Best Practices for Wastewater Management in Community Developments

NOWRA 2026 – Westminster, CO (CPOW)





"The comments and opinions made in this presentation are those of the presenter and not of NOWRA or the Mega-Conference sponsors."

Welcome

Your presenter today is

Alex Sundberg

- 15 years industry experience
  - Installer
  - Designer
  - Inspector
  - Service provider



Overview

- *How Wastewater Affects Project Feasibility*
- *What Questions to Address Early on*
- *How Site Conditions Influence System Selection*
- *Treatment Technology Comparison*
- *Planning for Future Growth*

Why Plan for your Wastewater first?

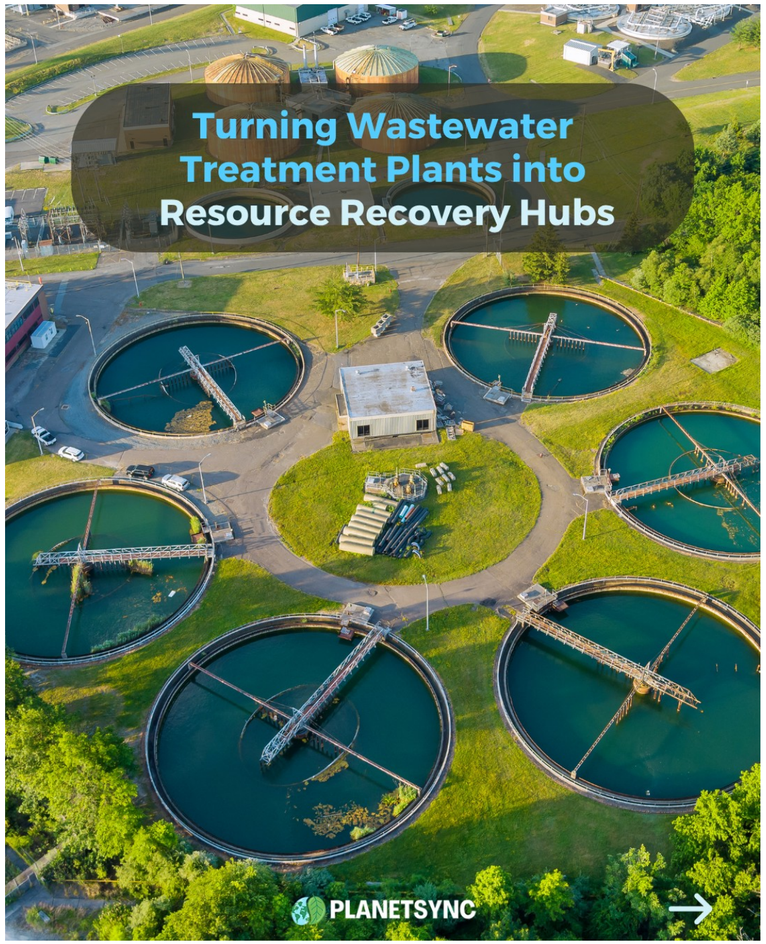
- *Wastewater permitting often dictates project timelines*
- *Site constraints / setbacks can affect lot density*
- *Regulatory compliance impacts project feasibility*
- *Treatment choice impacts ROI*





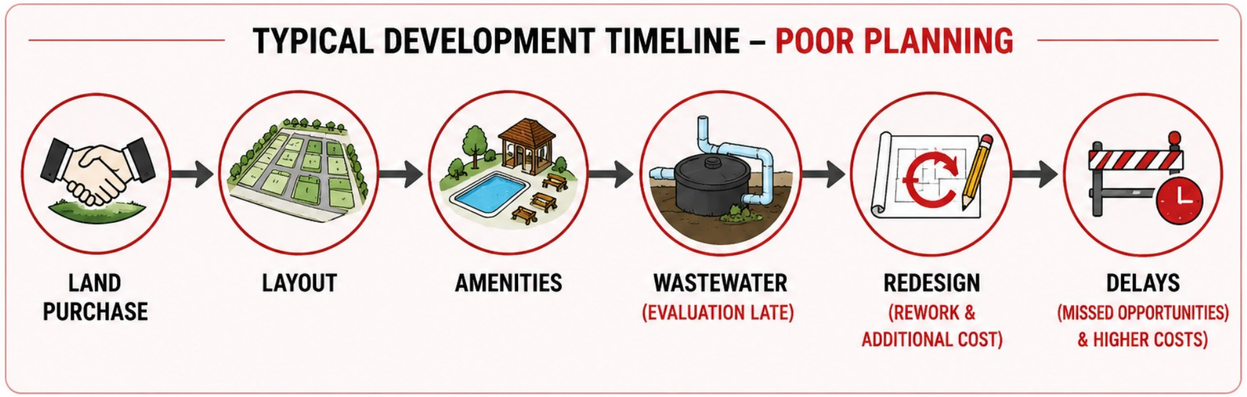
Why Wastewater Drives Development?

- *Density*
- *Lot Counts*
- *Cost*
- *Permitting*
- *Schedule*
- *Future Expansion*

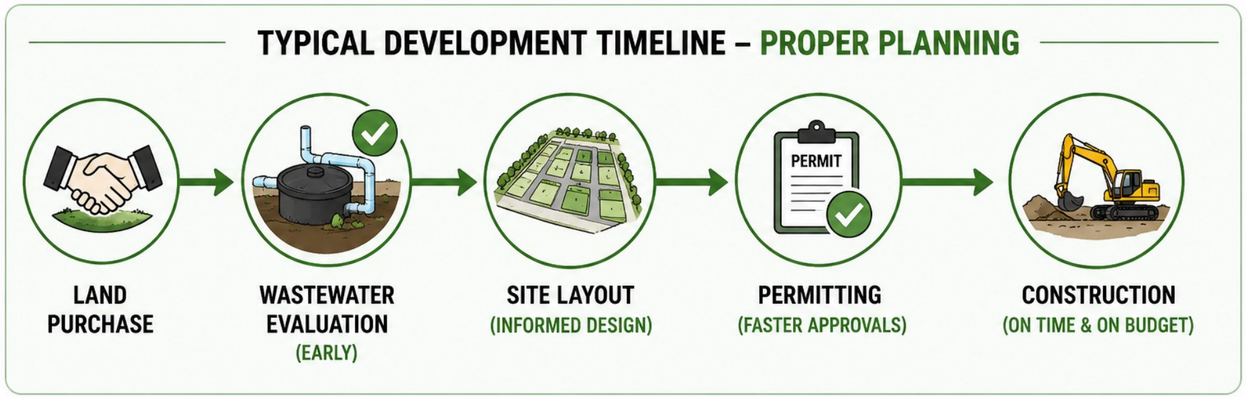


Typical Development Timeline

- *Engineering your own Downfall*



- *Planning for Success*



Project Development Road Map

- *Simple & Easy, 5 Step Framework*

Working with:

- *Developers*
- *Engineers*
- *Property owners, city planners*
- *State or county regulators*
- *Installers*
- *Service providers*

