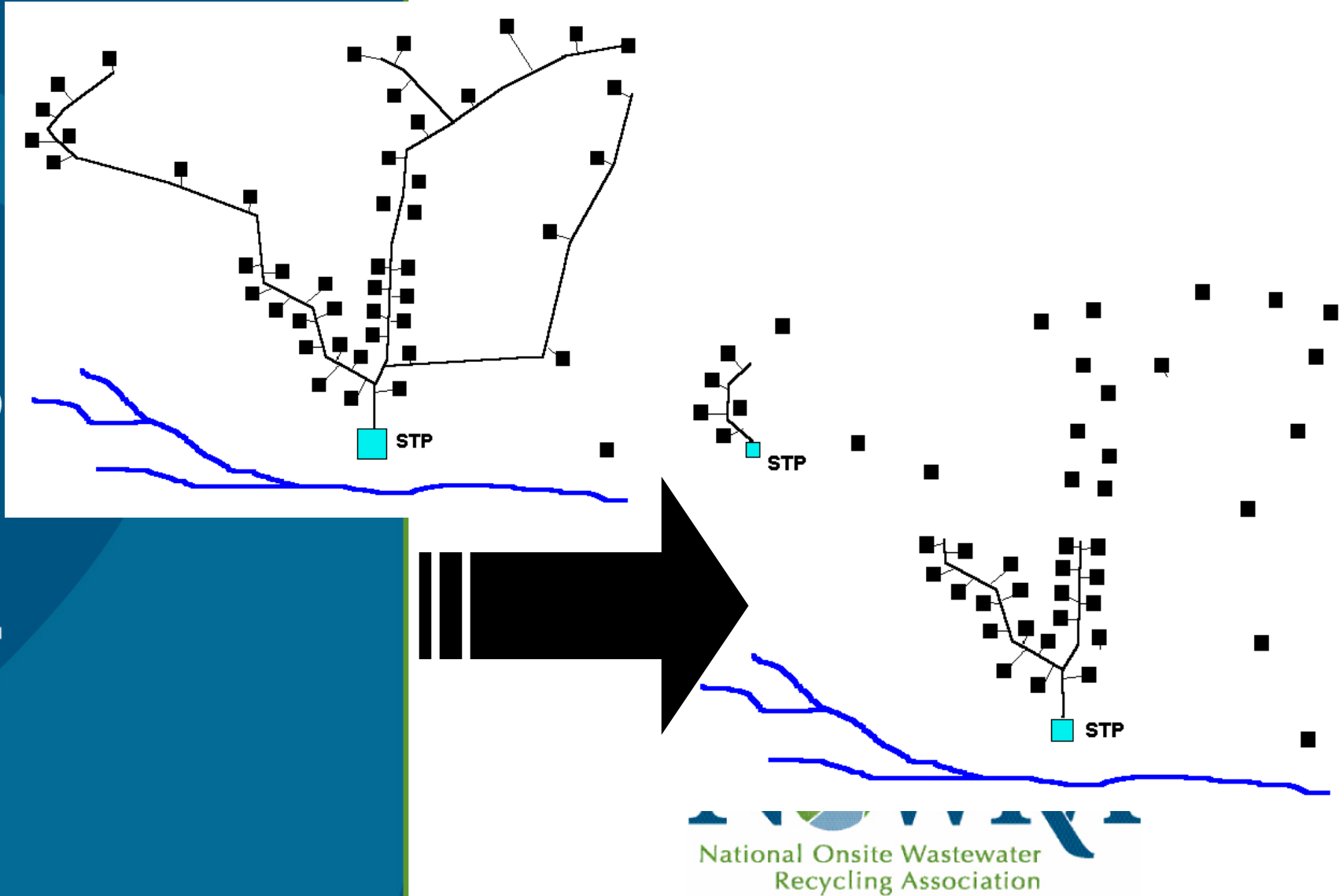
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Advantages of Decentralized Systems

- More cost effective (lower capital costs)
- Simple, easier to maintain
- Lower O&M requirements
- Lower energy requirements
- Can be designed for a variety of site, size and soil conditions
- Enhanced opportunities for wastewater reuse
- Greater opportunities for 'green development'

Decentralized Approach

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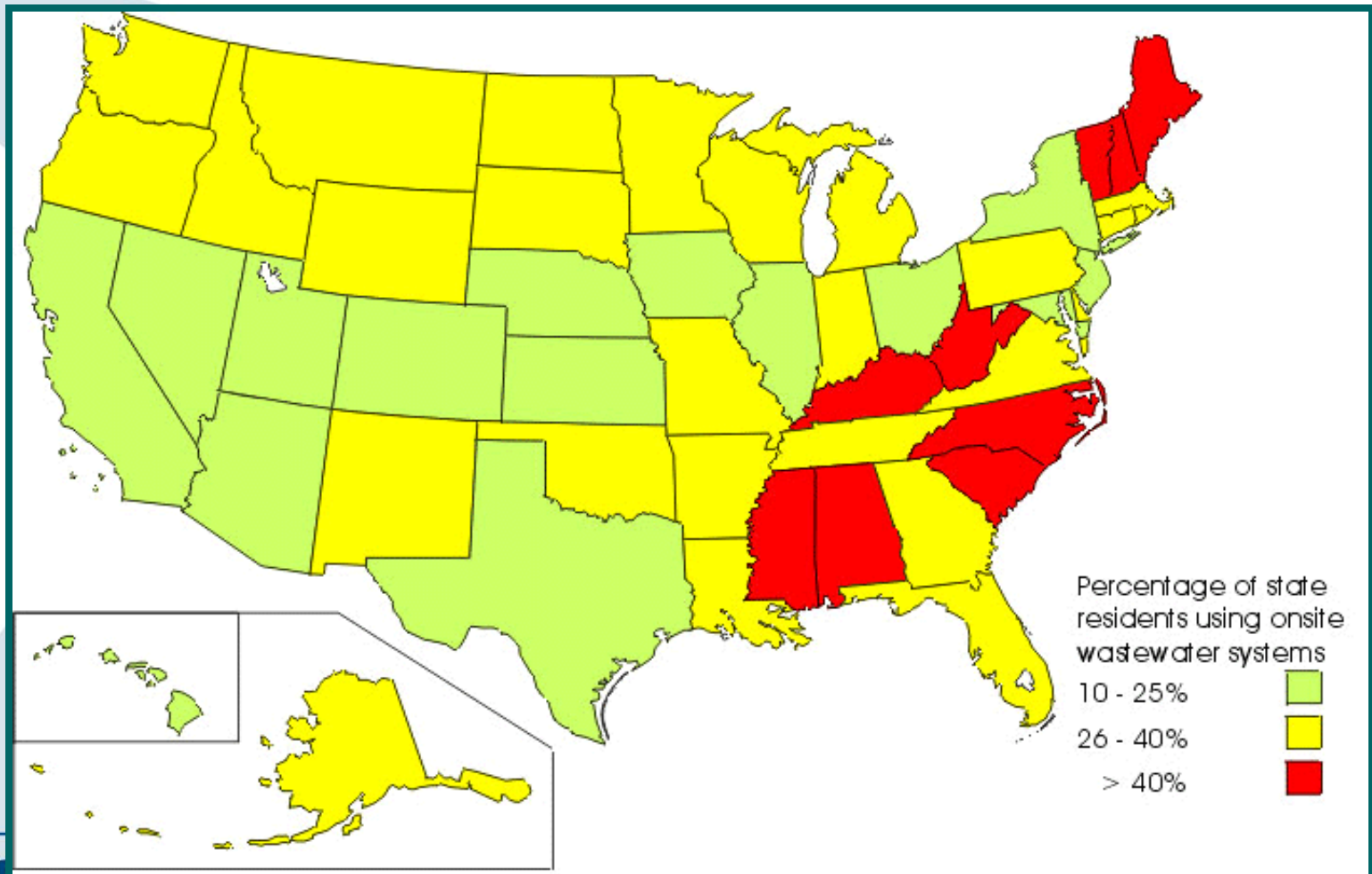
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Decentralized Treatment is Important Nationally

