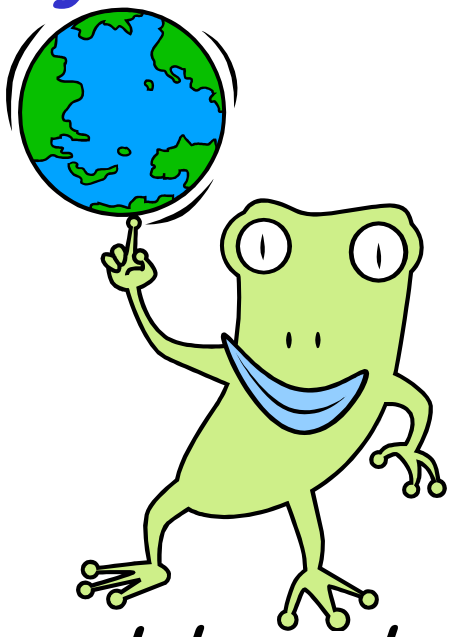
An Introduction to Advanced Onsite Wastewater Treatment Systems

Presentation Material Disclaimer

The presentation of proprietary technologies or use of trade names as part of this presentation is not to be construed in any form as an endorsement. The use of such material is purely for educational purposes and intended to make the audience aware of its existence, methodology and availability for use in achieving effective onsite wastewater treatment.

A Quick Review
The way the world works!



Wastewater treatment depends primarily upon natural biological processes to transform the wastewater to an acceptable quality for return to the environment.

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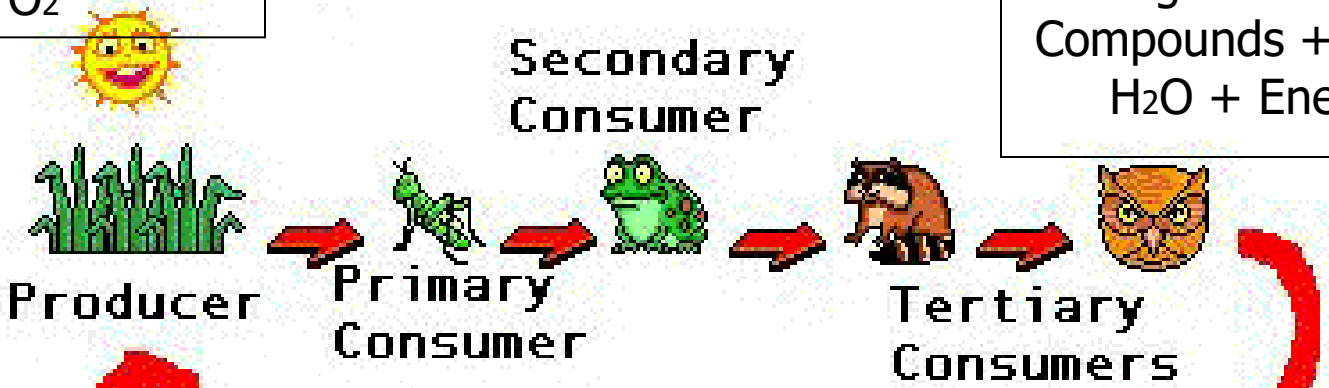
Its All About the Food Chain Carbon Cycle

PRODUCERS
Energy + CO_2 + H_2O + Nutrients =
Organic Compounds + O_2

CONSUMERS
Organic Compounds + (O_2 or **NO** O_2) =
Organic Waste Compounds + CO_2 + H_2O + Energy



Decomposer
Organic Waste Compounds **+ O_2** =
Energy + CO_2 + H_2O + Nutrients

Knight Treatment Systems

The Stages of Wastewater Treatment

PRIMARY TREATMENT

- **The first major treatment process in a wastewater treatment facility, used for the purpose of sedimentation.**
- **The removal of a substantial amount of suspended matter, but little or no colloidal and dissolved matter.**

SECONDARY TREATMENT

- **The biological treatment of settled wastewater from the primary process.**
- **An effluent that, with some exceptions, contains not more than 30 mg/L each (on a 30-day average basis) BOD and suspended solids.**

TERTIARY TREATMENT

- **The treatment of wastewater beyond the secondary or biological stage;**
- **Term typically implies the removal of nutrients, such as phosphorus and nitrogen, and a high percentage of suspended solids**

The Elements of Wastewater Treatment

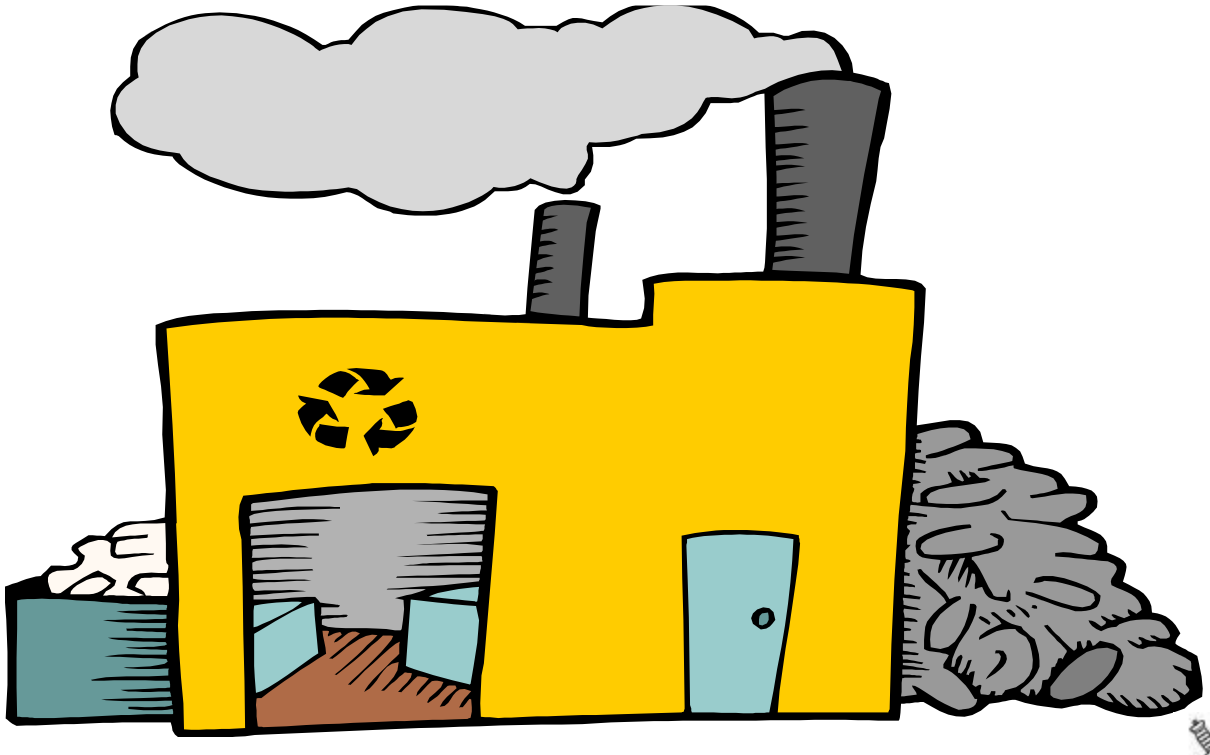
Knight Treatment Systems

The Elements of Wastewater Treatment

Knight Treatment Systems

The Elements of Wastewater Treatment

WORK SPACE



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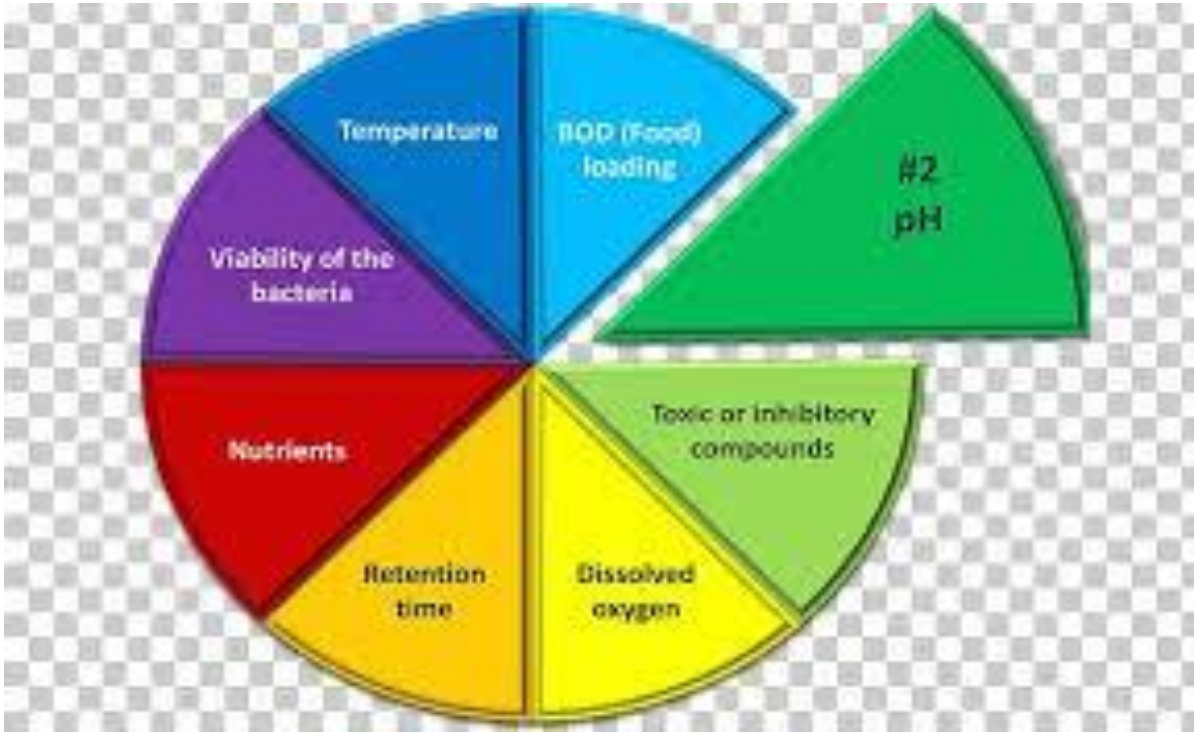
The Elements of Wastewater Treatment