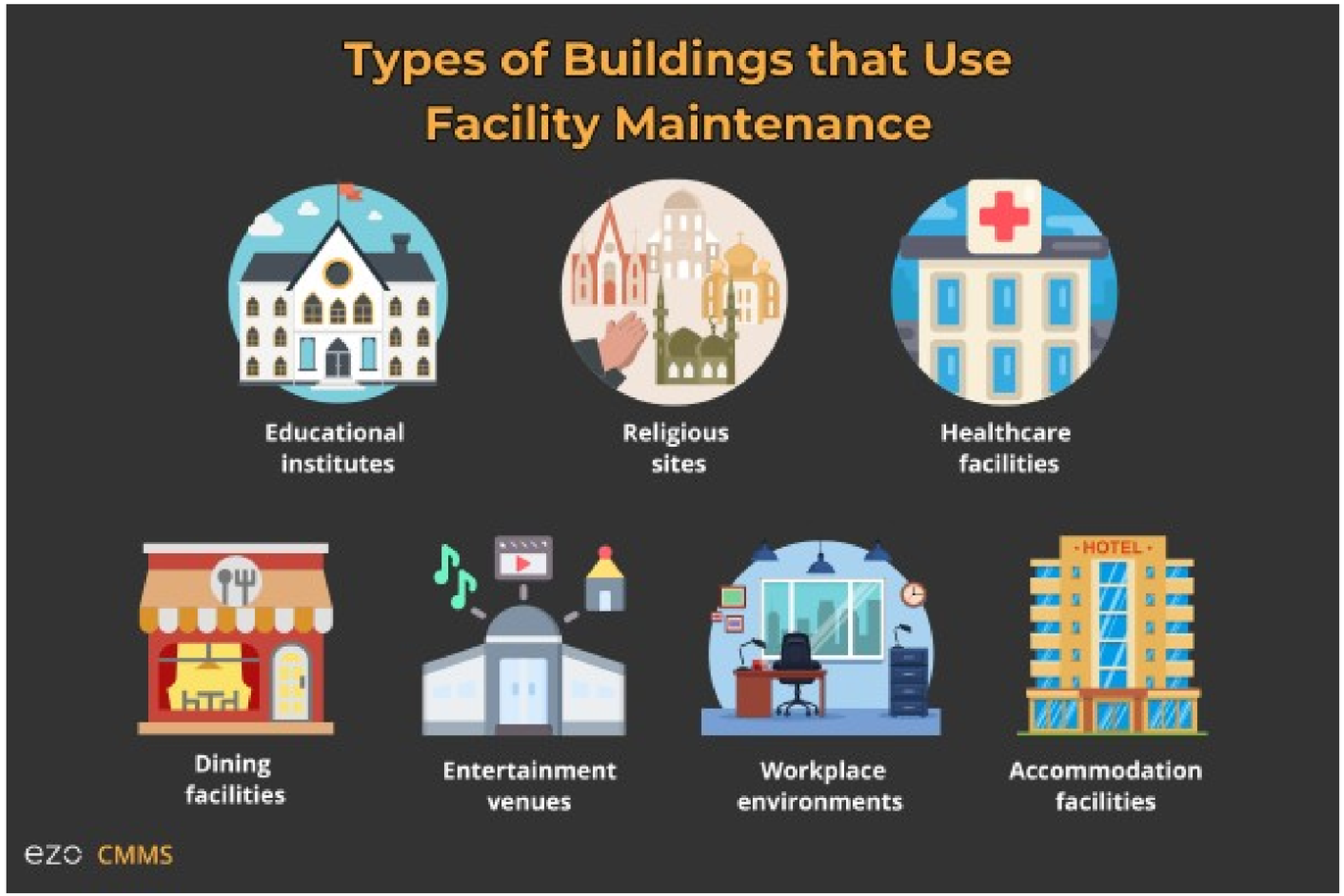


Step 1: Understanding the Project

- *Type of Facility (RV Park, Campground, Restaurant, etc.)*

- *Permanent Residents? Weekend or Seasonal?*

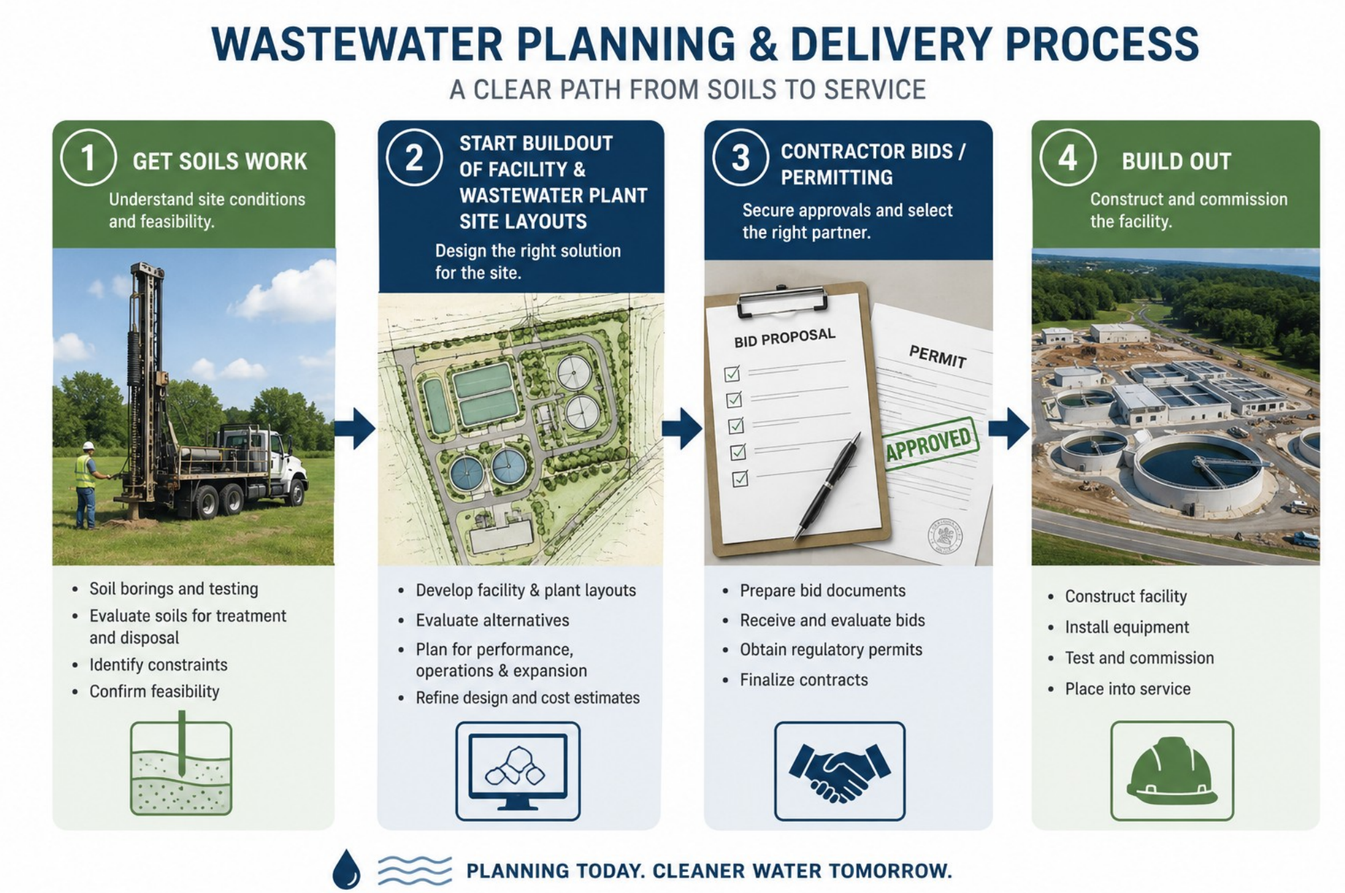
- *Mixed-Used Facility?*
- *Truck Stop?*
- *Coffee Shop?*



Step 1: Understanding the Project

Define the Vision & Capacity

- *Identify Project Scope and Key Partners*
- *Civil engineer, Soils / Geotech Engineer, Permitting Authority, Contractor, etc.*
- *Full build out or phases?*
- *Seasonal? Facility types? Clients?*



WASTEWATER PLANNING & DELIVERY PROCESS

A CLEAR PATH FROM SOILS TO SERVICE

1 GET SOILS WORK

Understand site conditions and feasibility.



- Soil borings and testing
- Evaluate soils for treatment and disposal
- Identify constraints
- Confirm feasibility



2 START BUILDOUT OF FACILITY & WASTEWATER PLANT SITE LAYOUTS

Design the right solution for the site.



- Develop facility & plant layouts
- Evaluate alternatives
- Plan for performance, operations & expansion
- Refine design and cost estimates



3 CONTRACTOR BIDS / PERMITTING

Secure approvals and select the right partner.



- Prepare bid documents
- Receive and evaluate bids
- Obtain regulatory permits
- Finalize contracts



4 BUILD OUT

Construct and commission the facility.



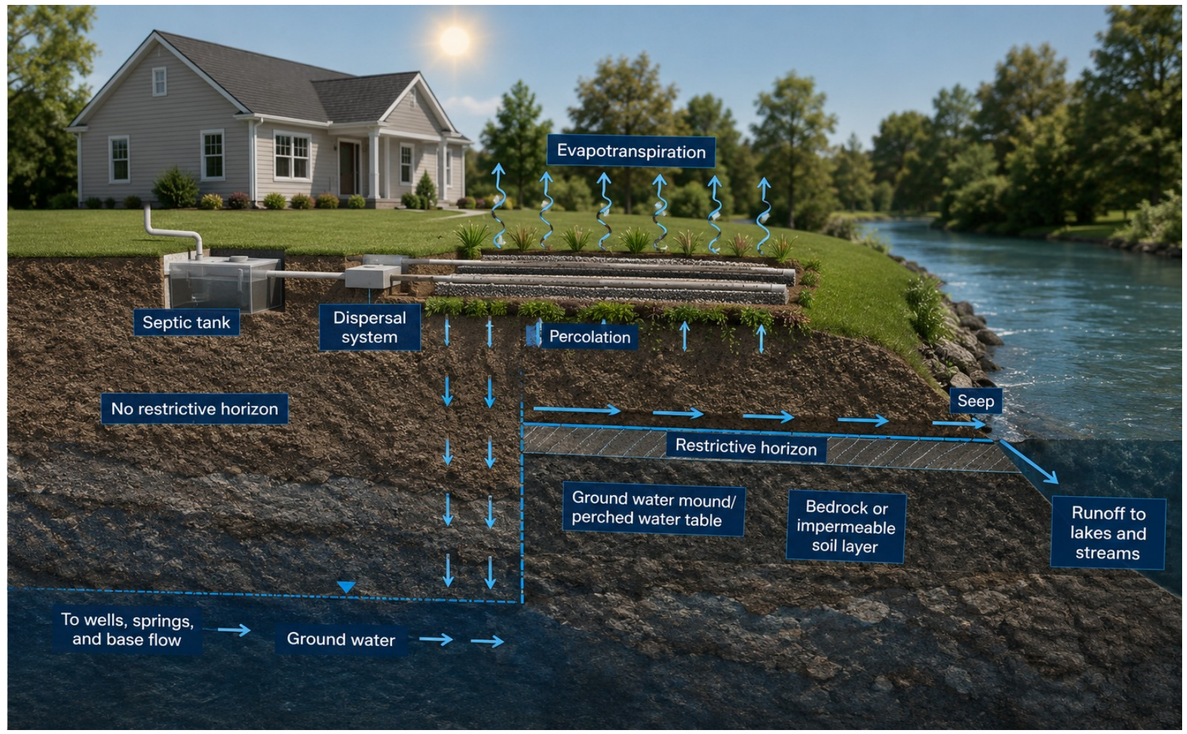
- Construct facility
- Install equipment
- Test and commission
- Place into service