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- 25% of population served
- 33% of new construction
- Small communities: 11% of need
- > 50% in suburbs or cities

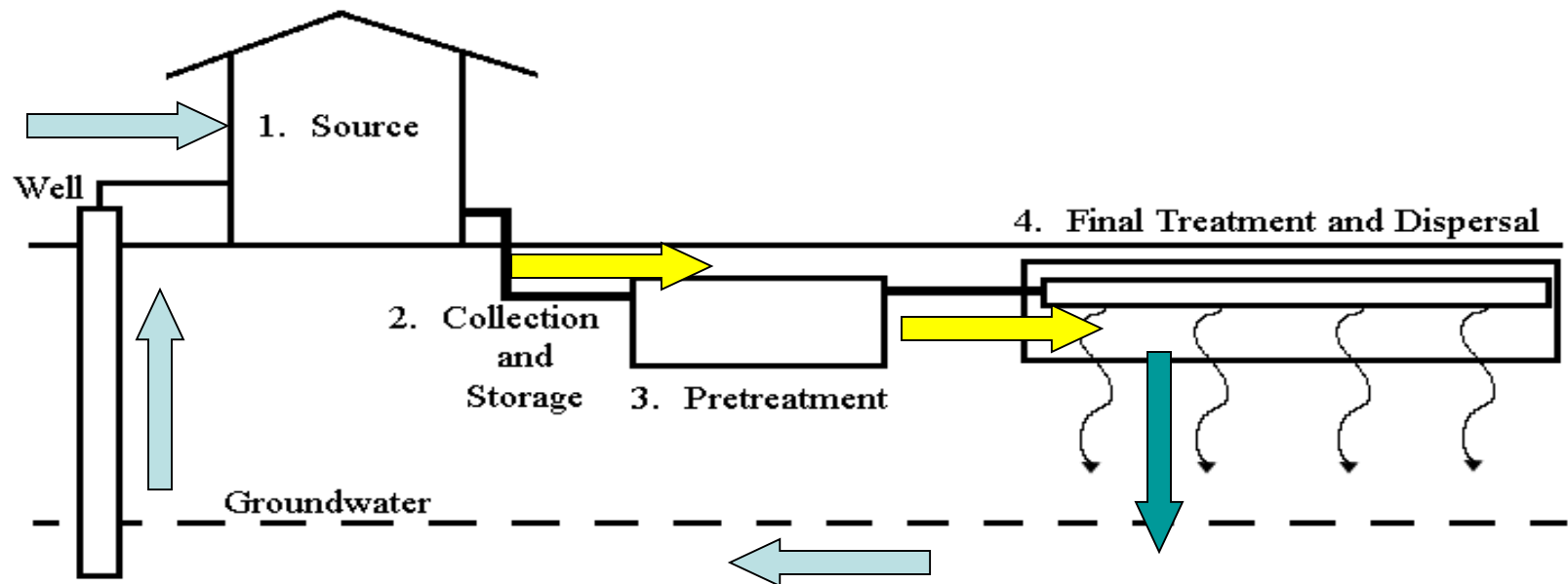
Where Septic Systems Are Used



Source: U.S. Census Bureau, 1990

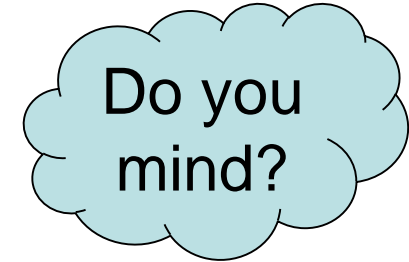
What Is an Onsite Wastewater Treatment System?

