



Anua
- Lincoln County, WV
Watershed Project

Lincoln County, WV Watershed Project



- **The Left Fork is one of the county's most rural and low income areas**

Lincoln County, WV Watershed Project

- A cooperative agreement between the Lincoln County Commission and the US Environmental Protection Agency. It has run from 2005 to 2014.
- All systems since phase 1 have Anua peat technology as secondary treatment, followed by Salcor UV final disinfection before discharging into tributaries.



Initial Site Conditions



Initial Site Conditions, cont'd



Initial Site Conditions, cont'd



Initial Site Conditions, cont'd

- *“One of the more extreme situations showing raw sewage flowing from under a mobile home. This family received a new system under Phase 3.”*



Lincoln County, West Virginia Watershed Project

- New systems for existing homes to remediate watershed pathogen contamination
- Puraflo + Salcor UV
→ direct discharge



Lincoln County, West Virginia Watershed Project



Lincoln County, West Virginia Watershed Project



Lincoln County, West Virginia Watershed Project



Lincoln County, West Virginia Watershed Project



Lincoln County, West Virginia Watershed Project

- Phase 3: Three homes were directly discharging raw waste into dog bone creek.
- Prior to installations, the E. coli readings were >200,000, 40,000, 7,500, and 50,000.
- Post installation samplings were 450, 250, and 360.
- Phase 3 report conclusion: ***“Clearly the new systems are positively impacting tributary health.”***

Lincoln County, West Virginia Watershed Project

- Of the 68 samples under 200 colonies, 58 or 85% had <10 colonies per 100 ml. All of the homes in Phase 3 had failing septic systems prior to new installations.
- ***“Because all of these new systems are direct discharge they immediately have had positive impact on human and ecological health.”***



Puraflo Overview





Treatment Mechanisms

- **Physical** - filtration & absorption
 - **Chemical** - adsorption & ion exchange
 - **Biological** - microbial assimilation

 - Zone of **aerobic** treatment
 - Upper portion of filter → degradation & assimilation of carbonaceous element of waste
 - BOD and SS treatment
 - Lower portion of filter
 - Nitrification → nitrifiers more prevalent at depths of 12” or greater
 - Typically passive process (no mechanical aeration)
-

What is Peat?

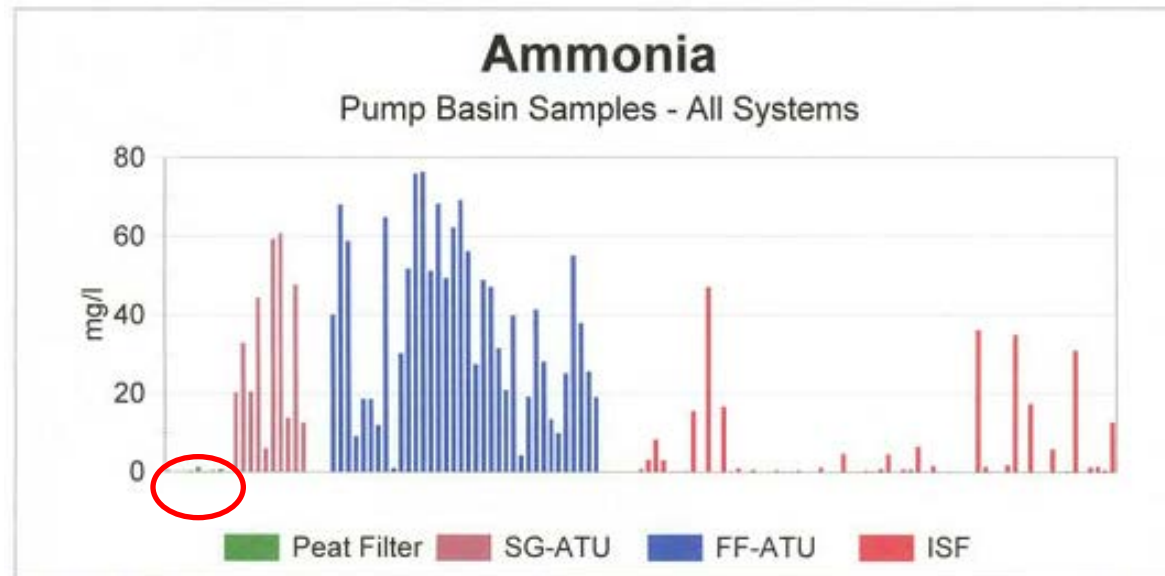
- Puraflo difference
 - It's a natural media...
 - High Cation Exchange Capacity (CEC)...125 meq/g
 - Retention time...36 – 48 hours
 - Water holding capacity...50 – 55%
 - Void space...90 – 95%
 - Surface area...52,000 ft²/ft³
 - Longevity...~15 years