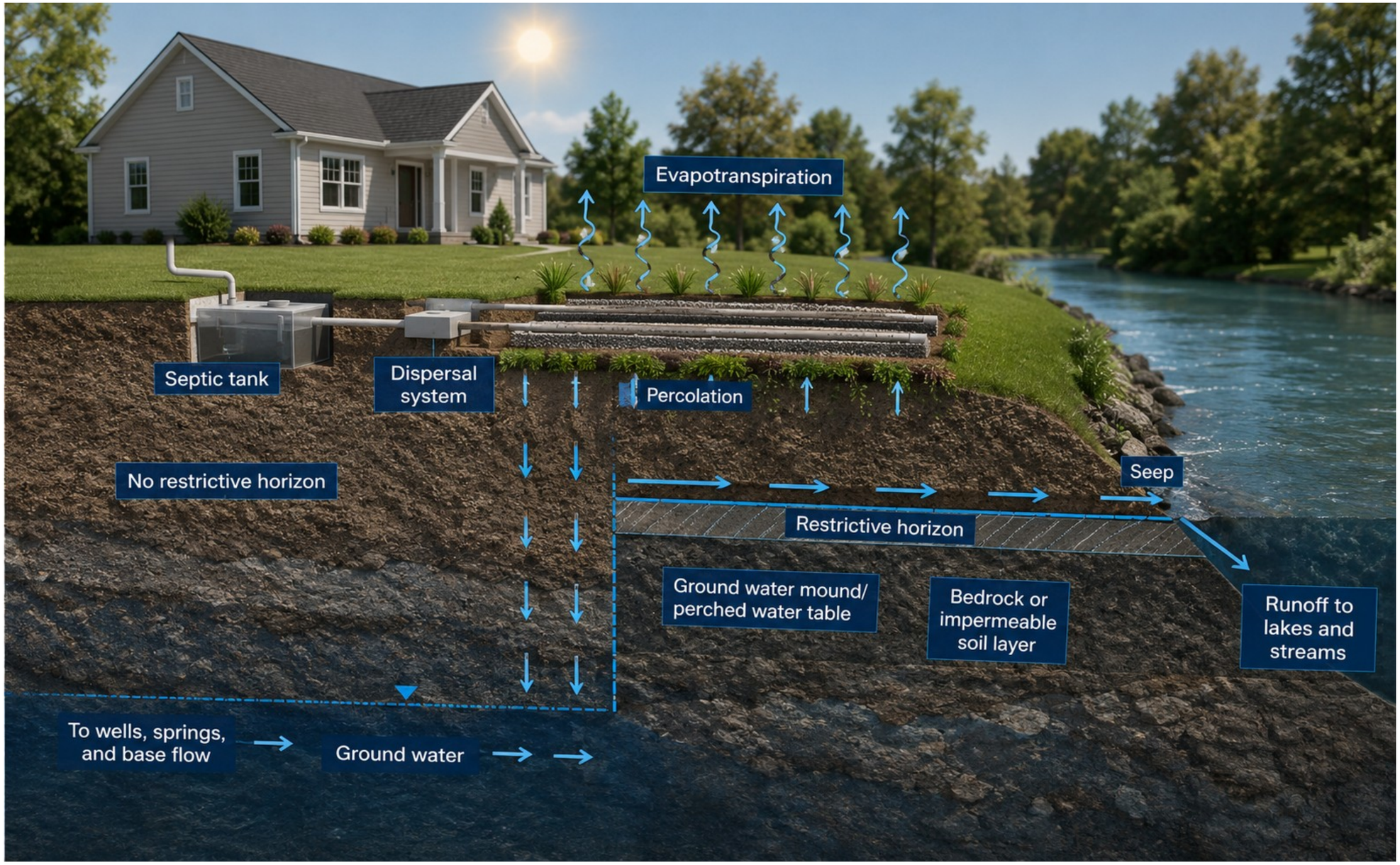


PLANNING TODAY. CLEANER WATER TOMORROW.

Step 1: Understanding the Project

- *Understanding the Topography of the Site*
- *Soil Composition*
- *Space Available?*
  Space Needed for Dispersal !



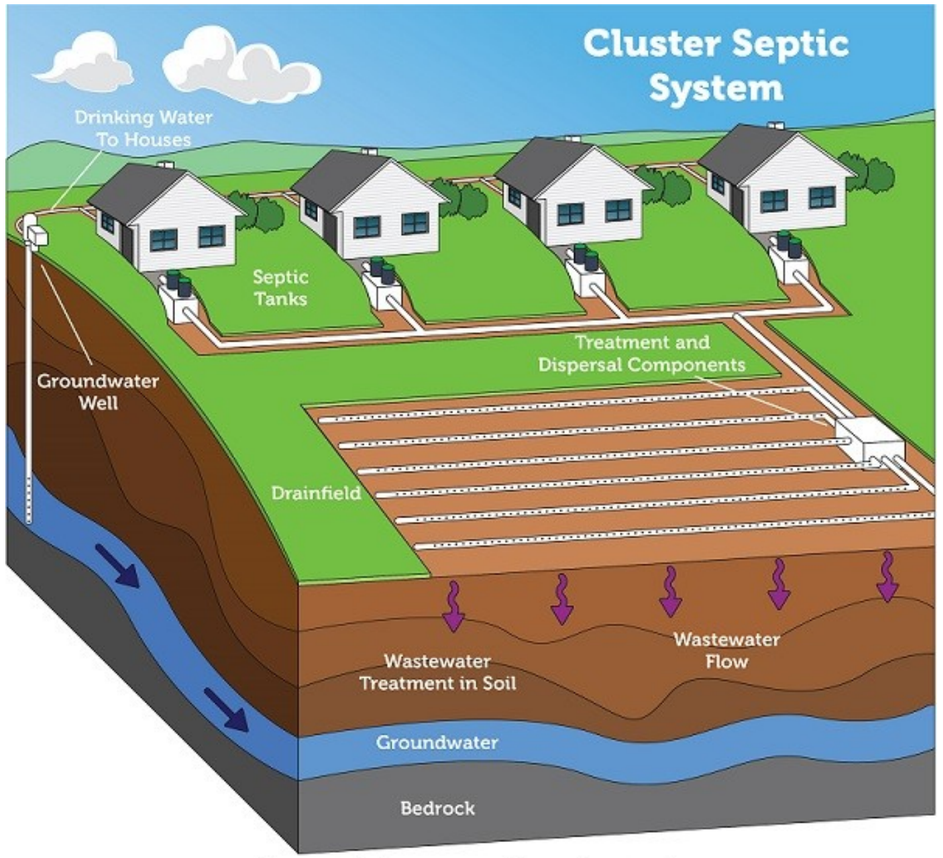

Evapotranspiration
Septic tank
Dispersal system
Percolation
No restrictive horizon
Seep
Restrictive horizon
Ground water mound/ perched water table
Bedrock or impermeable soil layer
Runoff to lakes and streams
To wells, springs, and base flow
Ground water

Step 1: Understanding the Project

Estimating Flow

Discuss with Civil, Wastewater, and Property Ownership:

- *Design Flow (per Building?)*
- *Peak Flow*
- *Seasonal Occupancy*
- *Future Developments*



Please note: Septic systems vary. Diagram is not to scale.

Step 1: Understanding the Project

Amenities Matter

- *Clubhouses*
- *Restaurant (Type of Food)*
- *Pool / Laundry / Dog Park*
- *Dump Stations*
- *House Bedroom Count*
- *# of Guests Expected*
- *Truck Stop Vehicle Count*



Step 1: Understanding the Project

Planning for Expansion

- *Planning to Build / Develop the Property?*
- *Build and Sell?*

- *Discuss Modular Design*
- *Phase 1 = 100 Sites*
- *Phase 2 = 250 Sites*

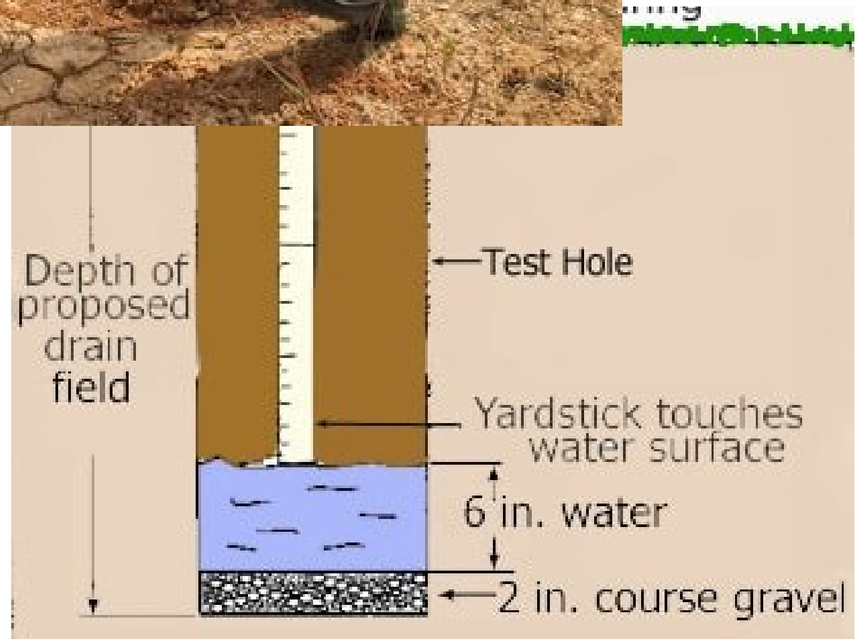




Site & Soil Evaluation

- *Site Feasibility / GeoTech Report*
- *Where Does the Water Go?*
- *Available Footprint and Dispersal Options*