1. Wastewater Source
2. Collection and Storage
3. Pretreatment components
4. Final Treatment and Dispersal components



Wastewater Source

- User
 - Domestic
 - Commercial
 - Industrial



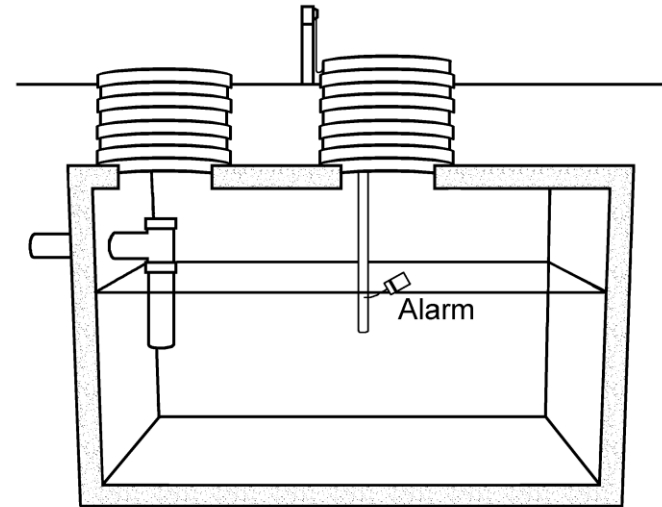
Collection

- Piping from facility with cleanout
 - Blackwater
 - Graywater



Collection

- Holding tanks
- Composting toilets
- Incinerating toilets



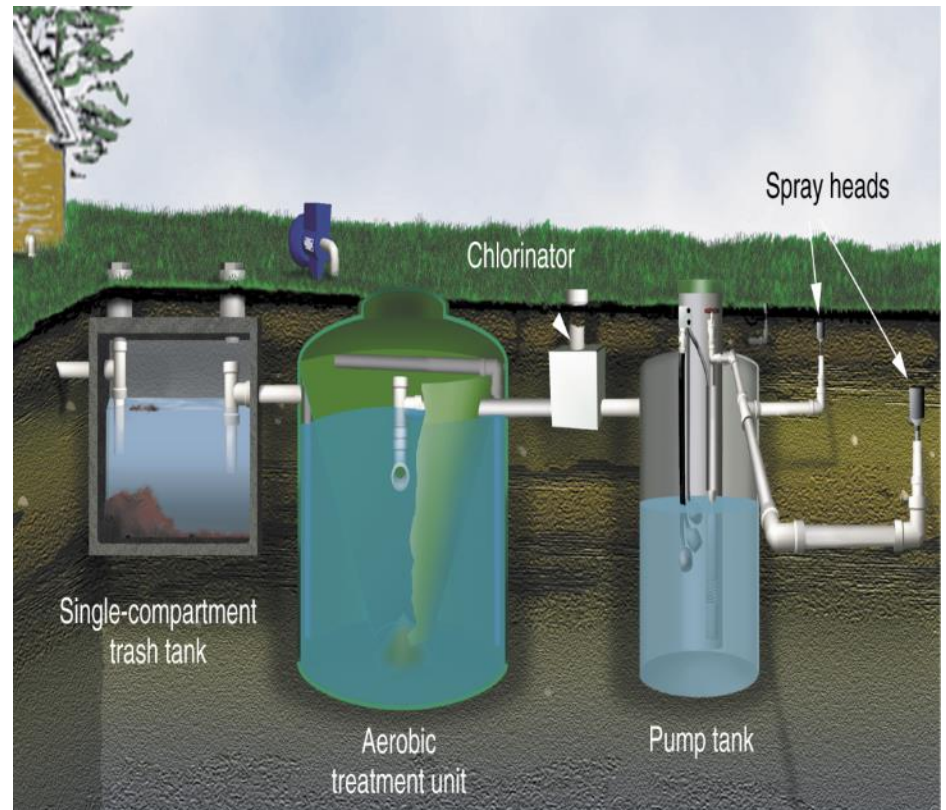
Courtesy of Clivus Multrum



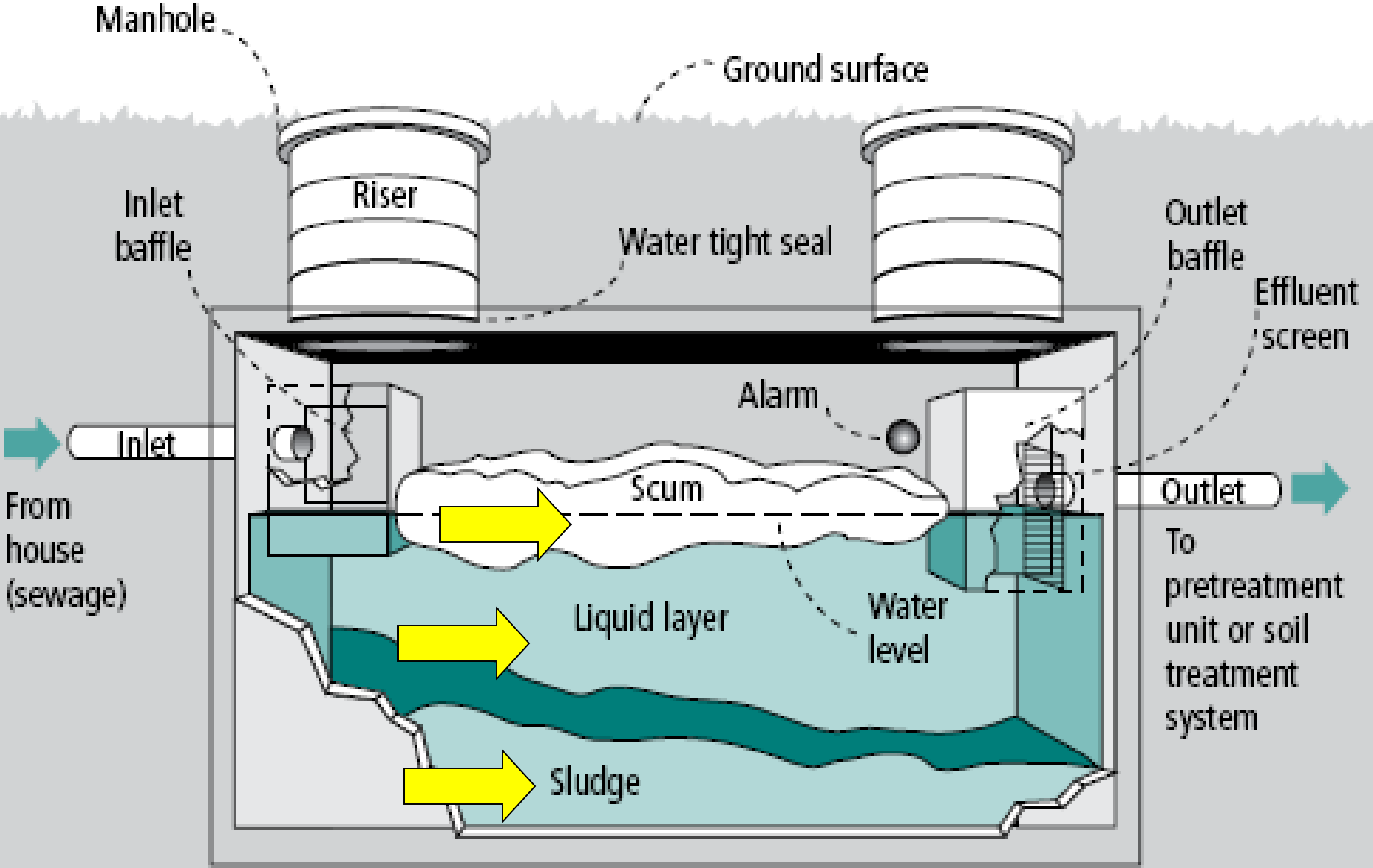
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Pretreatment