WORK ENVIRONMENT



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The Elements of Wastewater Treatment

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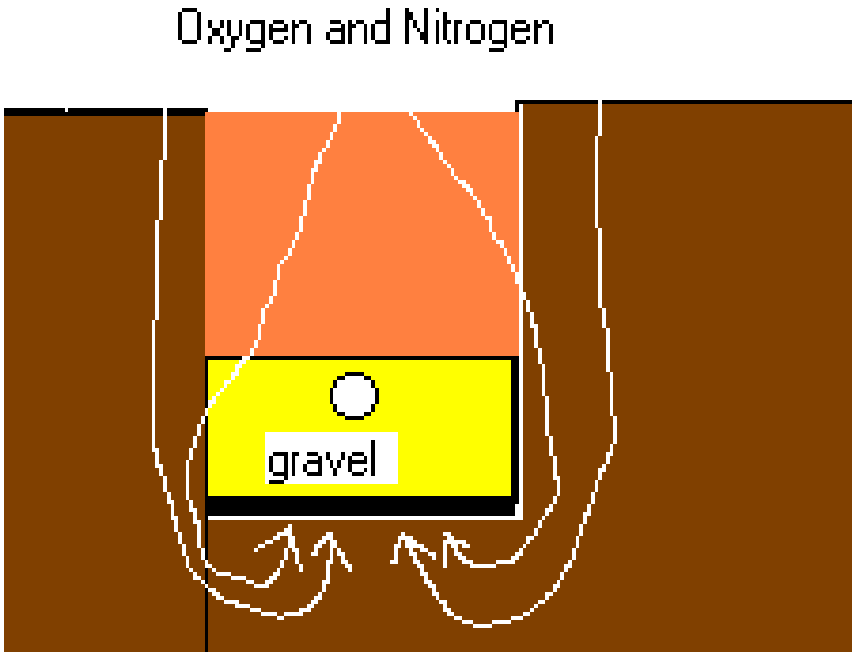
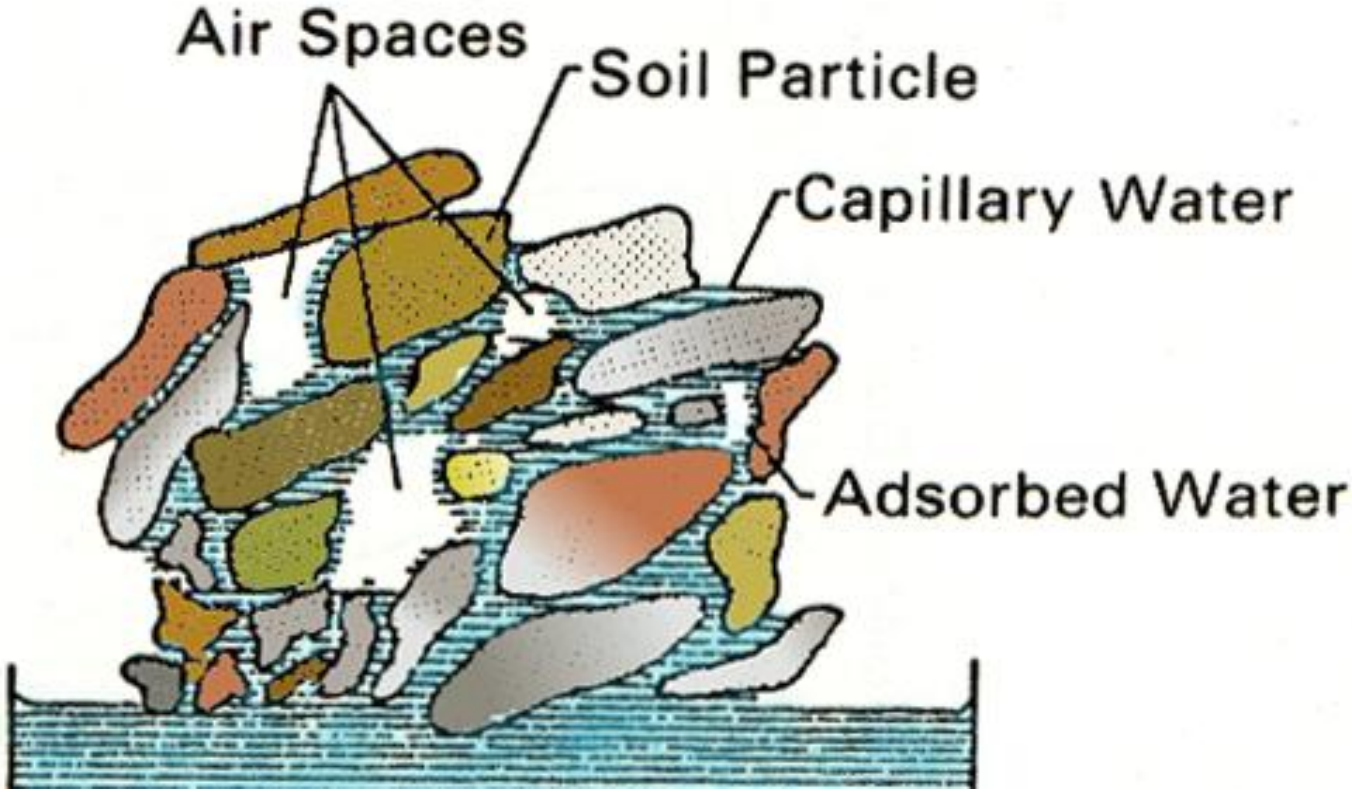
In a conventional septic system the soil must provide enough vertical and horizontal aerobic conditions for the biological workforce to convert the waste into harmless byproducts



Soil is a complex homogenous mixture of various size and shape particles



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Improper site, soil conditions and/or design considerations often lead to premature failure of septic systems

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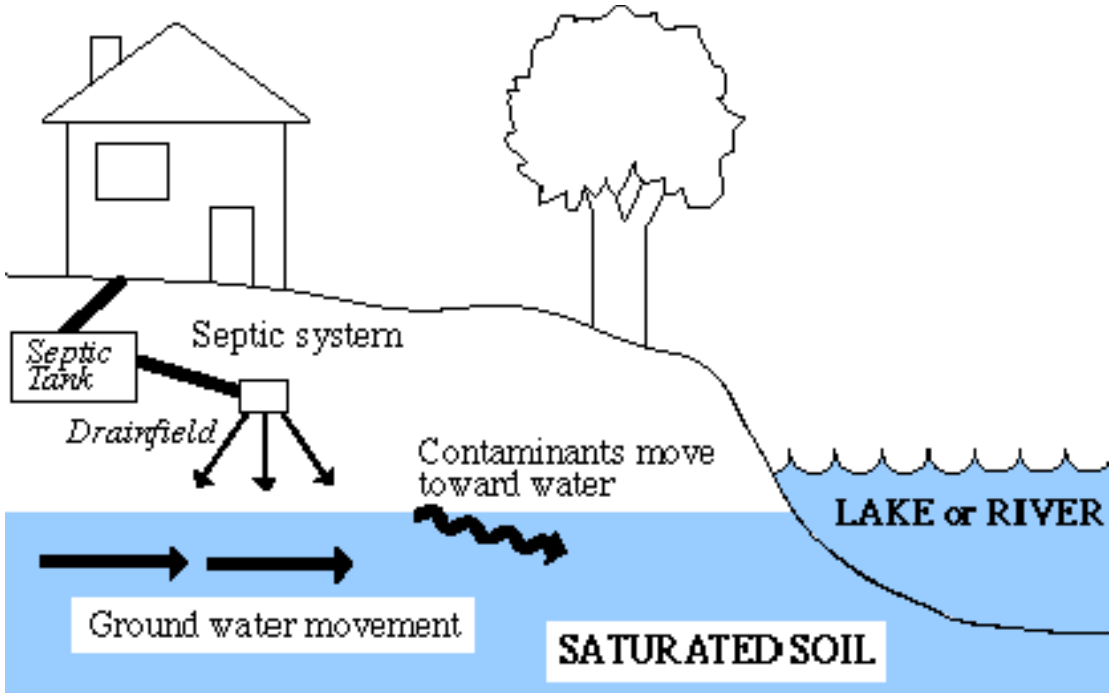
Ground & surface water contamination can be caused by the inadequate onsite treatment of wastewater



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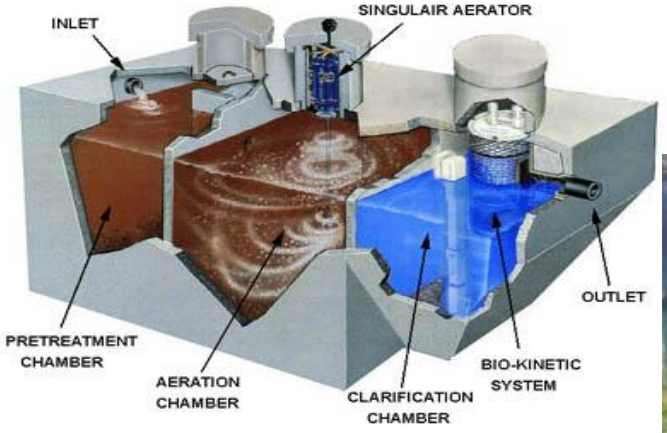
Understanding other forms of Onsite Treatment Technologies is key to identifying acceptable options



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Advanced Innovative Onsite Treatment technologies are not anything magical or mystical