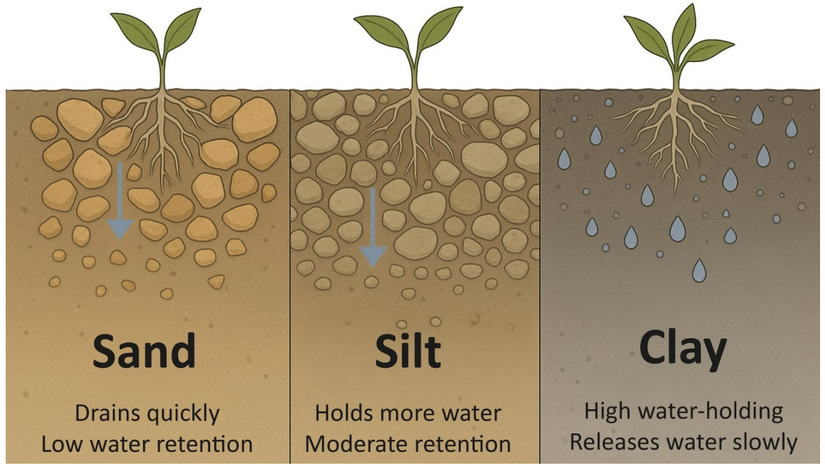


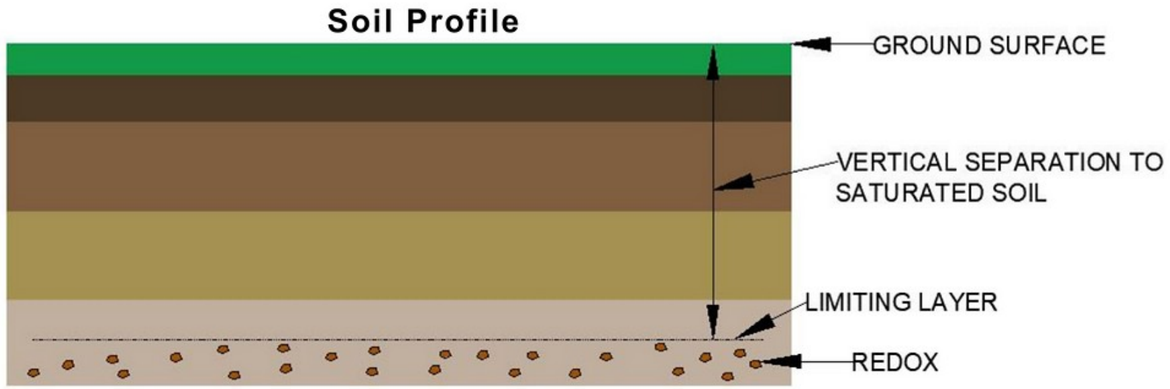


Step 2: Site Feasibility

Soils & Dispersal

- *Not all GeoTech Reports are the Same*
- *Soil Profile v. Perc Test*

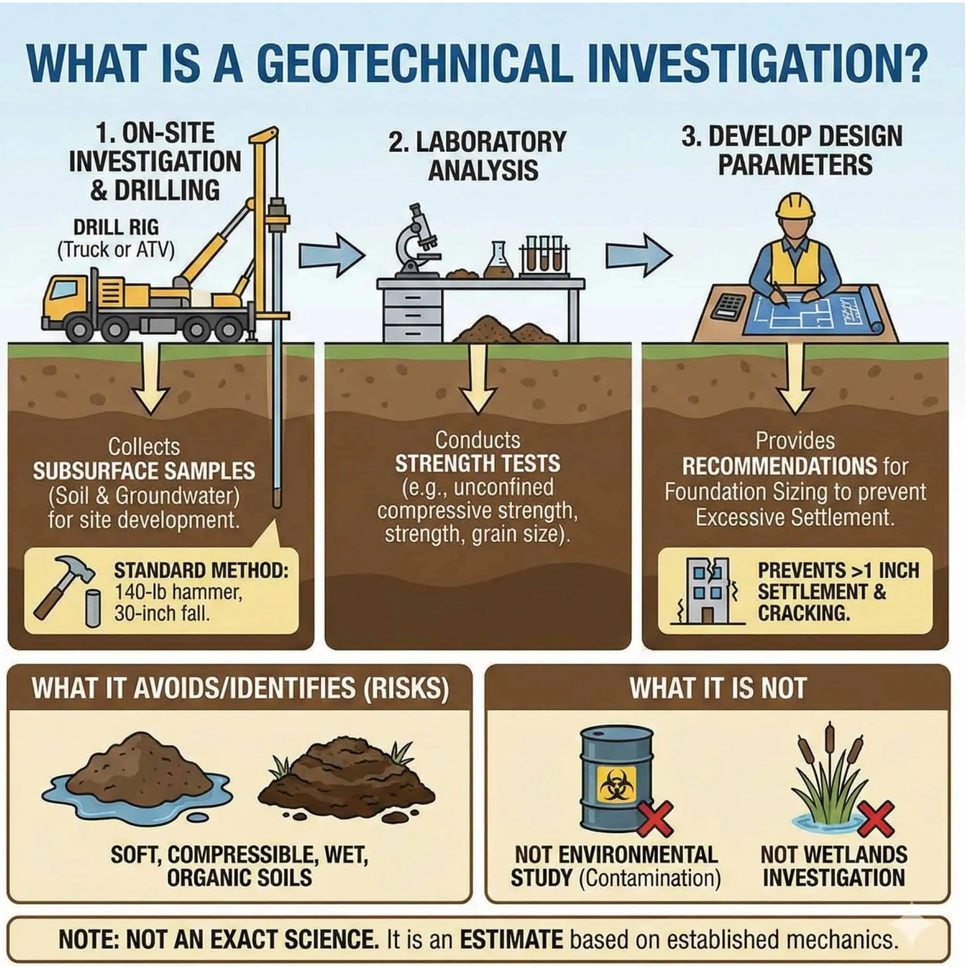




Step 2: Site Feasibility

Site Investigation Checklist

- *Soil*
- *Groundwater*
- *Slopes*
- *Floodplain*
- *Utilities (Power Required?)*
- *Existing Wells?*



Step 2: Site Feasibility

Constraints, Setbacks, & Considerations

- *Streams / Lakes*
- *Wetlands*
- *Setbacks*
- *Vertical Separation*
- *Water Runoff*

Table A-1 Minimum Horizontal Distances in Feet between Components of an OWTS and Water, Physical and Health Impact Features

	Spring, Well[1], Suction Line, Potable Water Supply Cistern[4]	Potable Water Supply Line[2]	Structure w/basement, crawl space or footing drains	Structure without basement, crawl space or footing drains	Property Lines, Piped or Lined Irrigation Ditch,	Subsurface Drain, Intermittent Irrigation Lateral, Drywell, Stormwater Structure	Surface Water (Lake, Water Course, Irrigation Ditch, Stream, Wetland)	Dry Gulch, Cut Bank, Fill Area (from Crest)	Septic Tank, Higher Level Treatment Unit,Dosing Tank, Vault or Privy
Septic Tank, Higher Level Treatment Unit, Dosing Tank, Vault or vault privy	50[2]	10[2]	5	5	10	10	50	10	--
Building Sewer or Effluent Lines	50[2]	5[2,6]	0	0	10[2]	10[2]	50[2]	10[2]	--
STA Trench, STA Bed, Unlined Sand Filter, Sub-surface Dispersal System, Seepage Pit	100[3,7]	25[2]	20	10	10	25	50[3]	25	5
Lined Sand Filter	60	10[2]	15	10	10	10	25	10	5
Outside of Berm of Lined Wastewater Pond	60	10[2]	15	15	10	10	25	10	5
Unlined Sand Filter in Soil With a Percolation Rate Slower than 60 MPI or System Not Relying on STA for Treatment (other than aerosol)	100	25[2]	15	15	10	25	25	15	10
Existing Pit Privy	100	50[2]	25	25	25	25	100	25	N/A
System Not Relying on STA for Dispersal	100[3,2]	10[2]	125	125[5]	10	0	25[3]	10	10

Table A-1 Minimum Horizontal Distances in Feet between Components of an OWTS and Water, Physical and Health Impact Features

	Spring, Well[1], Suction Line, Potable Water Supply Cistern[4]	Potable Water Supply Line[2]	Structure w/basement, crawl space or footing drains	Structure without basement, crawl space or footing drains	Property Lines, Piped or Lined Irrigation Ditch,	Subsurface Drain, Intermittent Irrigation Lateral, Drywell, Stormwater Structure	Surface Water (Lake, Water Course, Irrigation Ditch, Stream, Wetland)	Dry Gulch, Cut Bank, Fill Area (from Crest)	Septic Tank, Higher Level Treatment Unit,Dosing Tank, Vault or Privy
Septic Tank, Higher Level Treatment Unit, Dosing Tank, Vault or vault privy	50[2]	10[2]	5	5	10	10	50	10	--
Building Sewer or Effluent Lines	50[2]	5[2,6]	0	0	10[2]	10[2]	50[2]	10[2]	--
STA Trench, STA Bed, Unlined Sand Filter, Sub-surface Dispersal System, Seepage Pit	100[3,7]	25[2]	20	10	10	25	50[3]	25	5
Lined Sand Filter	60	10[2]	15	10	10	10	25	10	5
Outside of Berm of Lined Wastewater Pond	60	10[2]	15	15	10	10	25	10	5
Unlined Sand Filter in Soil With a Percolation Rate Slower than 60 MPI or System Not Relying on STA for Treatment (other than aerosol)	100	25[2]	15	15	10	25	25	15	10
Existing Pit Privy	100	50[2]	25	25	25	25	100	25	N/A
System Not Relying on STA for Dispersal	100[3,2]	10[2]	125	125[5]	10	0	25[3]	10	10

Step 2: Site Feasibility

Dispersal Options



Gravity Gravel Pipe Dispersal (Mounded Pad)



Low Pressure Gravel Pipe

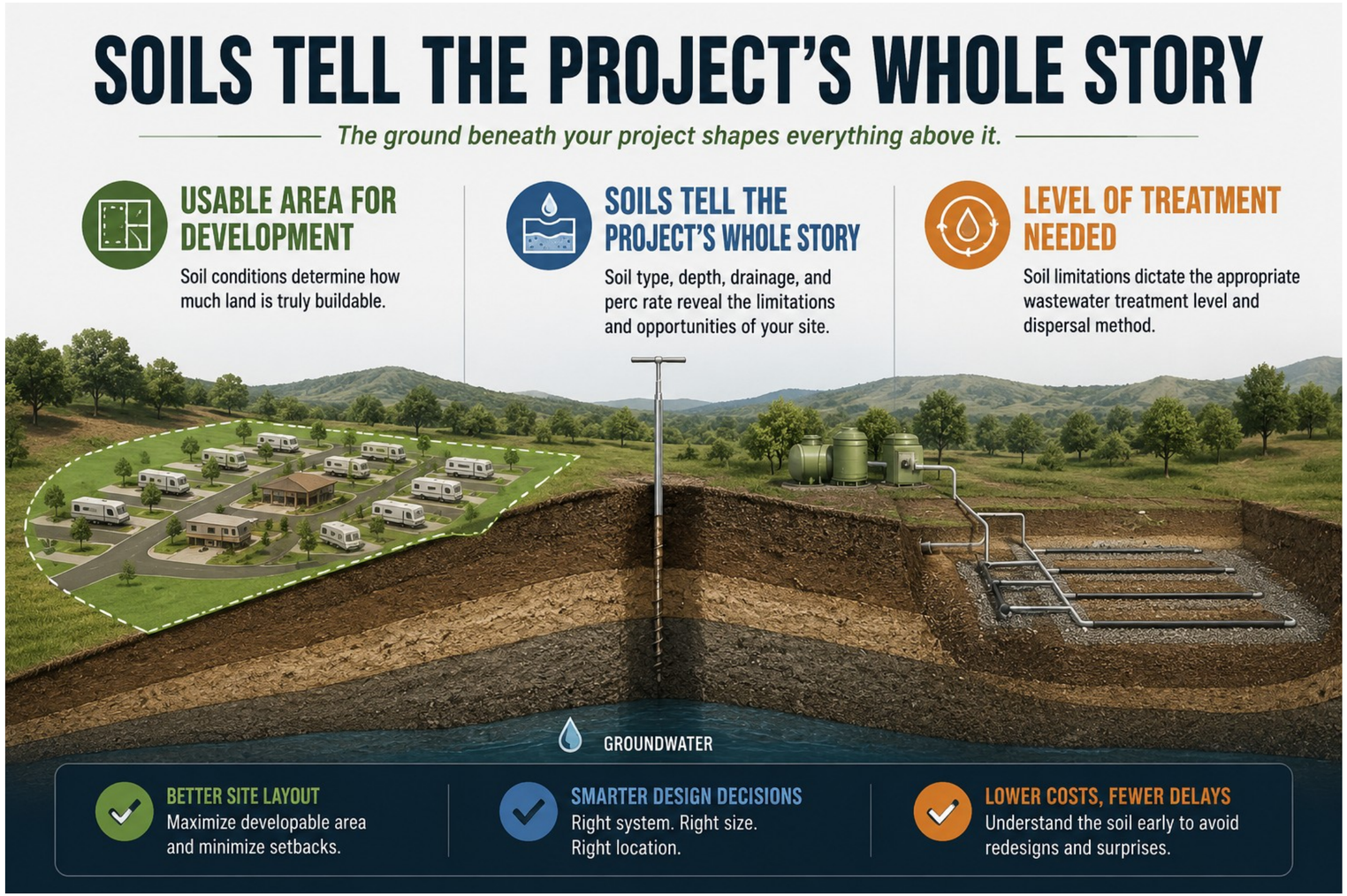


Drip Distribution



Combined Treatment /

Step 2: Site Feasibility



Step 3: Permitting & Regulatory

Who Regulates Onsite Systems?