- Septic tanks
- Aerobic treatment units
- Media filters
- Constructed wetlands
- Membrane bioreactors
- Disinfection



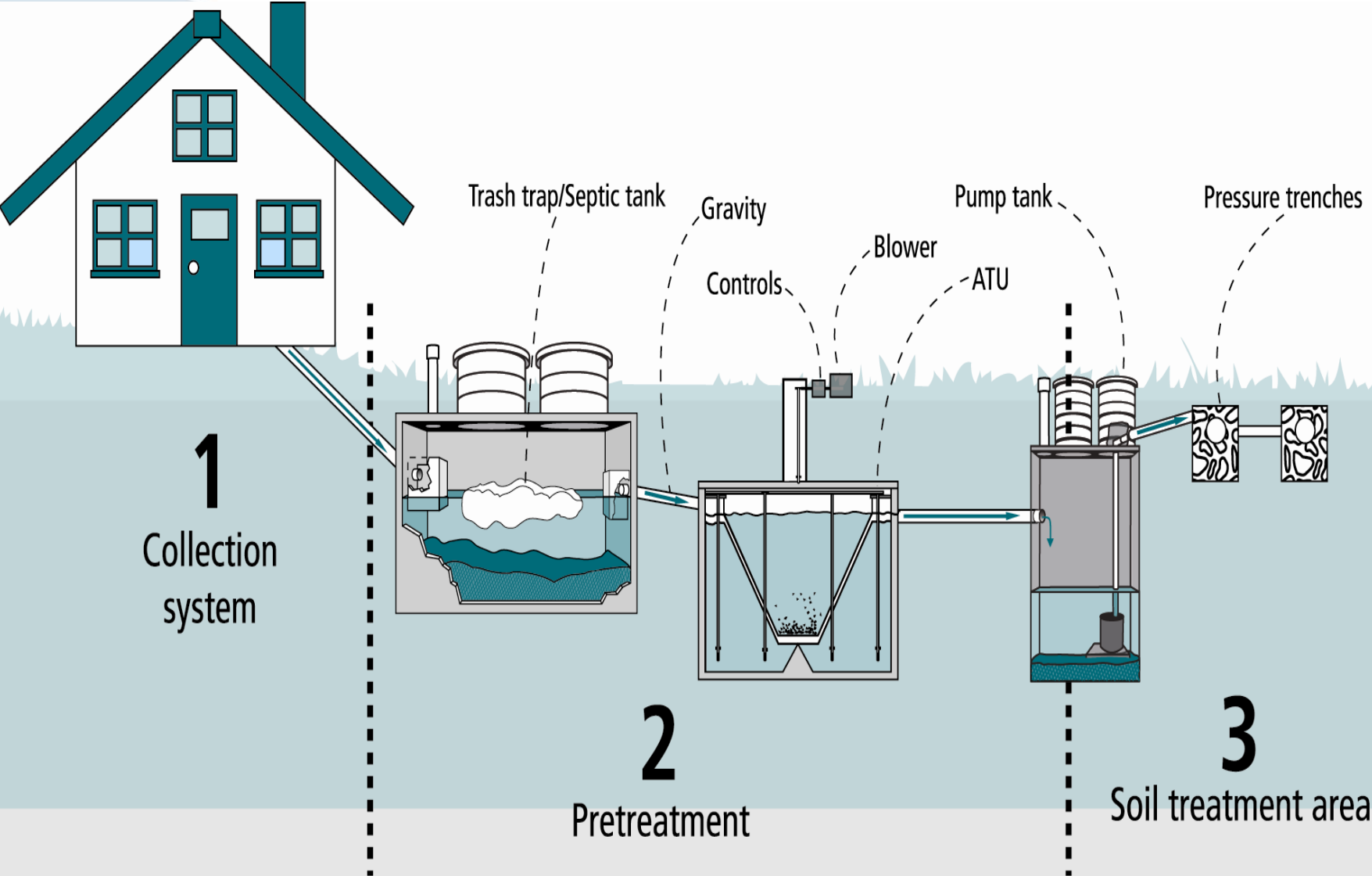
Septic Tank



Septic Tank: Primary Treatment

- Job of tank: catch the solids
- Water tight tank, inlet, inlet baffle, inspection pipes, manhole, outlet baffle, outlet pipe
- Layers in tank
 - Scum layer: floating soap, grease, toilet paper, etc
 - Liquid layer: water, liquid, and suspended solids
 - Sludge: heavy organic and inorganic materials in the bottom of the tank
- Anaerobic bacteria breakdown organic solids