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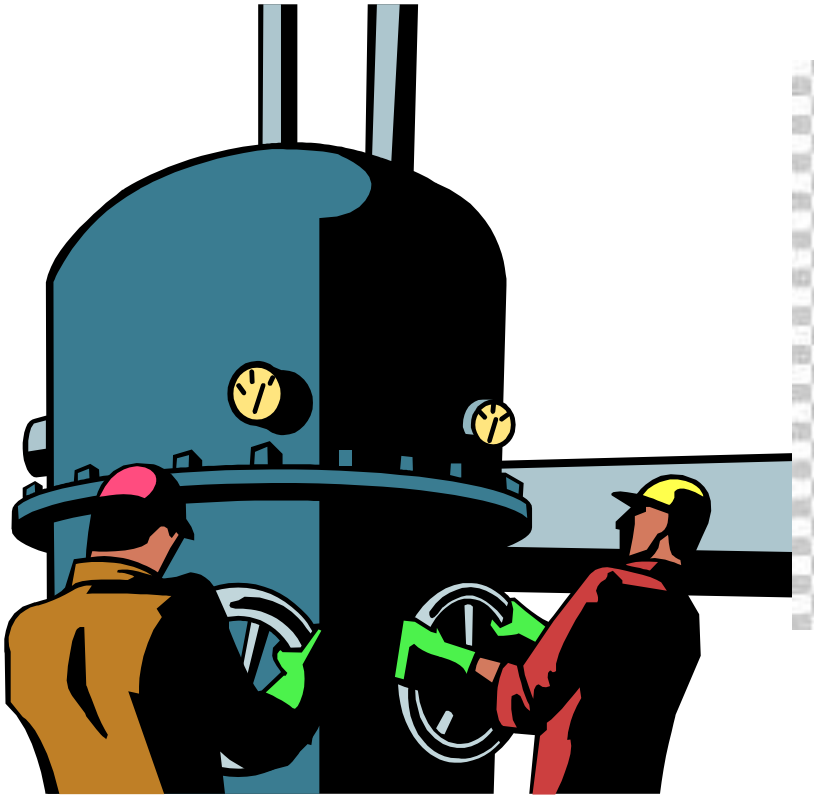
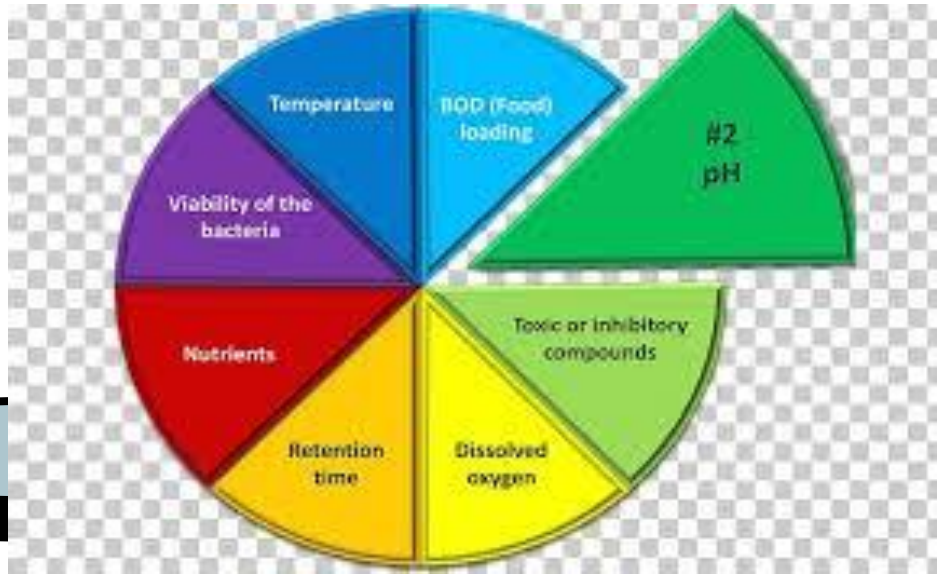
Most innovative onsite technologies simply provide a more friendly work environment and efficient space for the biological workforce to accomplish their task

Knight Treatment Systems

by providing & managing the operational environment for the biological workforce





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A few emerging onsite technologies are capable of introducing a selected skilled task specific work force

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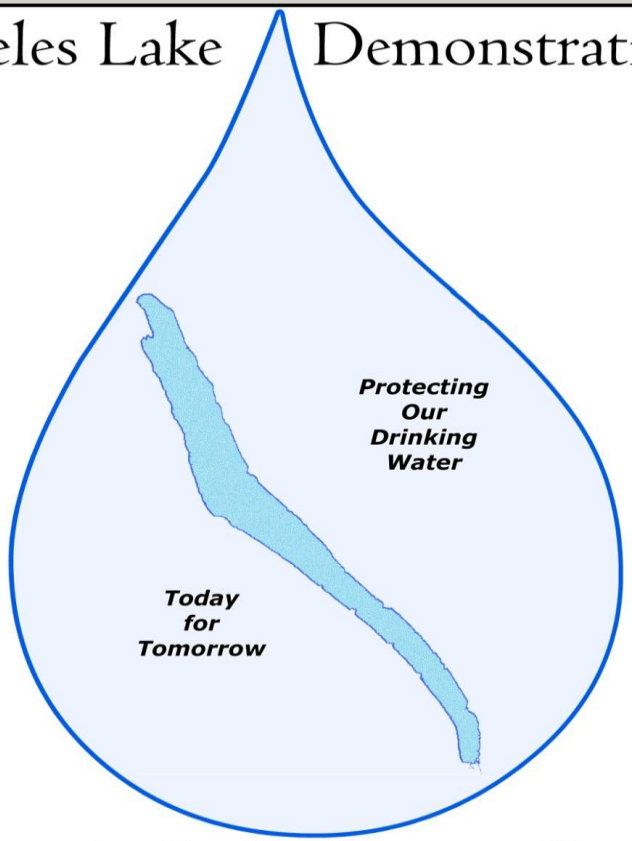
Most recently a couple have focused on the physical capture of nutrients following complete biological treatment by means of adsorption (bonding) to various medias

National Decentralized Water Resources Capacity Development Project

Strengthing the Foundations of Training & Practice in Decentralized Wastewater Treatment Through Support of Research & Development

Skaneateles Lake Demonstration Project



Alternative Onsite Wastewater Treatment
Demonstration Project Site

For more information, contact:
Eric Murdock,P.E. (315) 263-9260

Acknowledgement

- Funding Provided by USEPA

Participating Agencies

- Syracuse Water Dept.
- NYSDOH
- NYSDEC
- Onondaga Co. DOH
- Cayuga Co. DOH
- Cortland Co. DOH
- NYSOTN

Knight Treatment Systems

2,600 Dwellings in Watershed

300 Village Sewer

2,300 Onsite Systems

- 1,750 Conventional
- 340 Dry Wells
- 100 Holding Tanks
- 75 Composting Toilets

- 35 Mounds, ATU's & other non-conventional

Technical Committee Design Considerations

Treatment Cost, O&M & Dispersal

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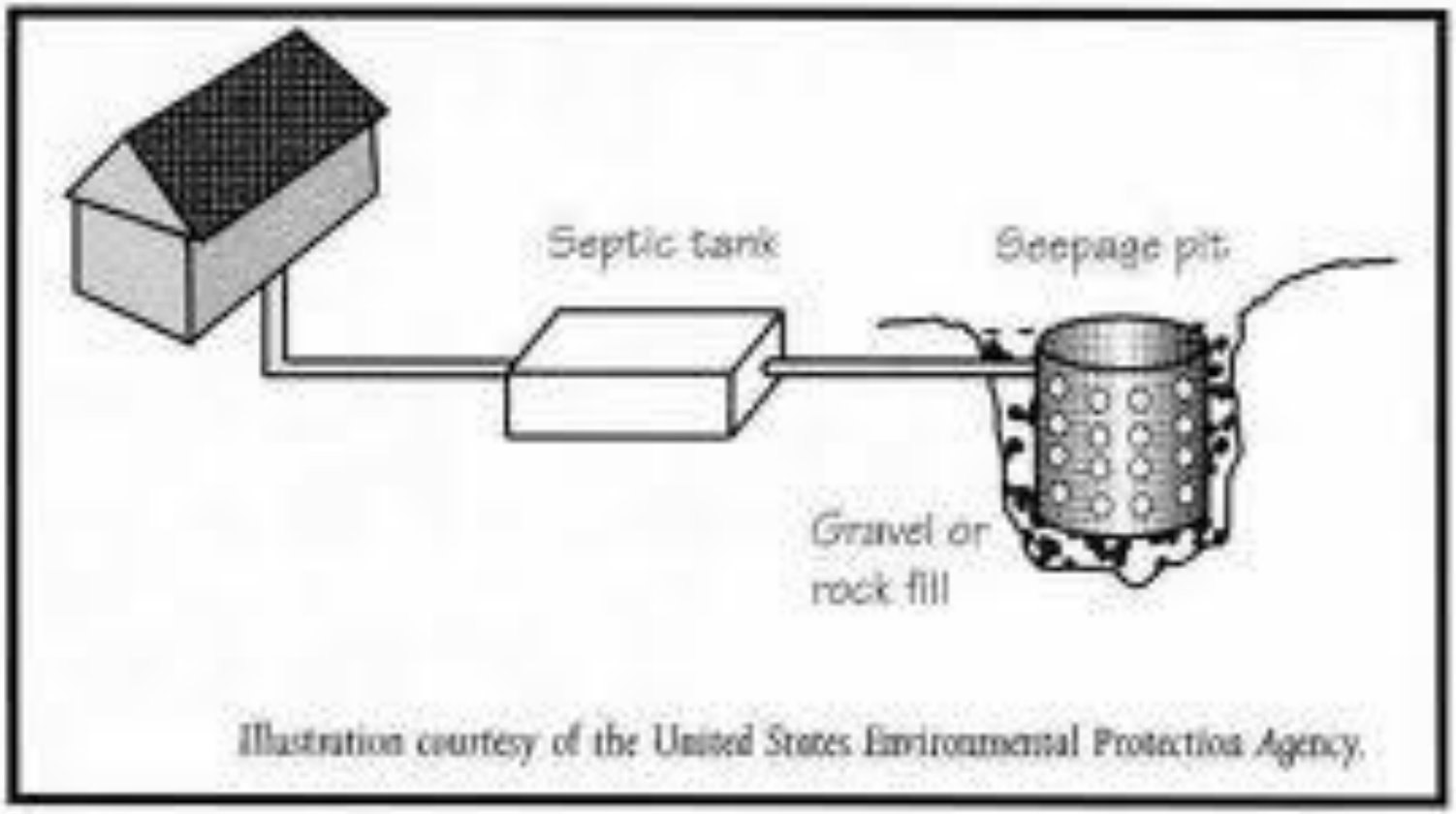
Dry Wells offer little or no treatment