- *County?*
- *State?*





Step 3: Permitting & Regulatory

Questions Regulators Ask

- *Flow*
- *Effluent Quality*
- *Nitrogen*
- *Groundwater*
- *Operation & Maintenance Plan?*

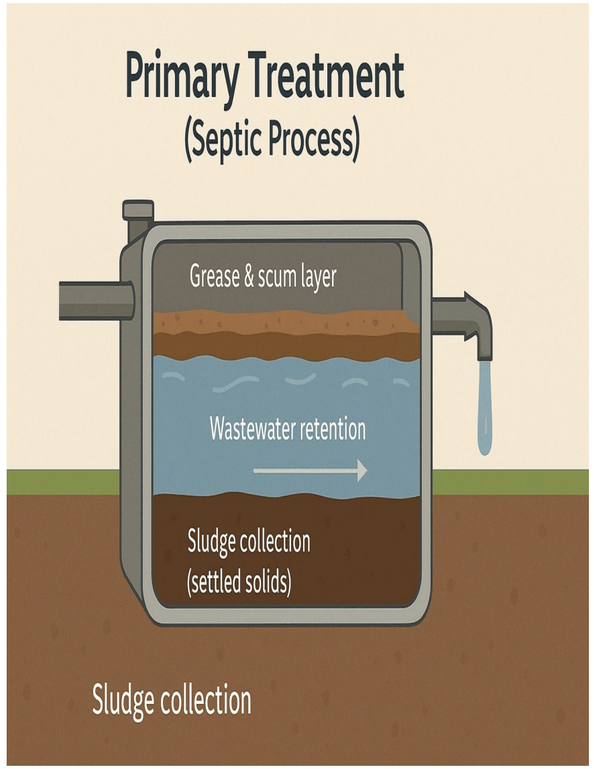
More Education, Verification, & Documentation of System Placement and Installation.





Step 3: Permitting & Regulatory

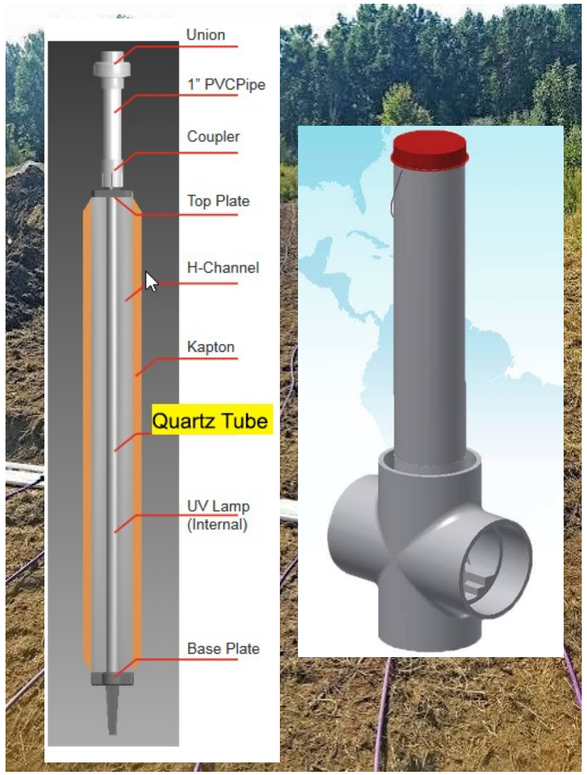
Treatment Levels



Primary Treatment



Secondary Treatment



Tertiary Treatment



Water Reuse

Step 3: Permitting & Regulatory

Common Permit Drivers

- *Nitrogen*
- *BOD / TSS*
- *Pathogens*

- *Installation Process*
- *Tank Water Tightness Test?*
- *Leak Tests?*
- *Squirt Tests?*





Step 3: Permitting & Regulatory

Tips & Tricks

- *Start the Conversation Early*
- *Explain the Site Layout / Business Model for the Development*
- *Ask About Their Permit Process / What They Would be Looking for.*

Step 4: Treatment Technology Selection

What System is Right for This Type of Development?

- *Flow Rate*
- *Site Constraints*
- *Cost*
- *Operations & Maintenance Costs*
- *Future Expansion*



- AeroCell (RMF)
- 200 homes
- ~80,000 GPD
- Camden Point, MO

Community



Select Treatment Strategy

- *Sewer Connection Available?*
- *Conventional Septic*
- *Advanced Treatment & Water Reuse*
- *Operations & Maintenance*
- *Sampling & Monitoring*





Step 4: Treatment Technology Selection

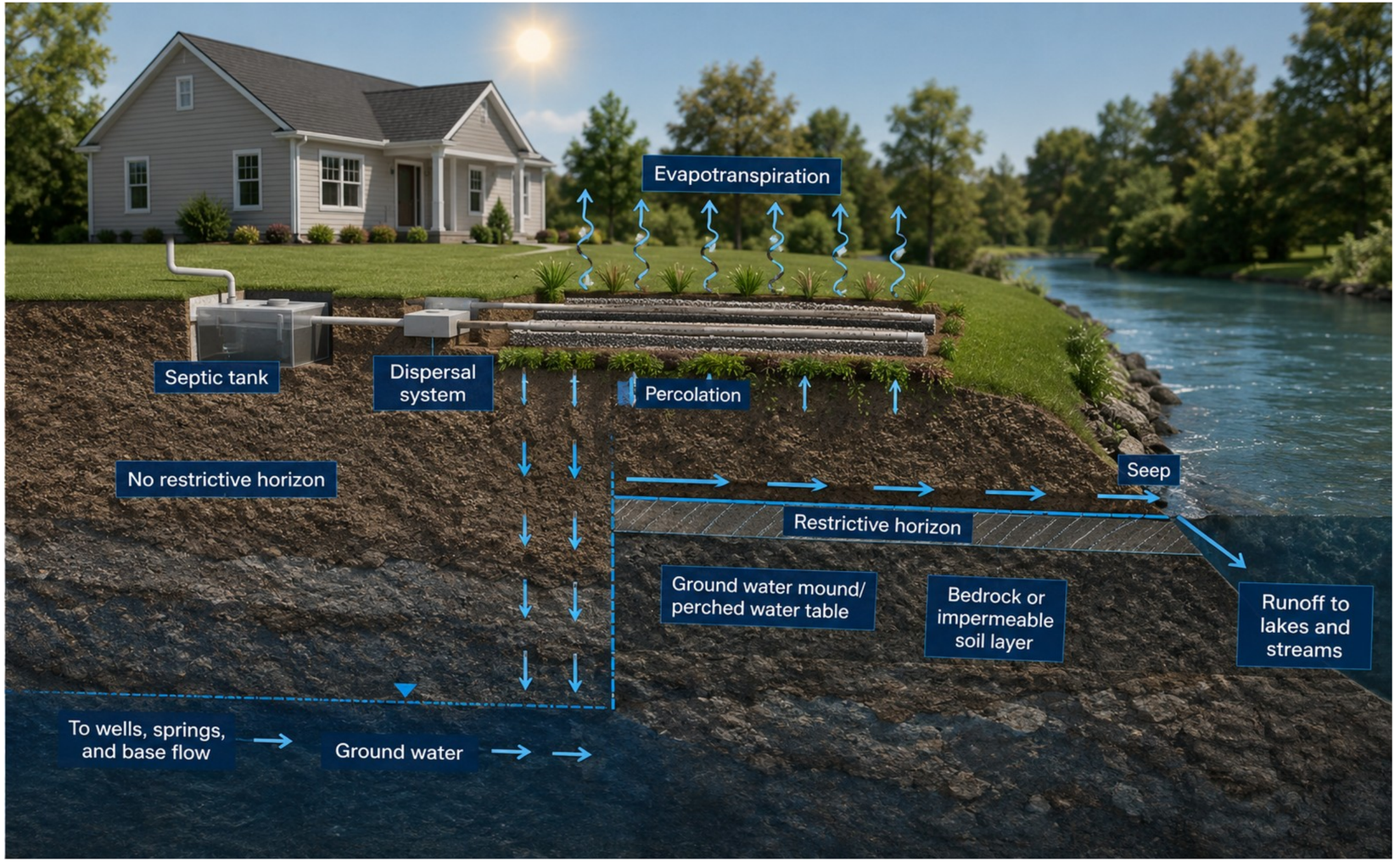
Conventional Septic

If soil and nutrient mass loading is allowable.