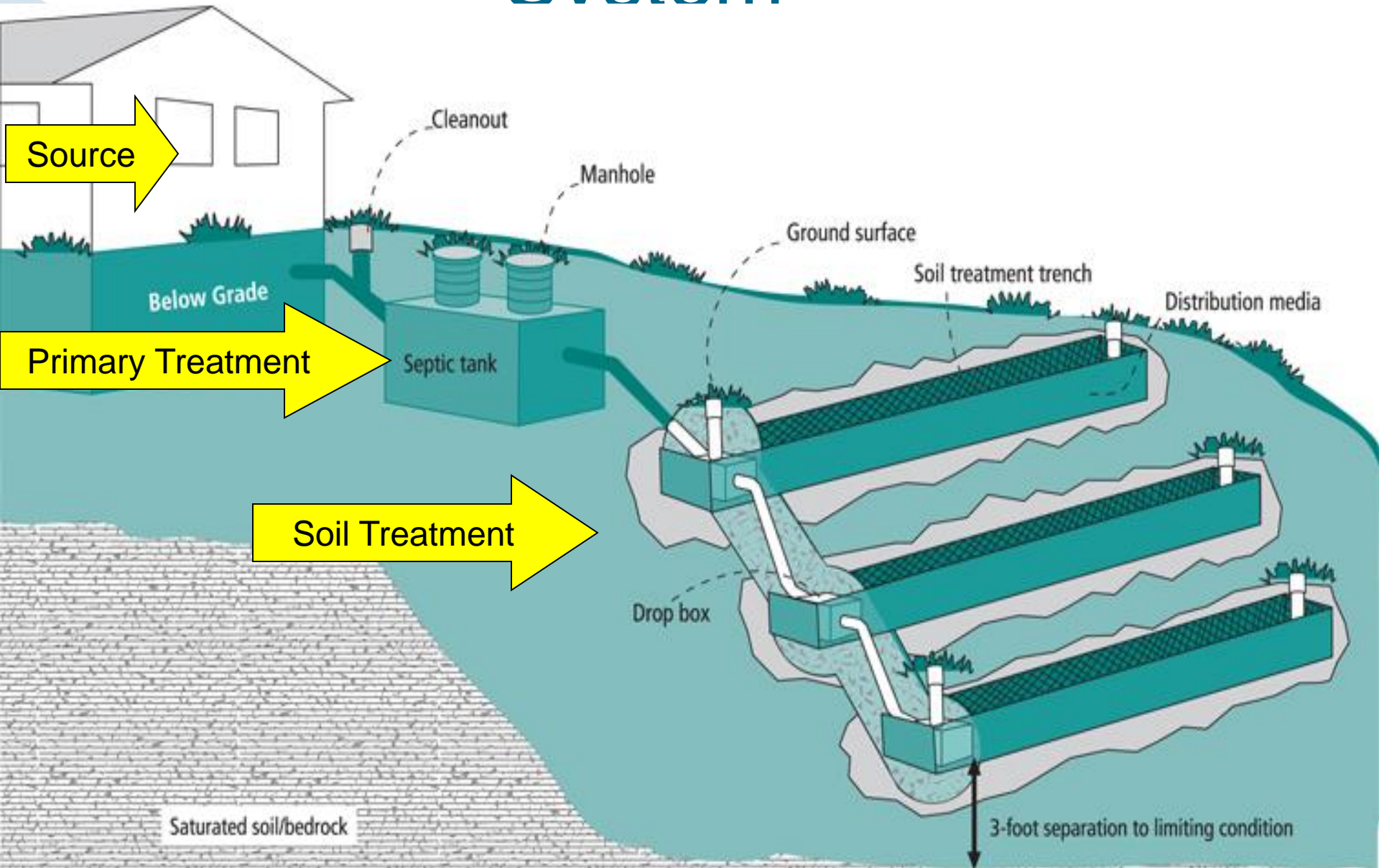
Septic System Incorporating Pretreatment



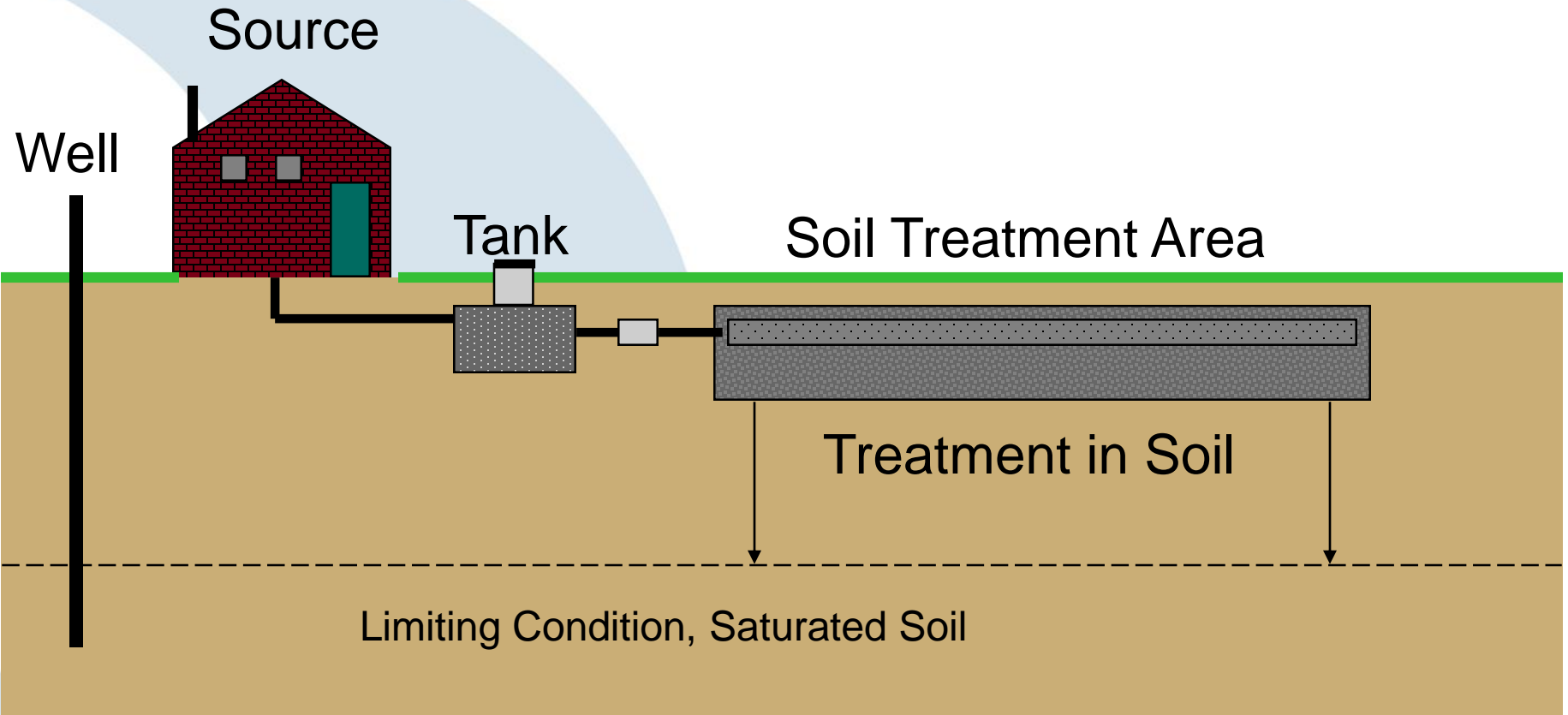
What is a Soil Treatment Area?