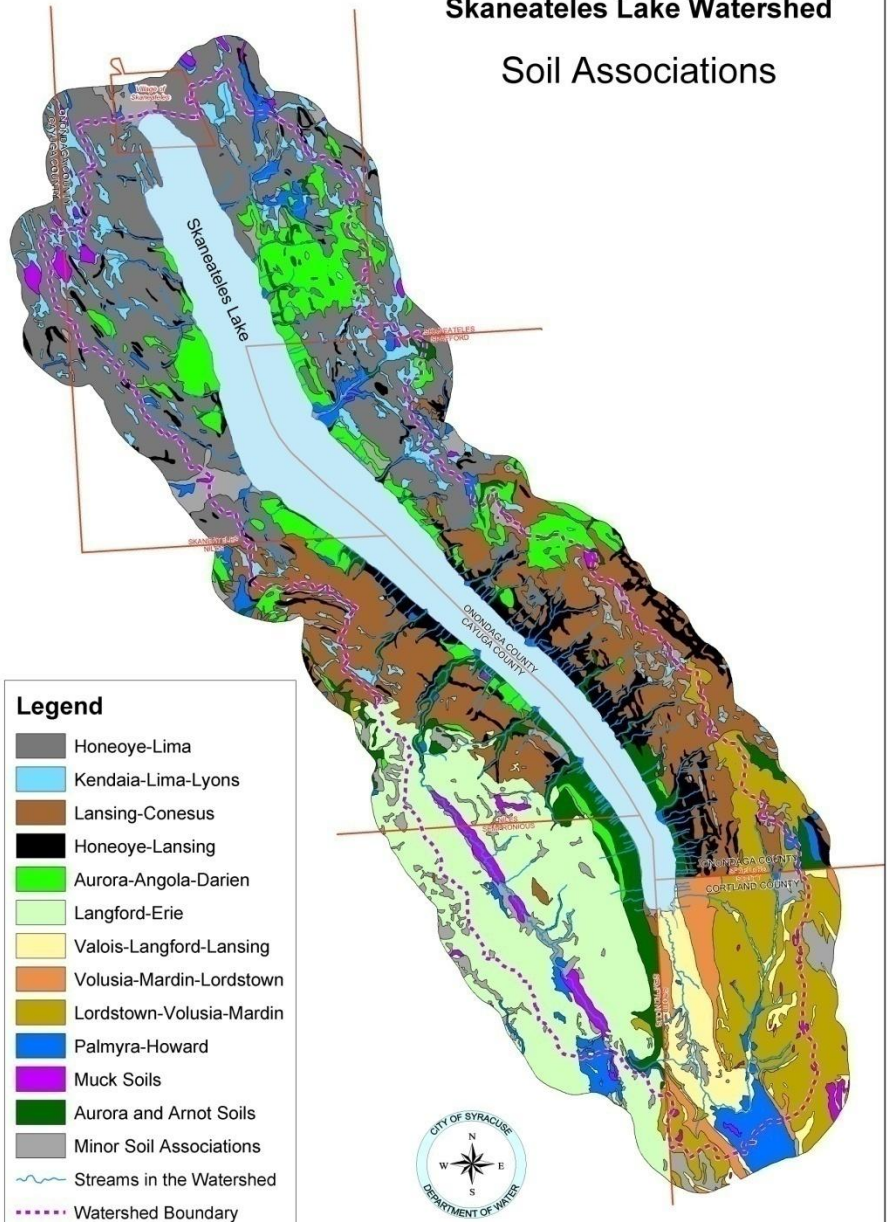


Schematic of a Seepage Pit (Dry Well)

Knight Treatment Systems

Skaneateles Lake Watershed

Soil Associations



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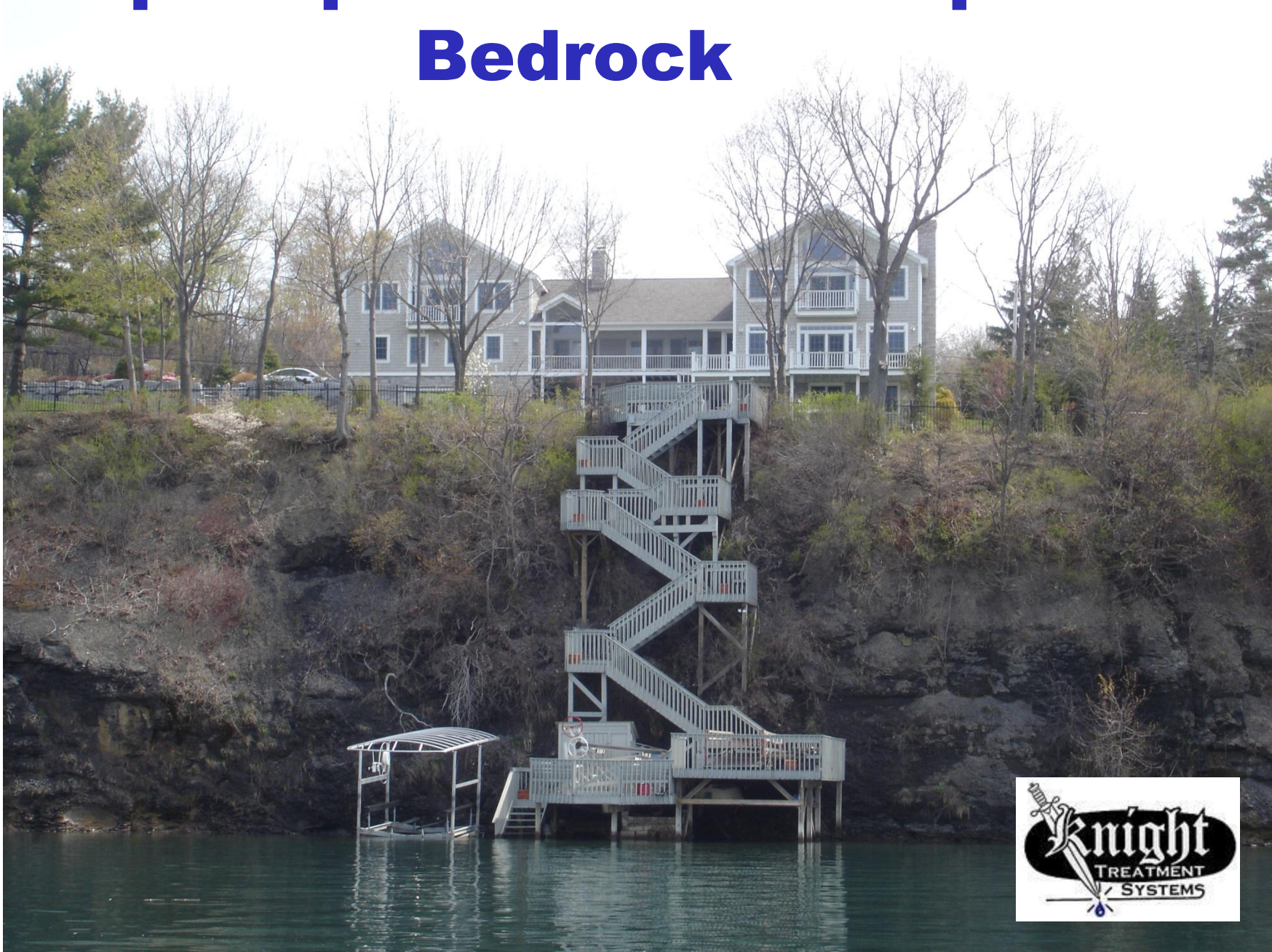
Steep Slope & Shallow Depth To Bedrock




Separation to Surface Water


Small Lots
Knight
Treatment
Systems


Steep Slopes
Knight
TREATMENT
SYSTEMS

AI Search Results

Key Innovative Onsite Technologies

- **Aerobic Treatment Units (ATUs):** Systems that use forced air to treat wastewater, allowing for higher quality effluent than conventional septic tanks.
- **Recirculating Sand Filters (RSFs):** Systems that pass septic tank effluent over a sand bed multiple times to achieve high-level nitrogen removal.
- **Constructed Wetlands (Subsurface Flow):** Use plants and soil microbes to treat effluent, particularly effective for nutrient removal in residential applications.
- **Advanced Treatment Media & Filters:** Technologies such as textile filters, foam cube filters, and peat filters that provide enhanced media for biological treatment.
- **Nutrient Removal Systems:** Technologies specifically designed for nitrogen reduction (e.g., denitrification filters) or phosphorus removal,Often used in environmentally sensitive areas.
- **Low-Pressure Pipe (LPP) Systems:** A method of distributing effluent more evenly over a larger area of the soil absorption field.
- **Microbial/Biological Process Enhancements:** Advanced biological treatment to improve degradation of contaminants.
- **Disinfection Technologies:** Ultraviolet (UV) light and Ozone disinfection for high-level pathogen reduction before discharge or reuse.
- **Innovative Toilet Technologies:** Composting toilets and incinerating toilets t[illegible] reduce or eliminate the need for water-based sewage disposal.