Septic Tank
Distribution Box
Leach Laterals / Seepage Pit



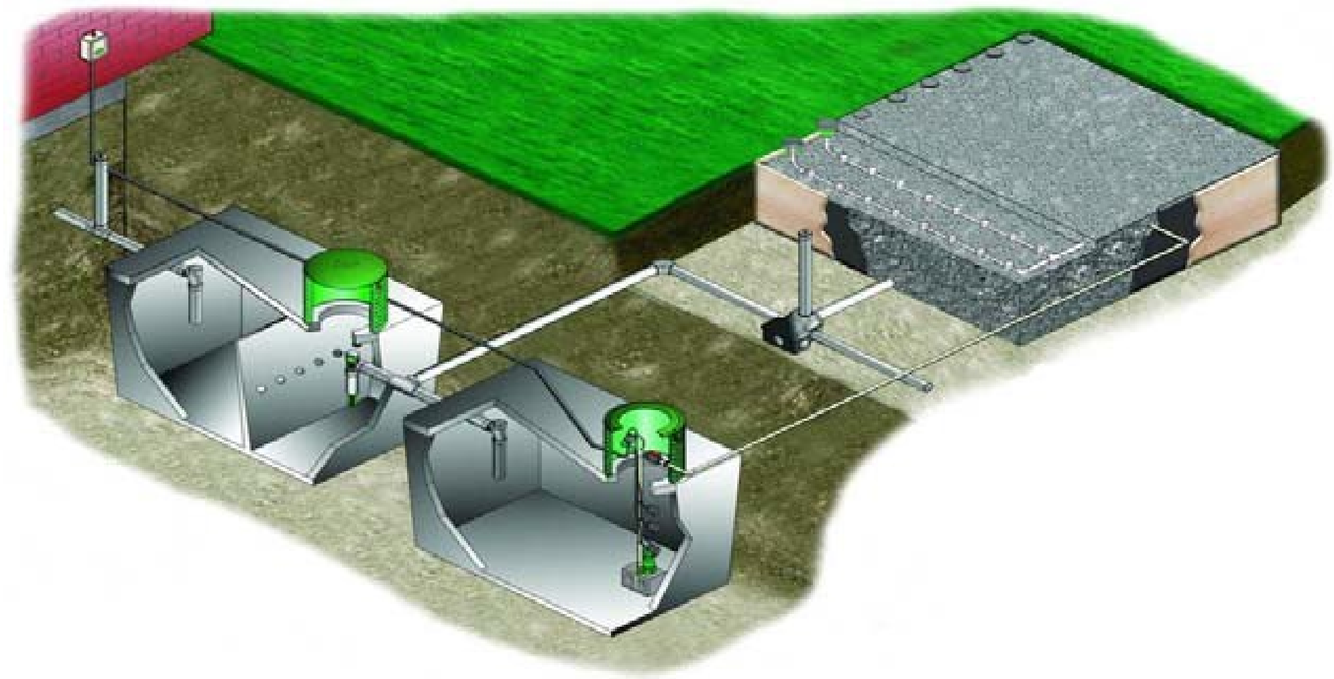
Conventional Septic



Step 4: Treatment Technology Selection

Recirculating Media Filters

- *Low Energy Usage*
- *Modular / Scalable*
- *More Upfront Capital Costs*
- *Simple to Maintain*



Septic Tank

Recirc / Dosing Tank

Recirculating Filter Media

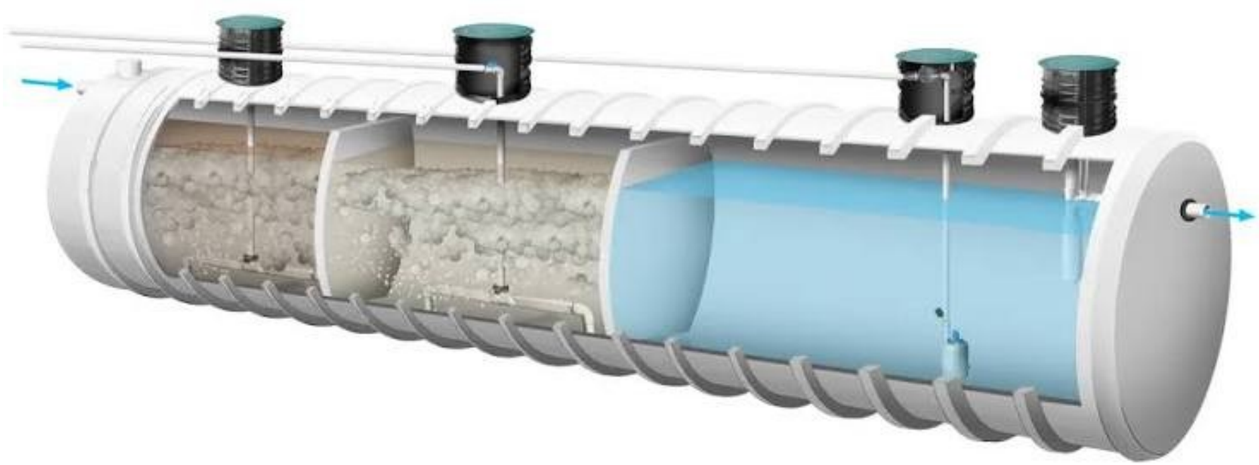
Dosing Pump

+ Leach Field Selection

Step 4: Treatment Technology Selection

MBBR (Moving Bed Biological Reactors)

- *High Energy Usage*
- *Lower Upfront Capital Costs*
- *Simple to Operate*
- *Replacement Parts Needed*



Septic Tank

Aeration & Clarifier Tank

Regenerative Blower & Controls

Moving Media Bed

+ Leach Field Selection

Step 4: Treatment Technology Selection

SBR (Sequencing Batch Reactors)

- *Mid-High Energy Usage*
- *Lower Upfront Capital Costs*
- *Automated Operations*
- *Maintenance is Key – Keeping Moving Parts Operational*

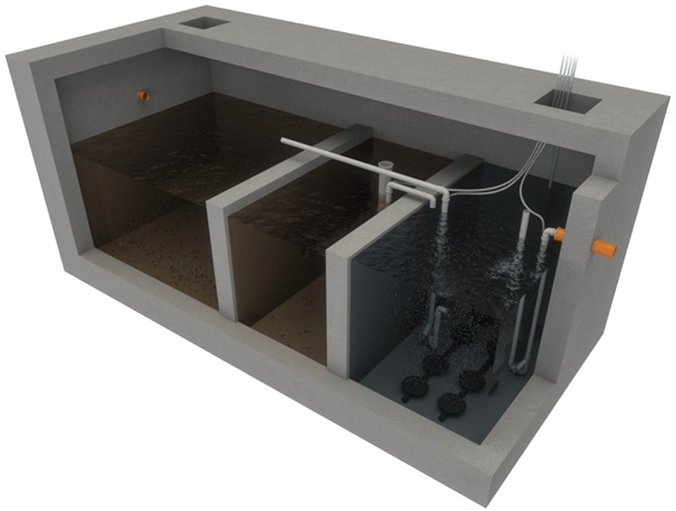
Septic Tank

Reactor Tank

SBR Pumps & Aerator

Control Panel

+ Leach Field Selection



Step 4: Treatment Technology Selection

MBR (Membrane Biological Reactors)

- *Mid-High Energy Usage*
- *High Quality Effluent*
- *Maintenance is Key – Fouling Membranes*

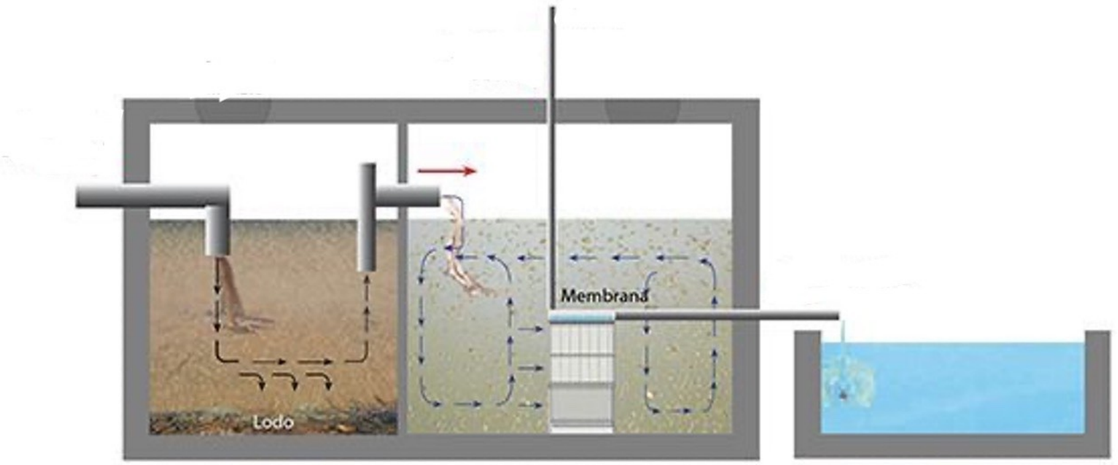
Septic Tank

Reactor / Membrane Tank

Regenerative Blower

Control Panel

+ Leach Field Selection



Step 4: Treatment Technology Selection

Water Reuse / Surface Discharge Systems

MBR (Membrane Biological Reactors)

- *Sampling & Monitoring Required*
- *High Quality Effluent – Non-Potable Reuse*
- *Operations & Maintenance PLAN is Key*