- A soil treatment system:
 - Safely treats and disperses and recycles wastewater
 - All the treatment and dispersal takes place on site or close by
 - Natural physical, chemical, and biological processes occur primarily in the soil

Components of a Septic System



Septic System Components

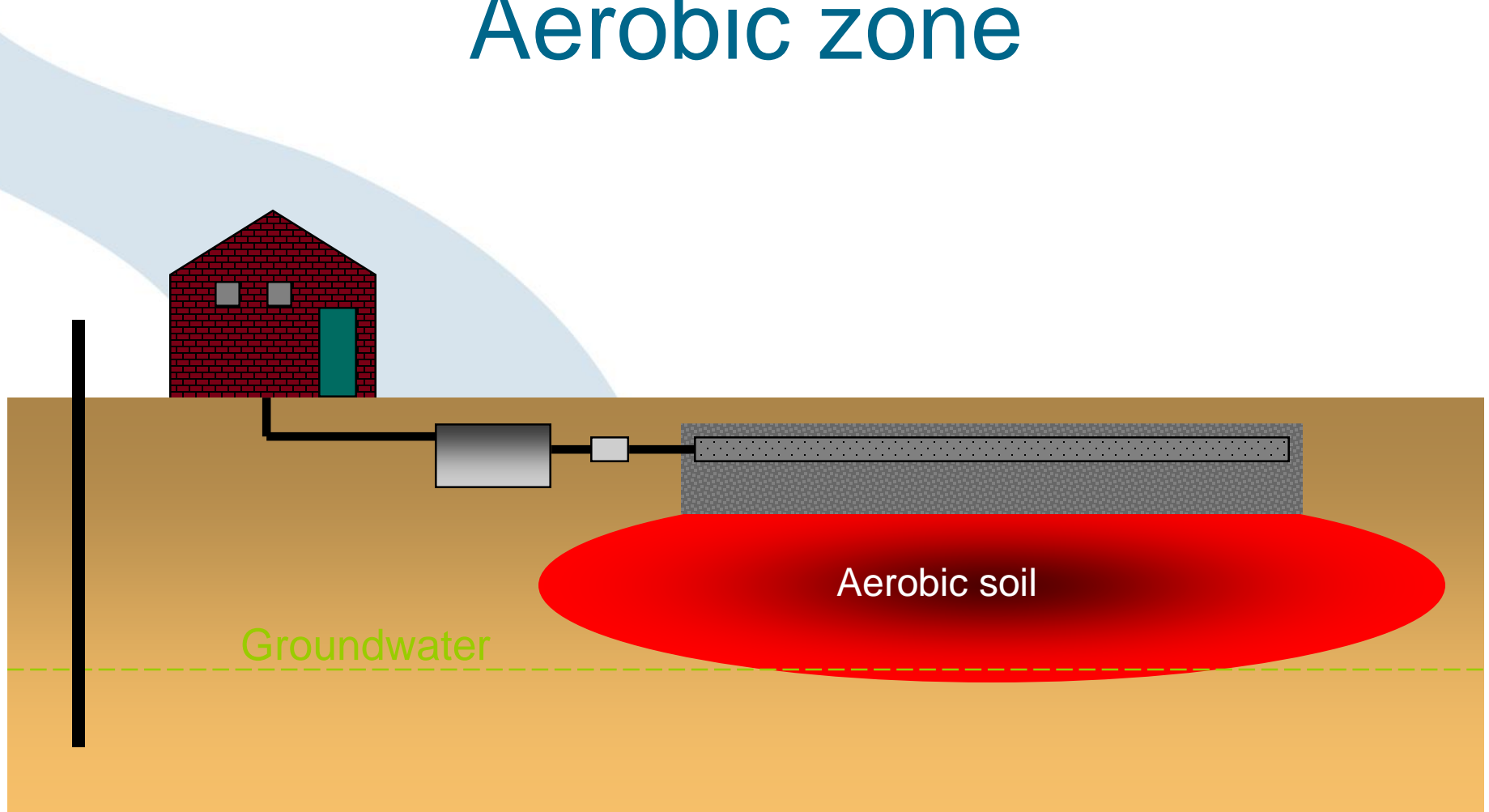


Process When Wastewater Enters Soil

- Biomat forms
- Results in unsaturated conditions
- Aerobic organisms treat the wastewater