Knight Treatment Systems

Categories of Innovative Onsite Treatment Technologies

- "Gravelless" Absorption Systems*
- Aerobic Treatment Units (ATU)
- Media Filters
  - Sand
  - Textile
  - Foam
  - Peat
- Microbial Inoculator/Generators
- Nutrient Reduction
- Composting

Enhanced Treatment

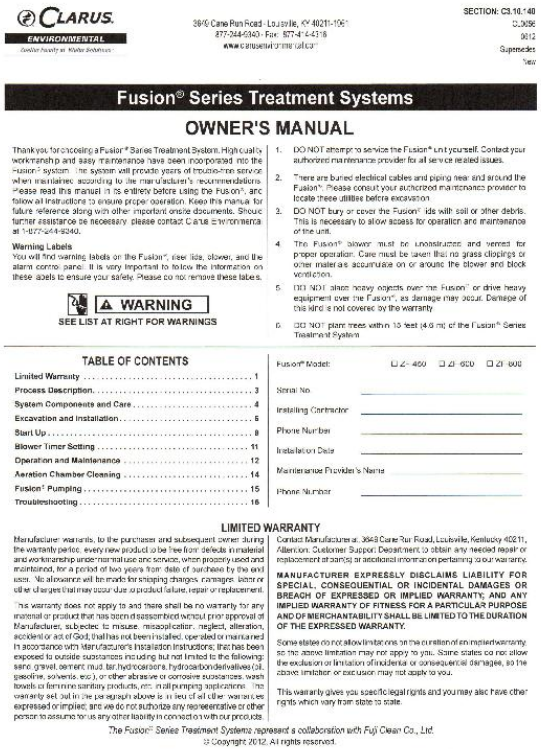
- Pre-engineered
- Small footprint
- Proven history of performance
- Disperse “clean” water
- Clean color
- Eliminate clogging of dispersal field

Certified to NSF/ANSI Standard 40

CLASS 1

Knight Treatment Systems

Written Instructions



CLARUS ENVIRONMENTAL

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SECTION: C3.10.140
C1.0056
0812
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New

Fusion® Series Treatment Systems

OWNER'S MANUAL

Thank you for choosing a Fusion® Series Treatment System. High quality workmanship and easy maintenance have been incorporated into the Fusion® system. The system will provide years of trouble-free service when maintained according to the manufacturer's recommendations. Please read this manual in its entirety before using the Fusion®, and follow all instructions to ensure proper operation. Keep this manual for future reference along with other important onsite documents. Should further assistance be necessary, please contact Clarus Environmental at 1-877-244-9340.

Warning Labels
You will find warning labels on the Fusion®, riser lids, blower, and the alarm control panel. It is very important to follow the information on these labels to ensure your safety. Please do not remove these labels.

⚠ WARNING
SEE LIST AT RIGHT FOR WARNINGS

1. DO NOT attempt to service the Fusion® unit yourself. Contact your authorized maintenance provider for all service related issues.
2. There are buried electrical cables and piping near and around the Fusion®. Please consult your authorized maintenance provider to locate these utilities before excavation.
3. DO NOT bury or cover the Fusion® lids with soil or other debris. This is necessary to allow access for operation and maintenance of the unit.
4. The Fusion® blower must be housed/ducted and vented for proper operation. Care must be taken that no grass clippings or other material is accumulate on or around the blower and block ventilation.
5. DO NOT place heavy objects over the Fusion® or drive heavy equipment over the Fusion®, as damage may occur. Damage of this kind is not covered by the warranty.
6. DO NOT plant trees within 15 feet (4.6 m) of the Fusion® Series Treatment System.

TABLE OF CONTENTS

Fusion® Model: ☐ ZF-450 ☐ ZF-600 ☐ ZF-800
Serial No.
Installing Contractor
Phone Number
Installation Date
Maintenance Provider's Name
Phone Number

LIMITED WARRANTY

Manufacturer warrants, to the purchaser and subsequent owner during the warranty period, every new product to be free from defects in material and workmanship under normal use and service, when properly used and maintained, for a period of two years from date of purchase by the end user. No allowance will be made for shipping charges, damages, labor or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to and there shall be no warranty for any material or product that has been disassembled without prior approval of Manufacturer, subjected to misuse, misapplication, neglect, alteration, accident or act of God, that has not been installed, operated or maintained in accordance with Manufacturer's installation instructions, that has been exposed to outside substances including but not limited to the following: sand, gravel, cement mud, tar, hydrocarbons, hydrocarbon derivatives (oil, gasoline, solvents, etc.), or other abrasive or corrosive substances, wash towels or feminine sanitary products, etc., in all pumping applications. This warranty set out in the paragraph above is in lieu of all other warranties expressed or implied, and we do not authorize any representative or other person to assume for us any other liability in connection with our products.

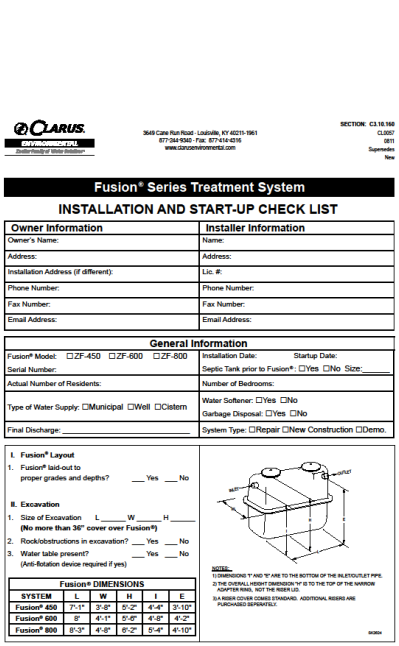
Contact Manufacturer at: 3649 Cane Run Road, Louisville, Kentucky 40211, Attention: Customer Support Department, to obtain any needed repair or replacement of part(s) or additional information pertaining to our warranty.

MANUFACTURER EXPRESSLY DISCLAIMS LIABILITY FOR SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES OR BREACH OF EXPRESSED OR IMPLIED WARRANTY; AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND OF MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY.

Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

The Fusion® Series Treatment Systems represent a collaboration with Fuji Clean Co., Ltd.



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SECTION: C3.10.160
C1.0057
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Fusion® Series Treatment System

INSTALLATION AND START-UP CHECK LIST

Owner Information	Installer Information
Owner's Name:	Name:
Address:	Address:
Installation Address (if different):	Lic. #:
Phone Number:	Phone Number:
Fax Number:	Fax Number:
Email Address:	Email Address:

General Information

Fusion® Model: ☐ZF-450 ☐ZF-600 ☐ZF-800	Installation Date: Startup Date:
Serial Number:	Septic Tank prior to Fusion®: ☐Yes ☐No Size:
Actual Number of Residents:	Number of Bedrooms:
Type of Water Supply: ☐Municipal ☐Well ☐Cistern	Water Softener: ☐Yes ☐No Garbage Disposal: ☐Yes ☐No
Final Discharge:	System Type: ☐Repair ☐New Construction ☐Demo.

I. Fusion® Layout
1. Fusion® laid-out to proper grades and depths? ___ Yes ___ No

II. Excavation
1. Size of Excavation L_____ W_____ H_____ **(No more than 36" cover over Fusion®)**
2. Rock/obstructions in excavation? ___ Yes ___ No
3. Water table present? ___ Yes ___ No (Anti-flotation device required if yes)

Fusion® DIMENSIONS

SYSTEM	L	W	H	I	E
Fusion® 450	7'-1"	3'-8"	5'-2"	4'-4"	3'-10"
Fusion® 600	8'	4'-1"	5'-8"	4'-8"	4'-2"
Fusion® 800	8'-3"	4'-8"	6'-2"	5'-4"	4'-10"

NOTES:
1) DIMENSIONS "I" AND "E" ARE TO THE BOTTOM OF THE INLET/OUTLET PIPE.
2) THE OVERALL HEIGHT DIMENSION "H" IS TO THE TOP OF THE NARROW ADAPTER RING, NOT THE RISER LID.
3) A RISER COVER COMES STANDARD. ADDITIONAL RISERS ARE PURCHASED SEPERATELY.

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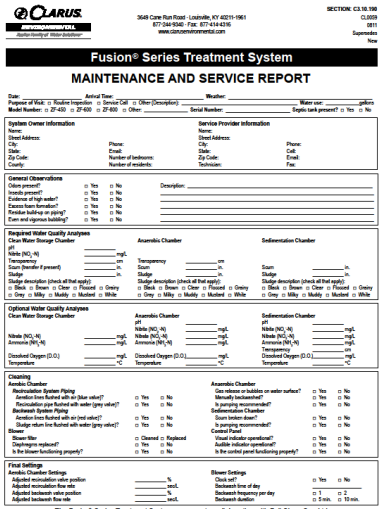

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SECTION: C3.10.180
C1.0059
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Fusion® Series Treatment System

MAINTENANCE AND SERVICE REPORT

Date: Arrival Time: Weather:
Purpose of Visit: ☐ Routine Inspection ☐ Service Call ☐ Other (Description) Water use: gallons
Model Number: ☐ ZF-450 ☐ ZF-600 ☐ ZF-800 ☐ Other: Serial Number: Septic tank present? ☐ Yes ☐ No

System Owner Information
Name:
Street Address:
City: Phone:
State: Email:
Zip Code: Number of bedrooms:
County: Number of residents:

Service Provider Information
Name:
Street Address:
City: Phone:
State: Cell:
Zip Code: Email:
Technician: Fax:

General Observations
Odors present? ☐ Yes ☐ No Description:
Insects present? ☐ Yes ☐ No
Excessive drain water? ☐ Yes ☐ No
Excessive algae formation? ☐ Yes ☐ No
Residue building or piping? ☐ Yes ☐ No
Even and vigorous bubbling? ☐ Yes ☐ No