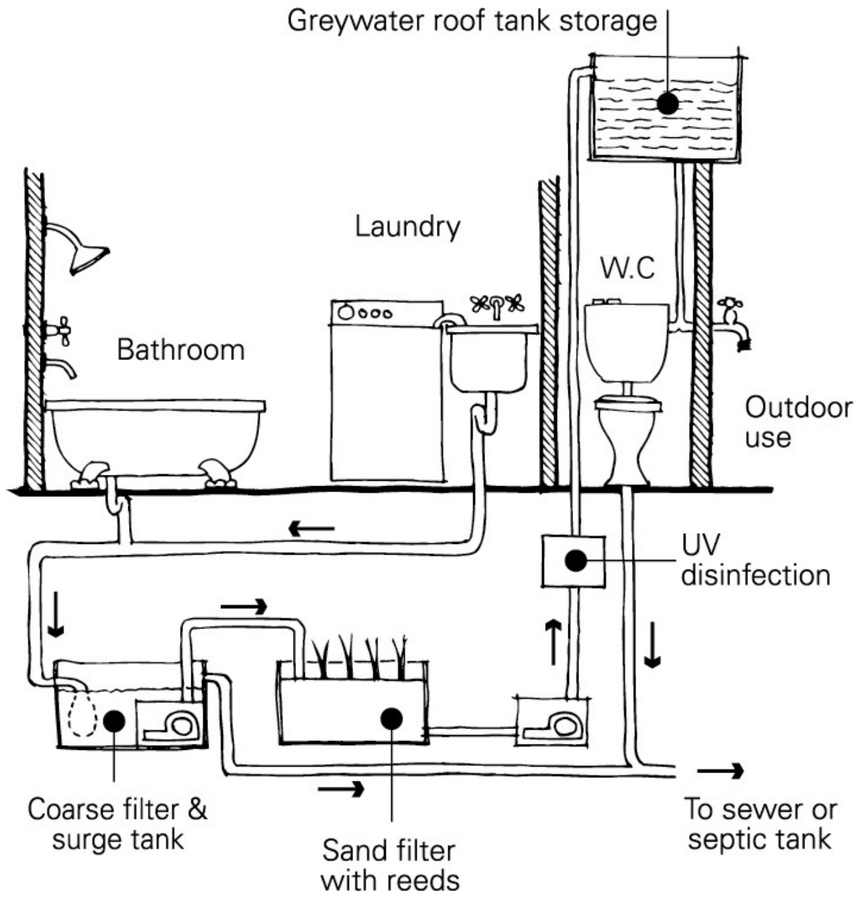
Septic Tank

Reactor / Membrane Tank

Regenerative Blower

Control Panel

+ Leach Field Selection



Treatment Technology Selection

ONSITE WASTEWATER TREATMENT TECHNOLOGY MATRIX

Comparing Key Technologies for Performance, Cost, and Application

TECHNOLOGY TYPE	BOD/TSS REMOVAL	NITROGEN REDUCTION	PHOSPHORUS REDUCTION	ENERGY USE	CAPITAL COST	O&M COST	SCALABILITY	COMPLEXITY / MAINTENANCE	FOOTPRINT REQUIREMENT	BEST APPLICATIONS
Conventional Septic System	●● Low	● None	● None	● None	$ Low	$ Low	● Low	● Simple	●●● Large	Standard residential sites with suitable soil
Recirculating Media Filter (RMF)	●●● High	●● Moderate	● Low	● Low	$$ Medium-High	$ Low	●●● High	● Simple	●● Medium	Residential & commercial sites, retrofit, nitrogen sensitive areas
Sequencing Batch Reactor (SBR)	●●●● Very High	●●● High	●● Moderate	●● Medium	$$$ Medium-High	$$ Medium	●●● High	●● Moderate	●● Medium	Residential & commercial, cluster systems
Moving Bed Biofilm Reactor (MBBR)	●●●● Very High	●●● High	●● Moderate	●● Medium	$$$ High	$$ Medium	●●●● Very High	●● Moderate	●● Medium	Commercial, high flow or strength applications
Membrane Bioreactor (MBR)	●●●● Excellent	●●●● Excellent	●● Moderate	●●● High	$$$$ Very High	$$$ High	●●● High	●●● Complex	● Small	Water reuse, high quality effluent required
Water Reuse Systems (Advanced Treatment)	●●●● Excellent	●●●● Excellent	●●● High	●●● High	$$$$ Very High	$$$ High	●●● High	●●● Complex	● Small	Non-potable & potable reuse, irrigation, industrial process water

LEGEND

Performance / Level
- ●●● Excellent / Very High
- ●●● High
- ●● Moderate
- ● Low
- – None / Not Applicable

Energy Use
- ●● High
- ●● Medium
- ● Low
- ● Very Low / None

Cost
- $ Low
- $$ Medium
- $$$ High
- $$$$ Very High

Footprint Requirement
- ●●●● Very Large
- ●●● Large
- ●● Medium
- ● Small

NOTE:
Performance and cost ratings are general guidelines only and can vary based on design, manufacturer, site conditions, regulations, and maintenance.

Other Design Considerations

- Why an Effluent Filter?
- Grease Interceptor Filter?









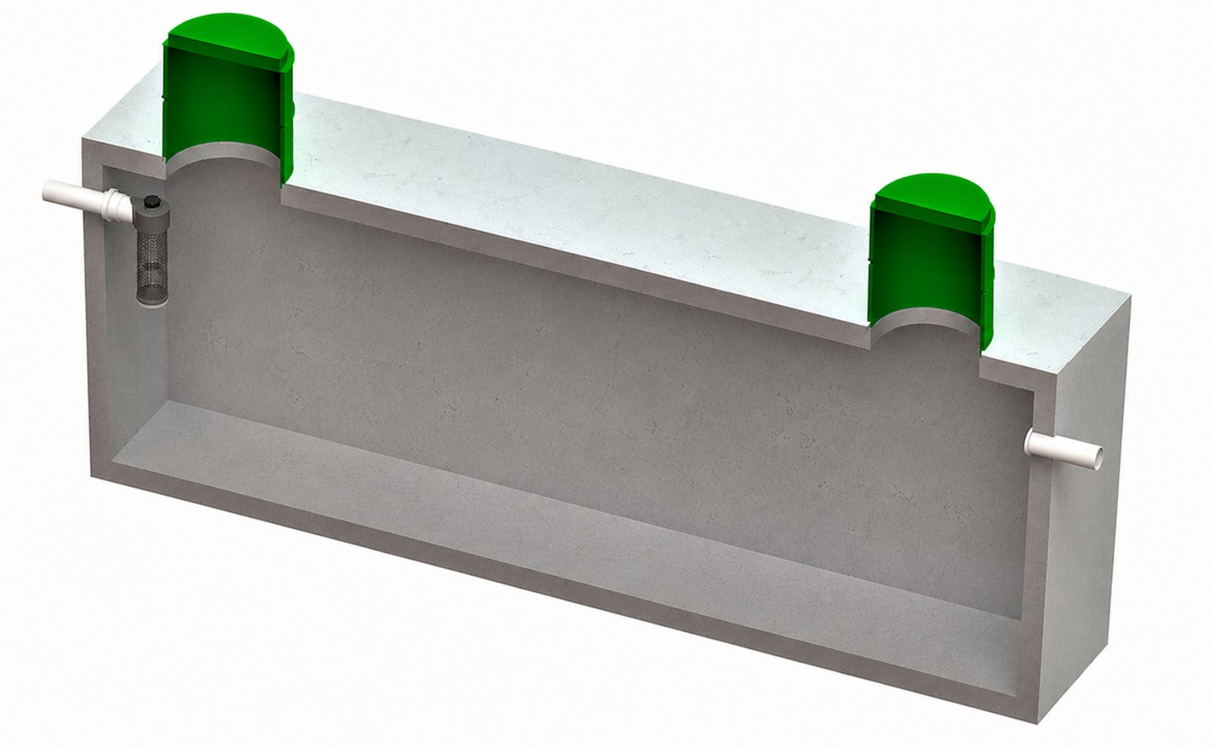
Other Design Considerations

- Flow Equalization Tanks (Holding Tanks)

- Flow – 1x Daily Flow GPD

- Storage / Anoxic Zone to accommodate seasonals or variable flows.

- Typically, combined with duplex alternating / timed dosed pumps to control flow to treatment unit.

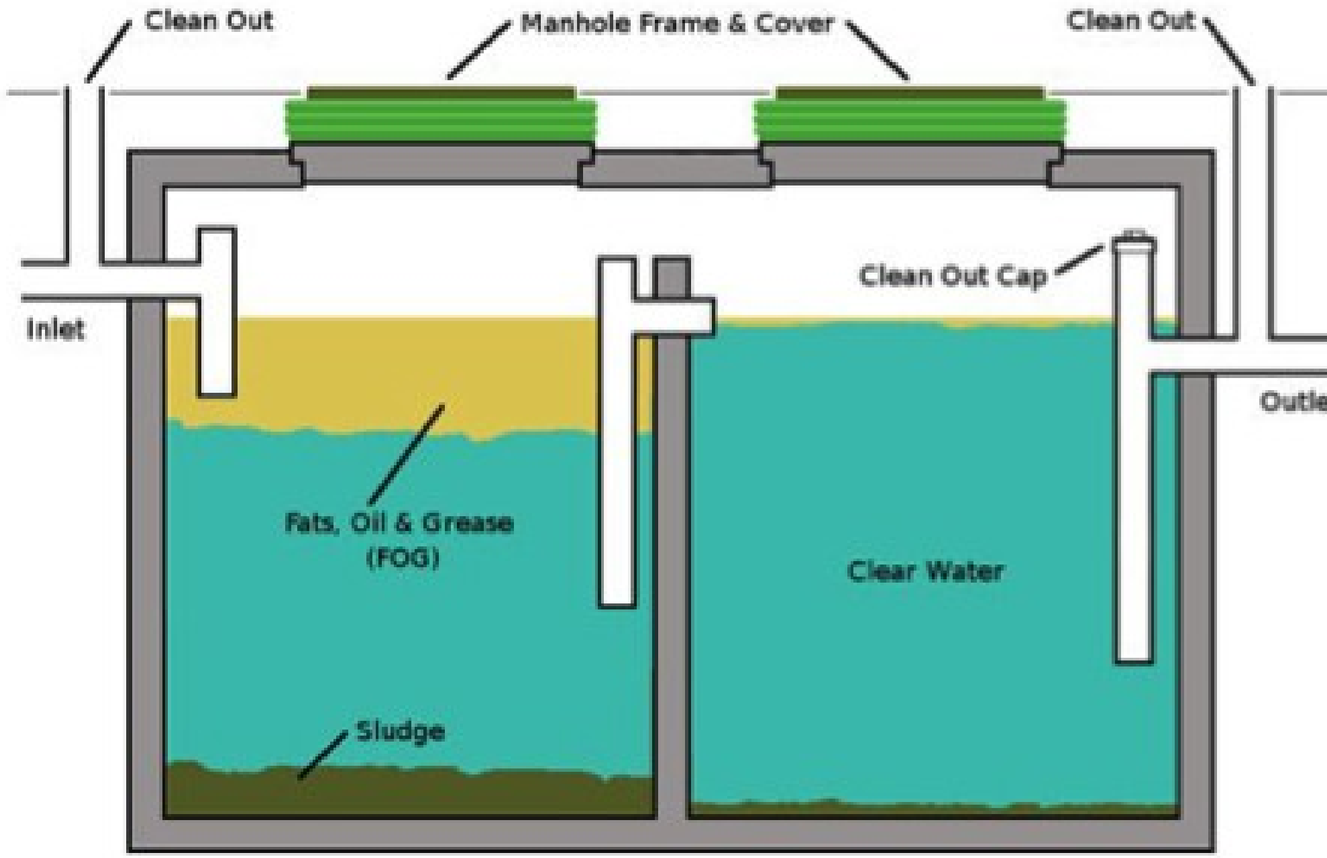


Other Design Considerations

- Grease Interceptors (Single Baffle)