Aerobic zone

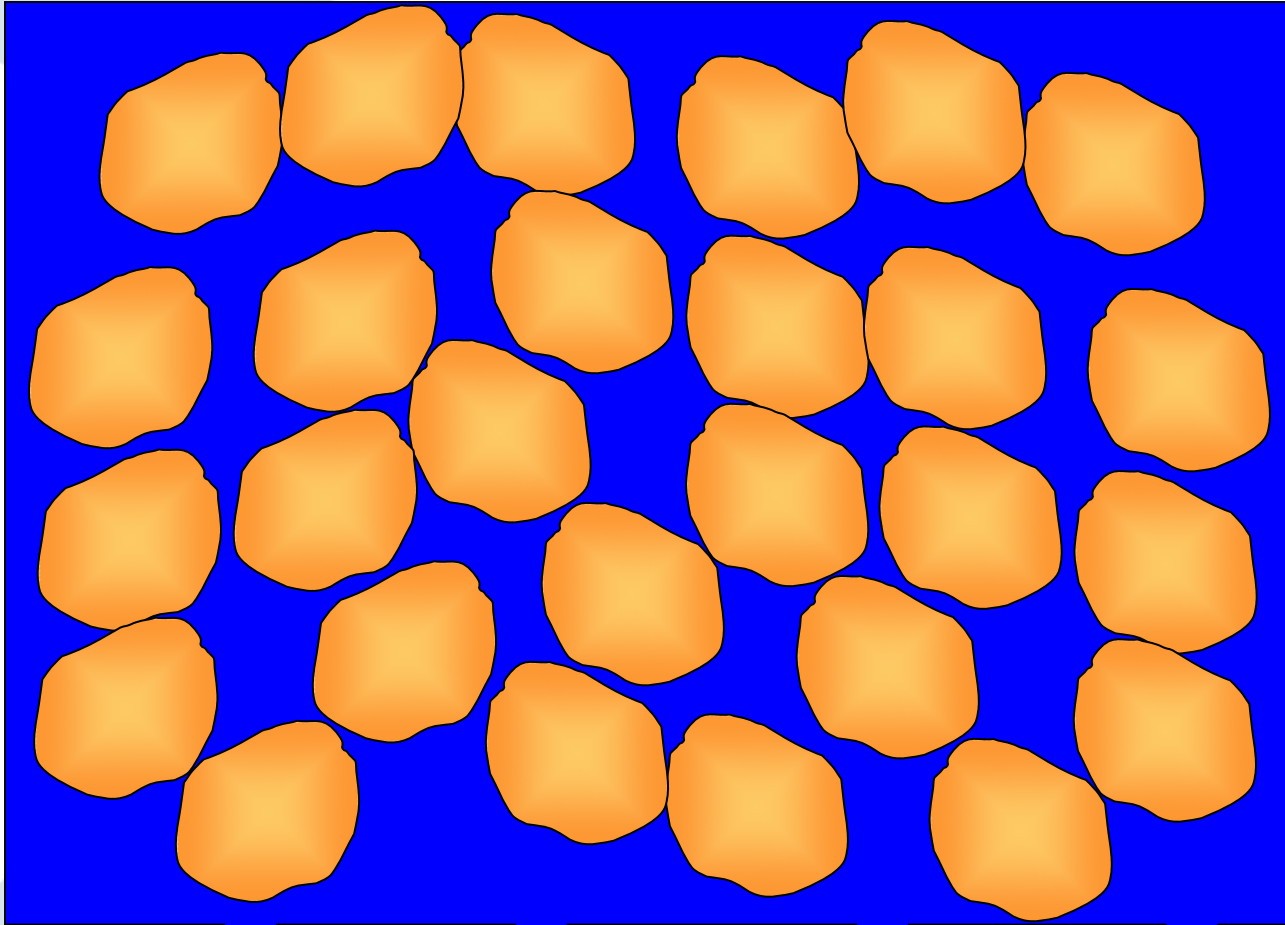


Unsaturated Soils

Unsaturated = Oxygen

Pores are filled with Air & water along the soil particles

Saturated Soils



***Pores are
filled with
water***

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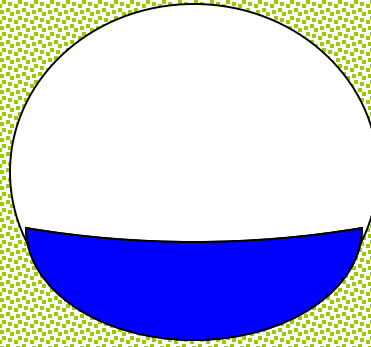
BIOMAT

Anaerobic ~ Building

Aerobic ~ Digesting



1. Effluent flows into pipe



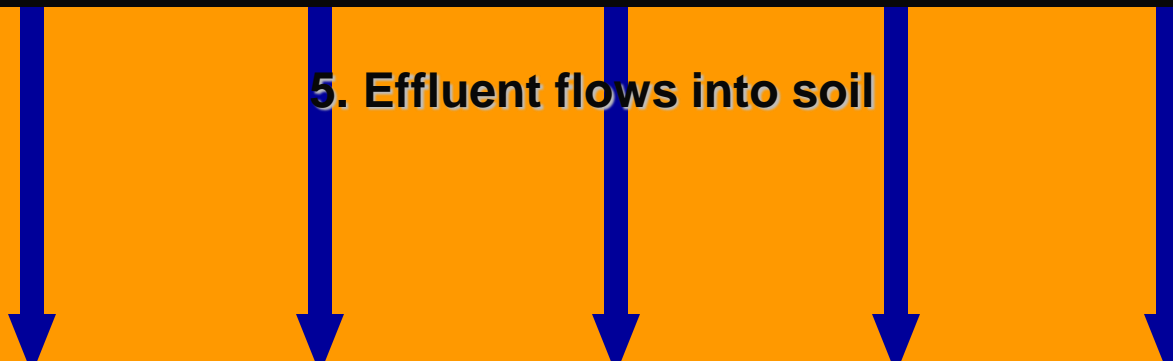
2. Effluent flows out of pipe and into gravel

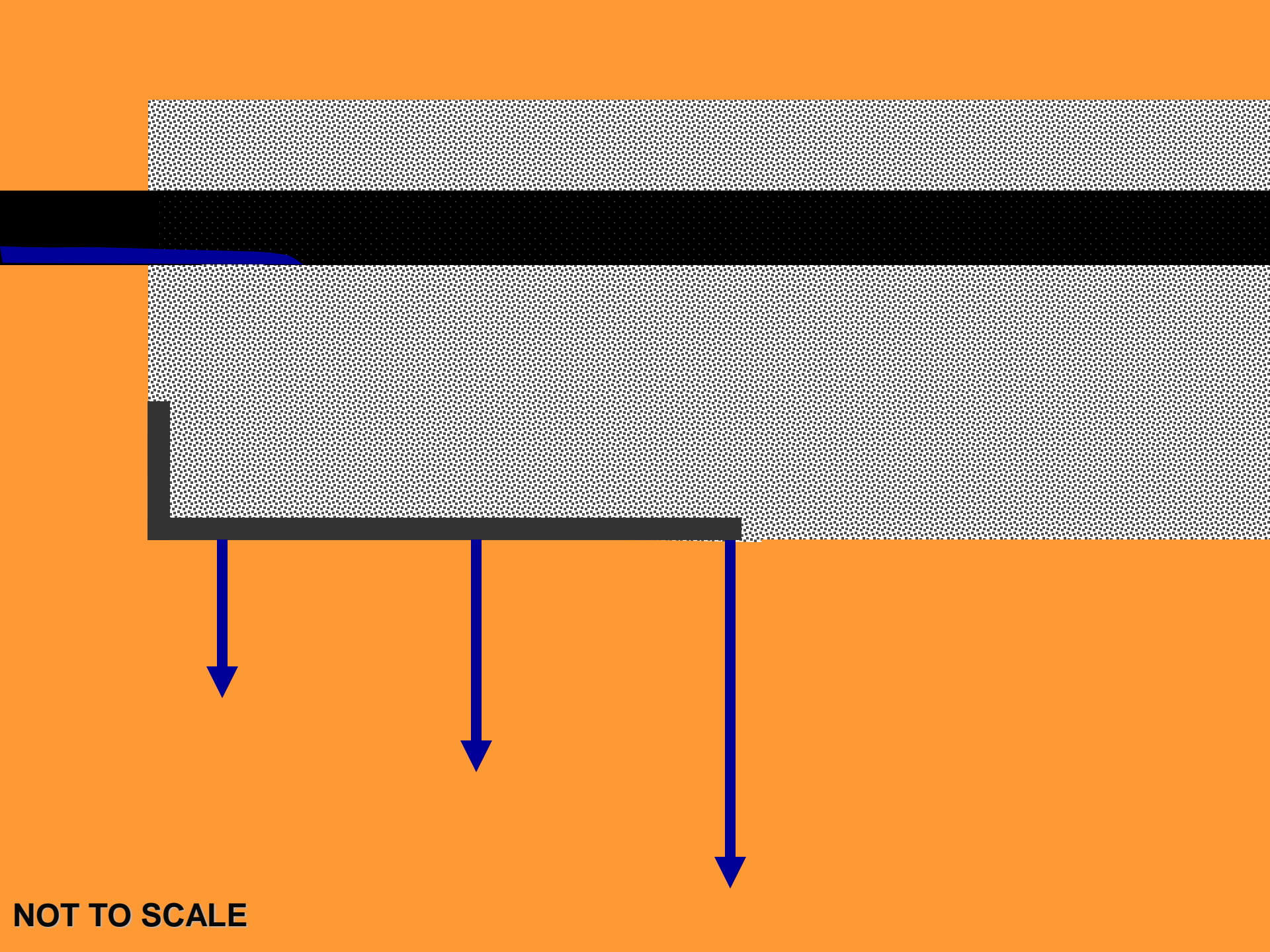
3. Effluent begins to pond and flows across soil interface.