Required Water Quality Analyses

Clean Water Storage Chamber	Anaerobic Chamber	Sedimentation Chamber
pH		
Nitrate (NO_3-N) _____ mg/L		
Transparency _____ cm	Transparency _____ cm	
Scum (transfer if present) _____ in.	Scum _____ in.	Scum _____ in.
Sludge _____ in.	Sludge _____ in.	Sludge _____ in.
Sludge description (check all that apply): ☐ Black ☐ Brown ☐ Clear ☐ Flocced ☐ Grainy ☐ Grey ☐ Milky ☐ Muddy ☐ Mucilated ☐ White	Sludge description (check all that apply): ☐ Black ☐ Brown ☐ Clear ☐ Flocced ☐ Grainy ☐ Grey ☐ Milky ☐ Muddy ☐ Mucilated ☐ White	Sludge description (check all that apply): ☐ Black ☐ Brown ☐ Clear ☐ Flocced ☐ Grainy ☐ Grey ☐ Milky ☐ Muddy ☐ Mucilated ☐ White

Optional Water Quality Analyses

Clean Water Storage Chamber	Anaerobic Chamber	Sedimentation Chamber
pH	pH	pH
Nitrate (NO_3-N) _____ mg/L	Nitrate (NO_3-N) _____ mg/L	Nitrate (NO_3-N) _____ mg/L
Ammonia (NH_3-N) _____ mg/L	Ammonia (NH_3-N) _____ mg/L	Ammonia (NH_3-N) _____ mg/L
		Transparency _____ cm
Dissolved Oxygen (D.O.) _____ mg/L	Dissolved Oxygen (D.O.) _____ mg/L	Dissolved Oxygen (D.O.) _____ mg/L
Temperature _____ °C	Temperature _____ °C	Temperature _____ °C

Cleaning

Aerobic Chamber			Anaerobic Chamber		
Recirculation System Piping			Gas release or bubbles on water surface?	☐ Yes	☐ No
Aeration lines flushed with air (blue valve)?	☐ Yes	☐ No	Manually backwashed?	☐ Yes	☐ No
Recirculation pipe flushed with water (grey valve)?	☐ Yes	☐ No	Is pumping recommended?	☐ Yes	☐ No
Backwash System Piping			Sedimentation Chamber		
Aeration lines flushed with air (red valve)?	☐ Yes	☐ No	Scum broken down?	☐ Yes	☐ No
Sludge return line flushed with water (grey valve)?	☐ Yes	☐ No	Is pumping recommended?	☐ Yes	☐ No
Blower			Control Panel		
Blower filter	☐ Cleaned	☐ Replaced	Visual indicator operational?	☐ Yes	☐ No
Check valve replaced?	☐ Yes	☐ No	Audible indicator operational?	☐ Yes	☐ No
Is the blower functioning properly?	☐ Yes	☐ No	Is the control panel functioning properly?	☐ Yes	☐ No

Final Settings

Aerobic Chamber Settings		Blower Settings	
Adjusted recirculation valve position	_____ %	Clock set?	☐ Yes ☐ No
Adjusted recirculation flow rate	_____ secs.	Backwash time of day	_____
Adjusted backwash valve position	_____ %	Backwash frequency per day	☐ 1 ☐ 2
Adjusted backwash flow rate	_____ secs.	Backwash duration	☐ 5 min. ☐ 10 min.

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Sampling and Analyses

- BOD & TSS
- Ammonia (NO_3-N)
- Nitrite-Nitrate (NO_2-NO_3)
- TKN
- Total Phosphorus (as P)
- Total Coliform
- Fecal Coliform
- Turbidity

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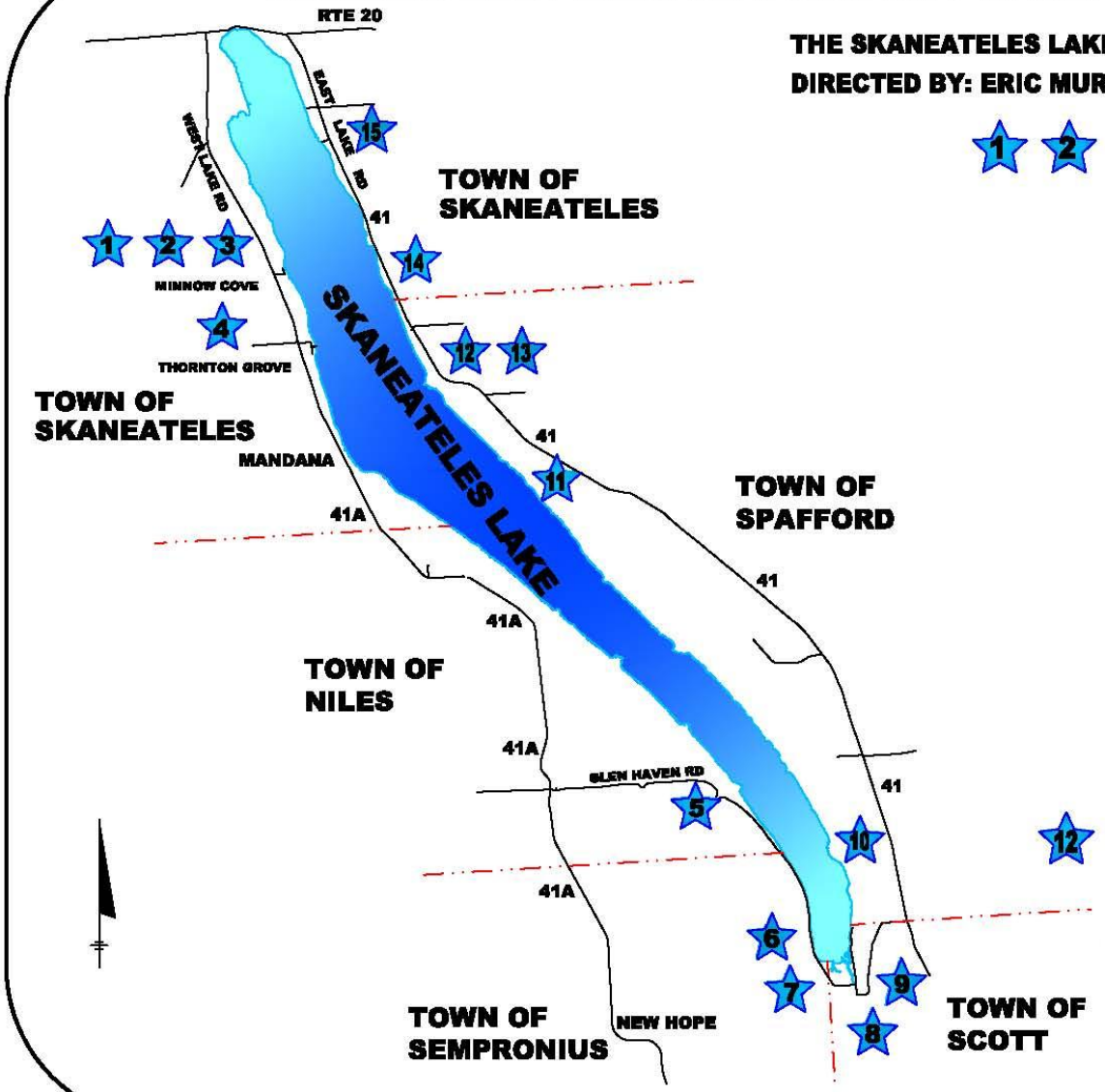
SKANEATELES DEMONSTRATION PROJECT TOUR



THE SKANEATELES LAKE DEMONSTRATION PROJECT
DIRECTED BY: ERIC MURDOCK P.E.

1 2 3 THE MINNOW COVE SITES (3 SITES)
1250-1254 MINNOW COVE (FIRE LANE #22)
PREMIER TECH ENVIRONMENT - PEAT FILTER
GEOFLOW - DRIP IRRIGATION

4 THE DAVIDSON SITE
2312 THORNTON GROVE (FIRE LANE #33)
BORD NA MONA - PEAT FILTER

5 THE FRANCIS RYAN SITE
FIRELANE 6 - LOT 38
ORENCO-ADVANTEX - SHALLOW PRESSURE DOSED TRENCHES

6 THE PAT RYAN SITE
6992 NORTH GLEN HAVEN ROAD
BORD NA MONA - PEAT FILTER

7 THE RAY PHELPS SITE
7035 GLEN HAVEN ROAD
XXXXX - XXXXXX

8 THE GLEN HAVEN RESTAURANT
7434 FAIR HAVEN ROAD
KNIGHT TREATMENT SYSYTEMS - WHITE KNIGHT

9 THE FILKINS FARM
7367 ROUTE 41
ELJEN IN-DRAIN

10 THE HELGREN SITE
96 NYS ROUTE 41
NORWECO ATU & DRIP IRRIGATION

11 THE FLEISS SITE
1991 WOODLAND LANE
CONSOLIDATED, INC. - ENVIROGUARD

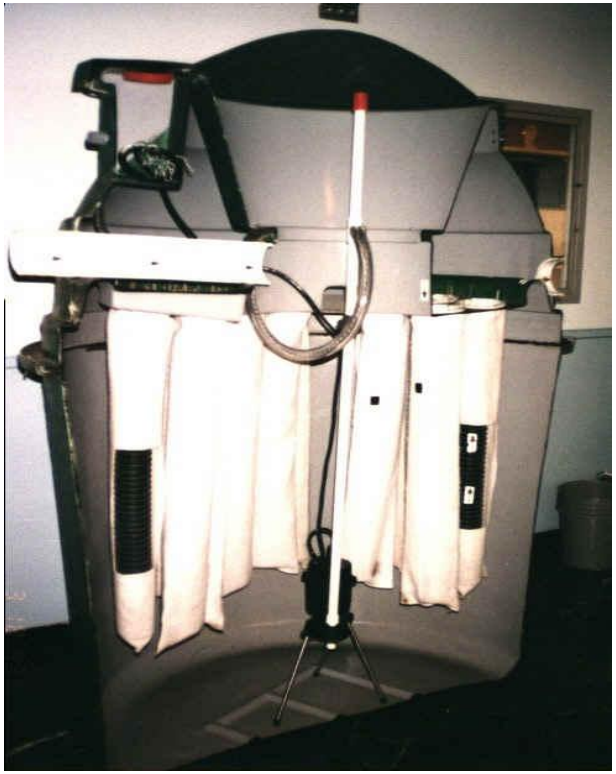
12 13 THE 5 MILE POINT SITES
PREMIER TECH ENVIRONMENT - TEXTILE PEAT FILTER
ORENCO SYSTEMS INC - ADVANTEX &
BOTOMLESS SAND FILTER