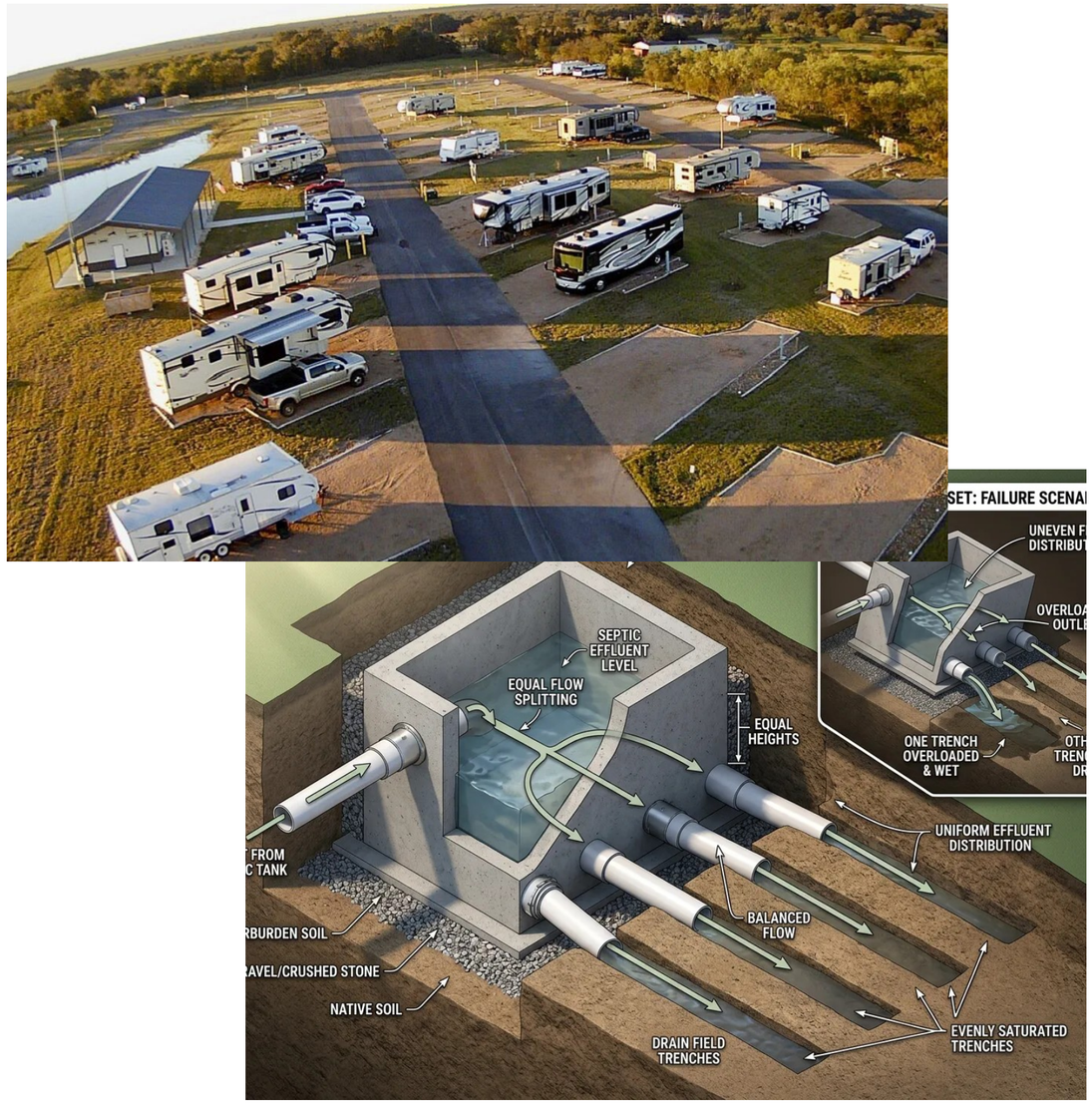
- Required when “excessive grease, garbage, sand, or other wastes [are present] in the sewage [flow]

- Interceptor Size = M x F x T x S
- Simple Ballpark Method = F x T



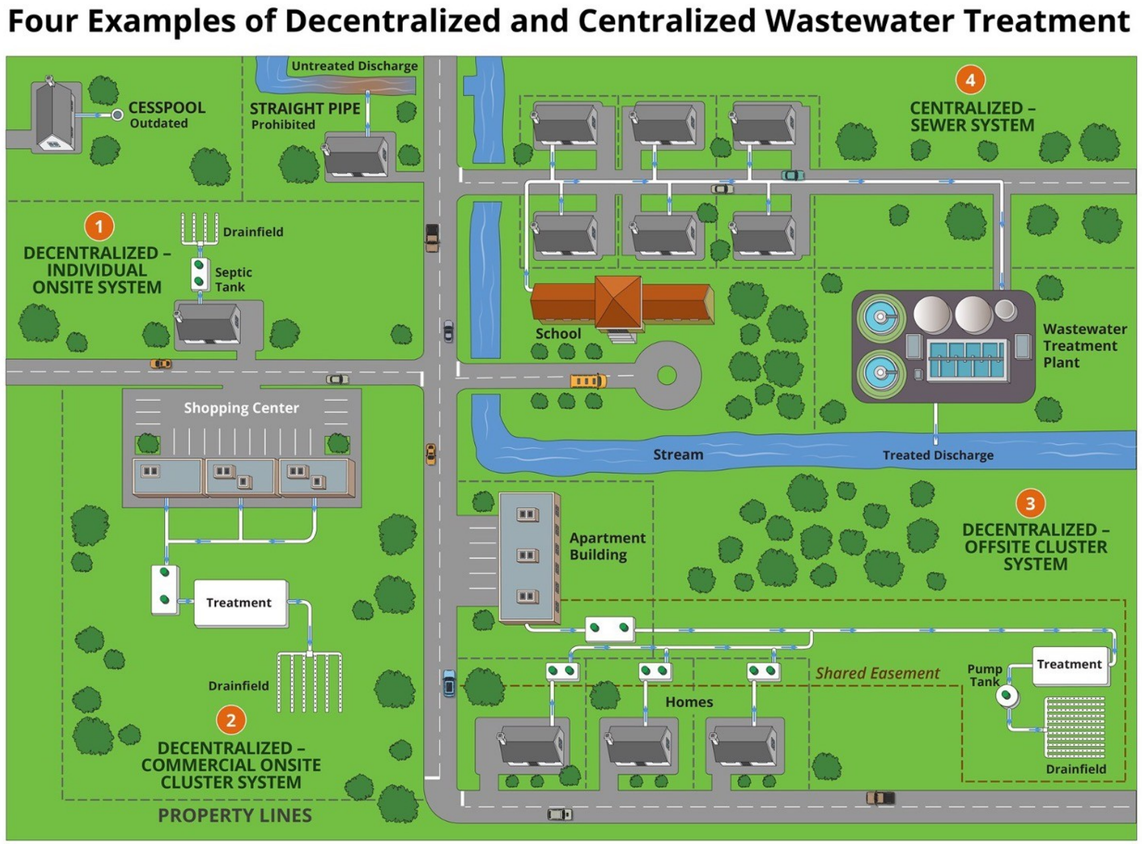
Plan for Seasonal Variability

- *RV Parks – Seasonal or Full time residents?*
- *Travel Centers – event based spikes in wastewater flow?*
- *Municipal Sewer – time of day?*



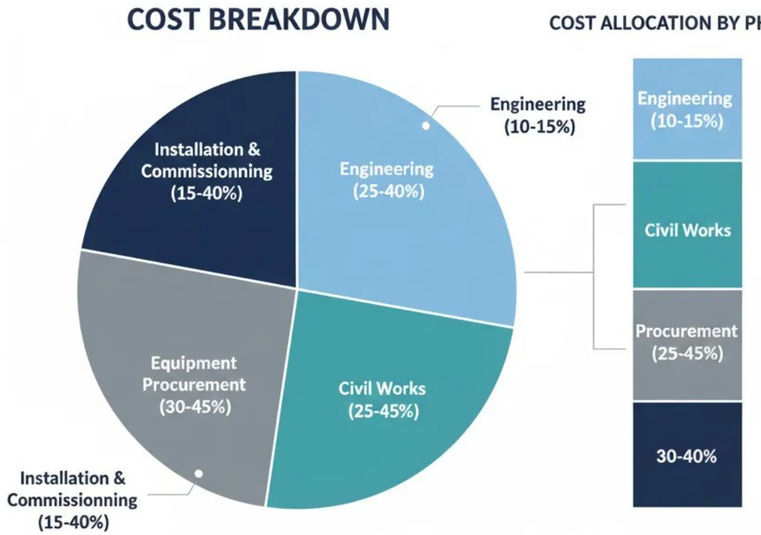
Plan for Expansion & Asset Value

- *Will Municipal Sewer reach your property? When?*
- *Initial Septic Install?*
- *Sewer fee? Or Community Wastewater system?*
- *Factors to consider when planning any community development.*



Long Term Operations & Management

- *Replacement Parts?*
- *Operating Cost (personnel & electrical)?*
- *Technical Support?*
- *Serviceability?*





Step 5: Operations & Future Growth

Water & wastewater treatment is an investment.

Protect and maintain it!

Everyone's favorite analogy:

- *Don't buy a car and never change the oil.*
- *Service your onsite system regularly!*
- *Consult the experts!*



Step 5: Operations & Future Growth

Asset Management Approach

- *Routine Maintenance*
- *Operator Training*
- *Monitoring*
- *Lifecycle Costs*





Key Takeaways

5 Things to Remember

1. *Start your Wastewater Planning First*
2. *Know your Site (Above and Below)*
3. *Understand Permitting Process*
4. *Match Technology to Project Site / Goals*
5. *Design for Expansion or Operations*





Thank you!

Questions? Thoughts?

Alex Sundberg

Business Development & Technical Manager - West

Contact

775.881.8320

alex.sundberg@anua-us.com



ANUA Geoflow SimTech Quanics