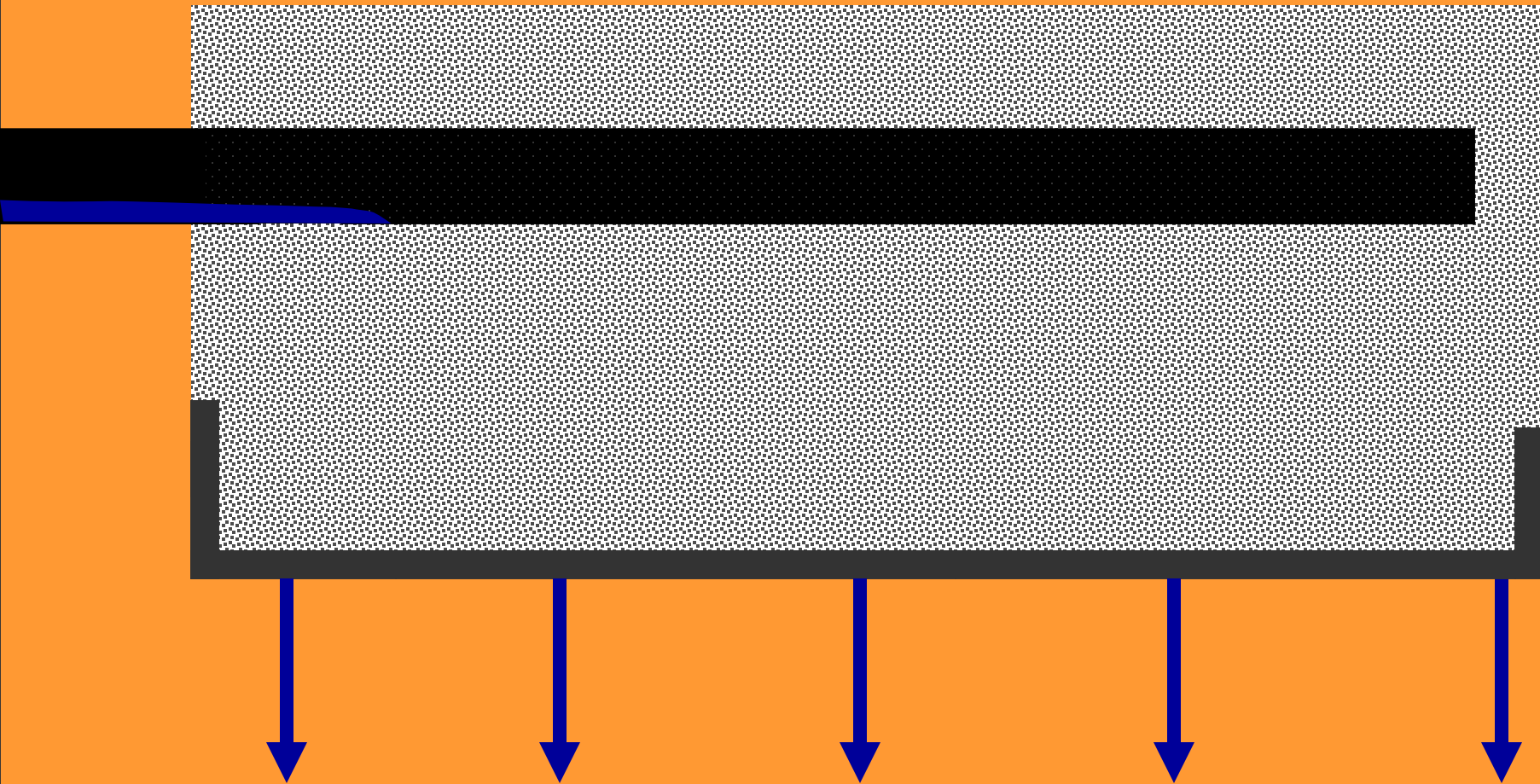
4. Biomat begins to form

5. Effluent flows into soil





NOT TO SCALE



NOT TO SCALE

System Type and Size

- System type based upon soils and site
 - Depth to limiting condition
 - Bedrock or saturated soils
 - Area available
- System size based upon:
 - Use
 - Number of bedrooms
 - Garbage disposal
 - Soils
 - Percolation test results,
 - Soil type (sand, loam, clay)



Color & Saturation



Well Drained



Moderately Well Drained



Poorly Drained

Management

- Out of site, out of mind doesn't work!
 - Regular inspection & maintenance can prevent system failure
 - Proper care & maintenance will prolong system life & save money
 - Selling is easier

QUESTIONS
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QUESTIONS?