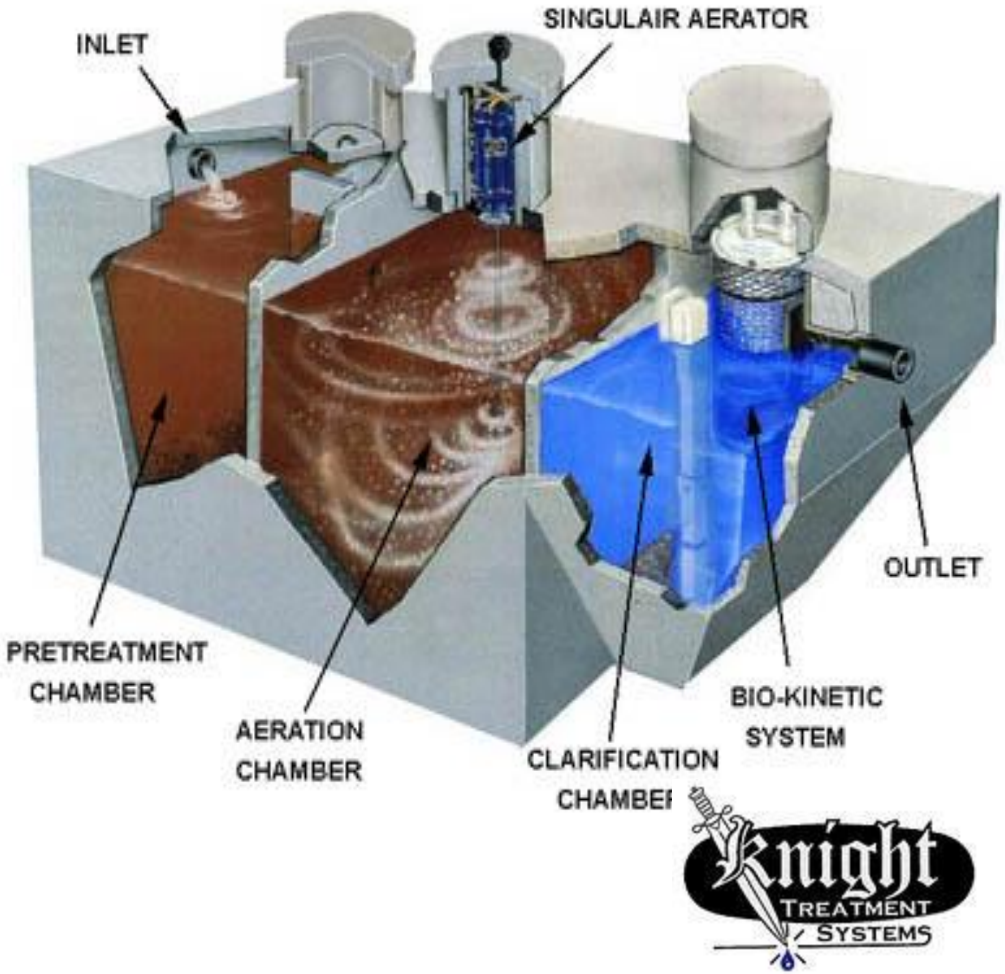
14 THE POLLOCK SITE
1749 SHADY BEND LANE
QUANICS - AEROCELL TRICKLING FILTER

15 THE KELLY SITE
2727 EAST LAKE ROAD
ORENCO-ADVANTEX
SHALLOW PRESSURE DOSED TRENCHES

Knight TREATMENT SYSTEMS

NSF Aerobic Treatment Unit (ATU)





Foam

- Many pre-packaged systems
- Higher loadings
- Waterloo BioFilter
- Zabel Aero Cell

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Textile Filters

- **Greater surface area**
- **Loadings up to 50 GPD/sqft**
- **Normally 10-25 GPD/sqft**

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Peat Systems

- **Modularized**
  - **Puraflo**
- **Containerized/sized**
  - **Eco-Pure**
  - **Eco-Flow**
- **Trenches**
  - **Brooks**

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Nutrient Reduction Technologies

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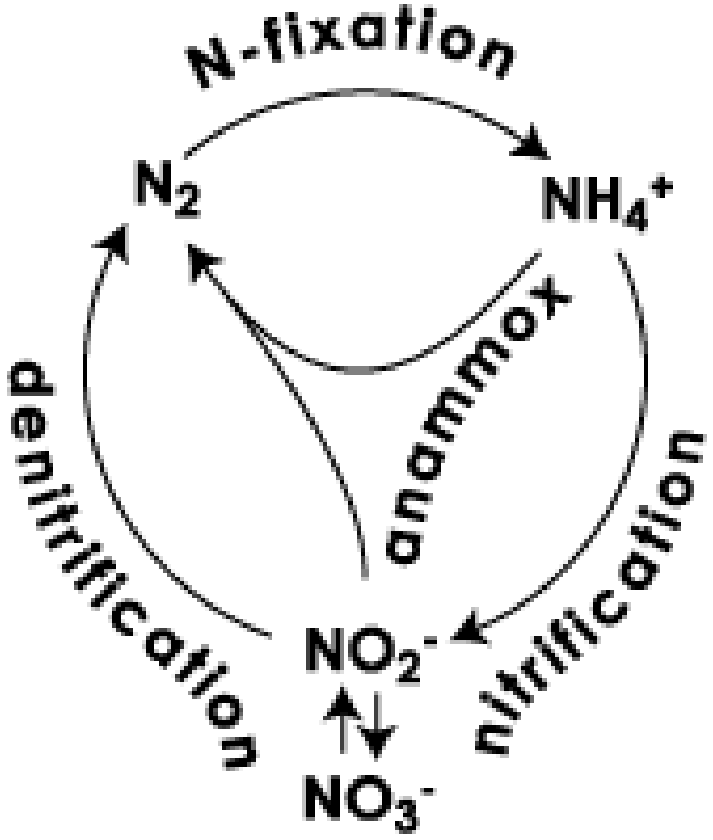
Nutrient Reduction: Nitrogen Cycle

It's a Biological Process

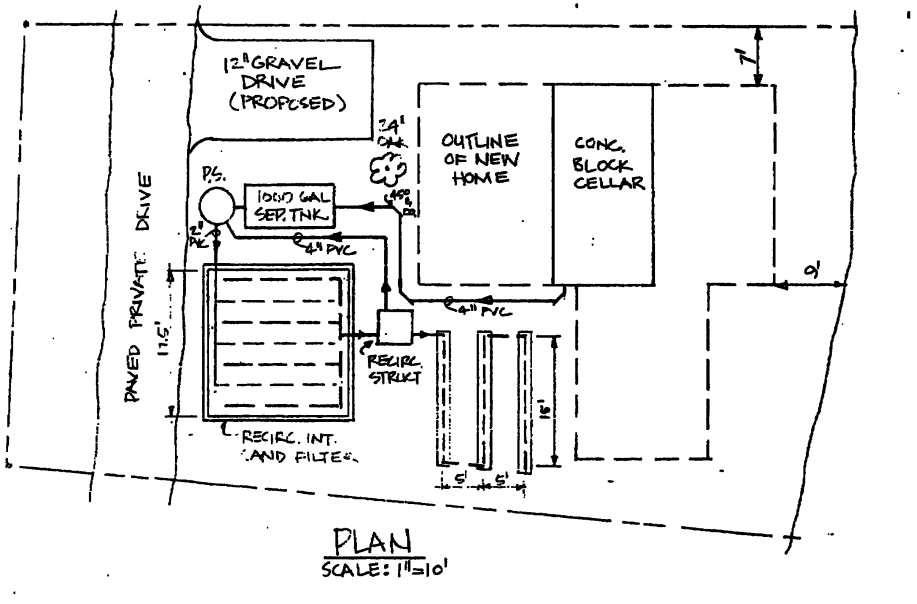


Nitrogen Removal by Recirculation

- Recirculate secondary treated effluent to head of system
- Can be accomplished with:
  - Sand Filters
  - Media Filters
  - ATU's
  - Peat Systems

Recirculating Sand & Media Filters

- Provides additional treatment of settled wastewater
- Can be configured to promote denitrification.



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Phosphorus Removal Methodology

IONIC BONDING TO MEDIA

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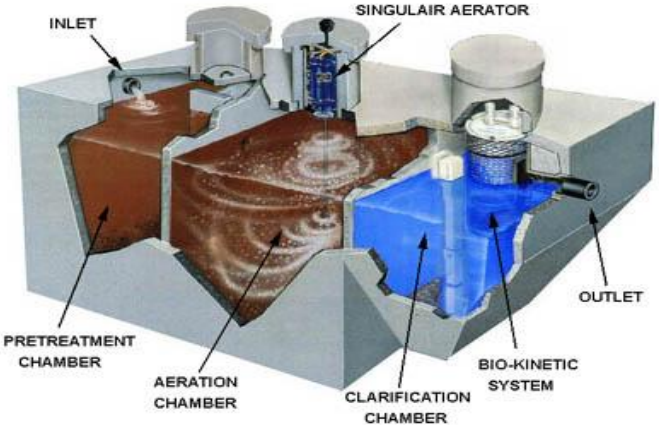
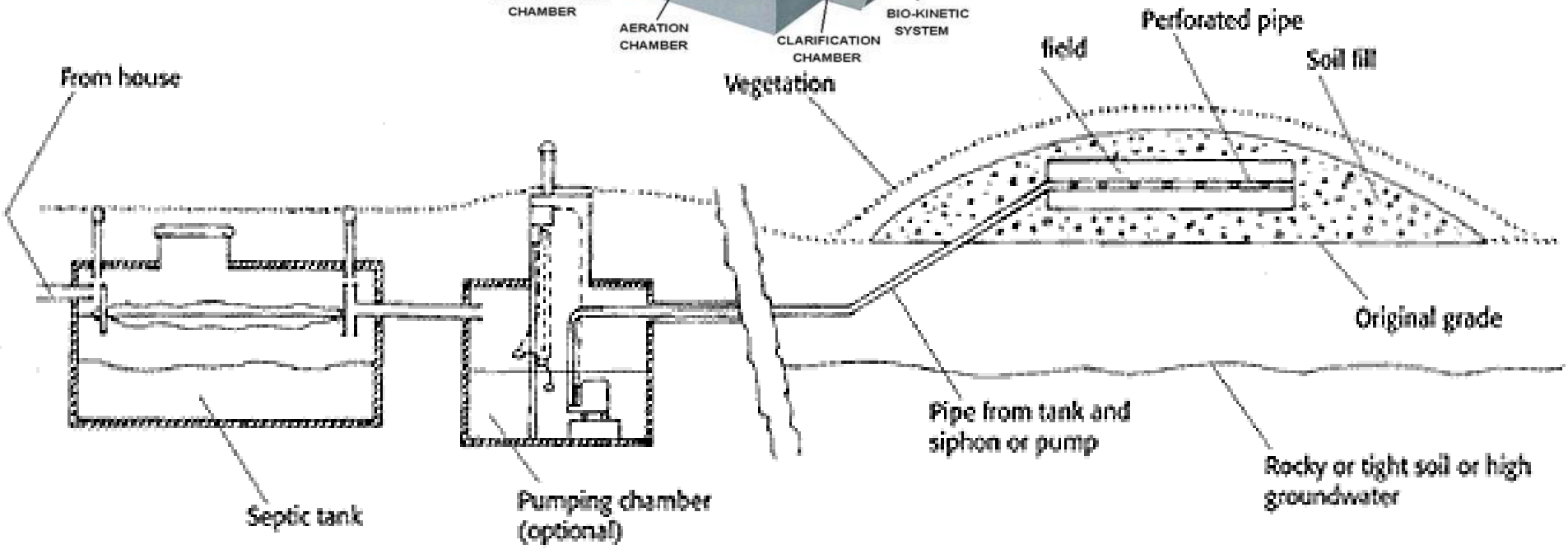
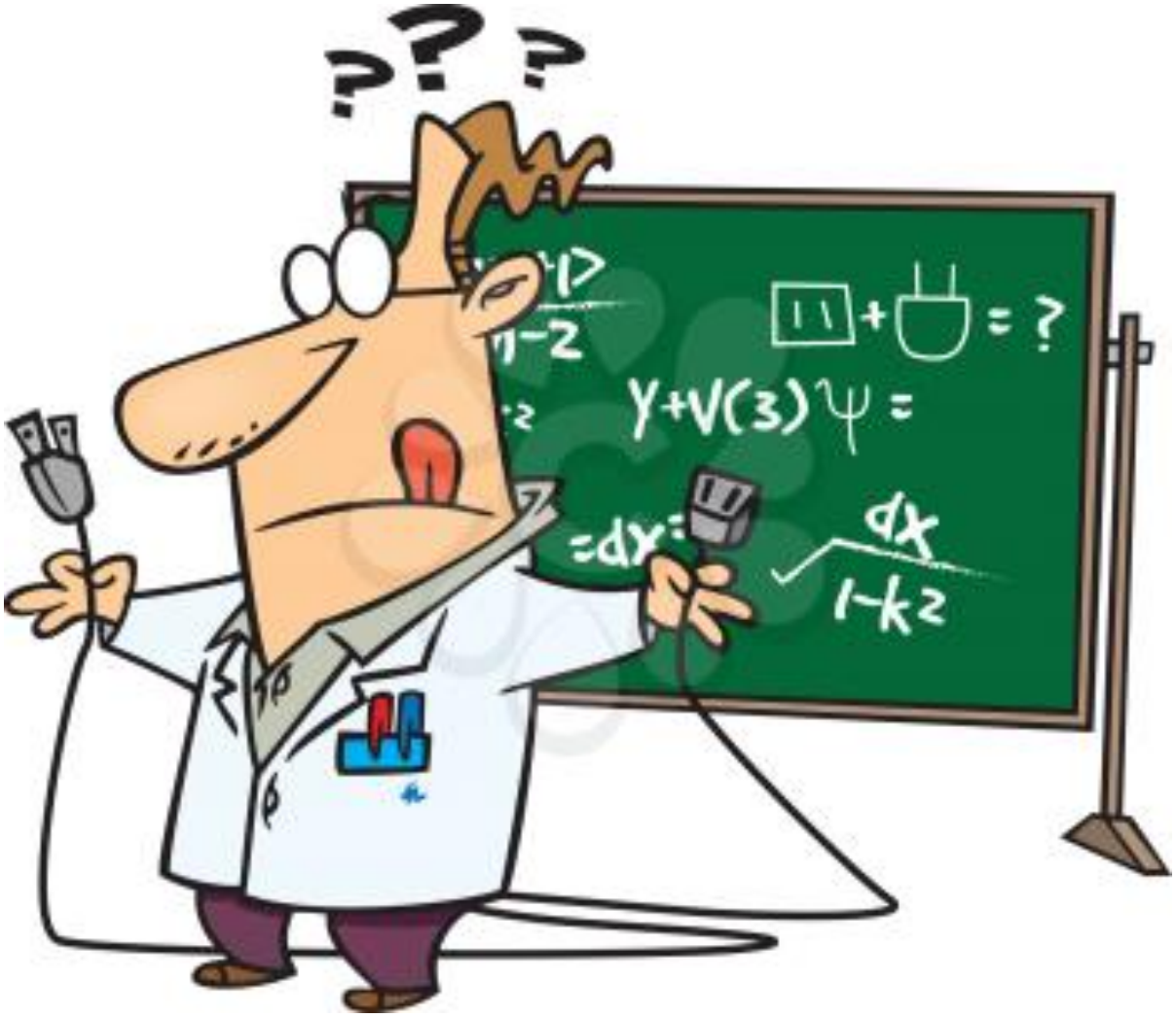
The more advanced the treatment technology, the greater post installation attention required to assure proper performance.





Questions?



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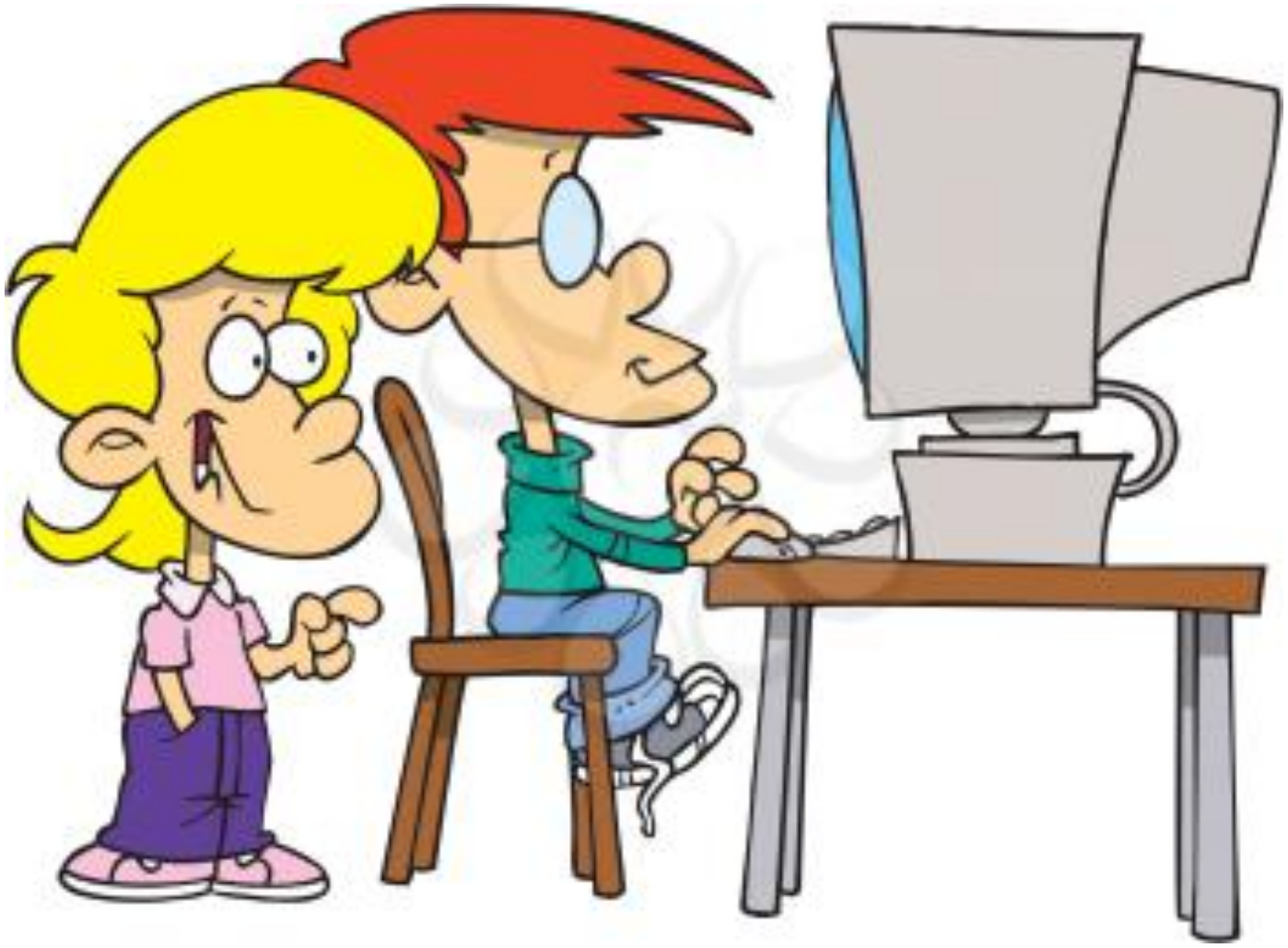

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