Puraflo Treatment Capabilities

- *Reduction of Nonpoint Source Pollution from On-Site Sewage Systems in Clermont County Ohio*
 - *Ohio EPA 319 Project #98(h) E-10*
 - “Puraflo peat biofilters followed by a modified mound (PEAT)”

Puraflo Treatment Capabilities, cont'd

The pump basin samples represent the relative strength of the waste prior to being pumped to the modified mound. Clearly most samples from the FF-ATU and SG-ATU have higher concentrations of all parameters in the effluent from those treatment units. In the ISF systems 88% to 93% of the samples from the treatment unit would meet the OEPA discharge limit and in the PEAT 100% of the samples analyzed met the limits.



Puraflo Treatment Capabilities, cont'd

- Ohio EPA Guidance Document
 - ***Guidance Document for Drip Distribution Systems***
 - Published December 2008

Puraflo Treatment Capabilities, cont'd

- Ohio EPA Guidance Document
 - ***Guidance Document for Drip Distribution Systems***
 - Published December 2008

Disinfection may be required for sites when the proposed drip distribution system has the potential to discharge into a usable aquifer or is located within a sensitive watershed. Disinfection may be considered on a case by case basis only and should not include chlorination because of the impact on the “good bugs” in the soil. Disinfection can be achieved by:

- UV
- Peat Biofilters

Lincoln County, WV Watershed Project



Lincoln County Commission WV DEP Cooperative Project



*Septic tank, pump tank, and peat modules
waiting Commission inspection*

BACKGROUND

The *ARRA Green Wastewater Project* built on the success of the cooperative agreement between the Lincoln County Commission and the US Environmental Protection Agency. From 2005 to 2010, that agreement funded a multi-year wastewater demonstration project. It was a low income, rural community. Through the project, 40 homes received new wastewater systems. One of the project's primary goals was to protect public health and improve water quality. The *ARRA Green Wastewater Project* installed another 20 home systems in the same watershed.



The Left Fork is one of the county's most rural and low income areas

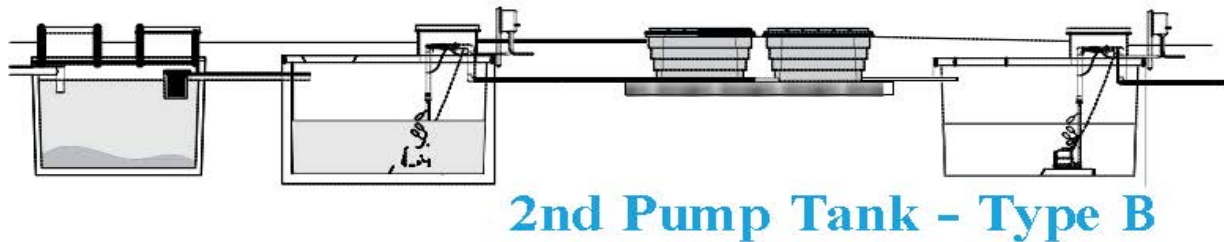
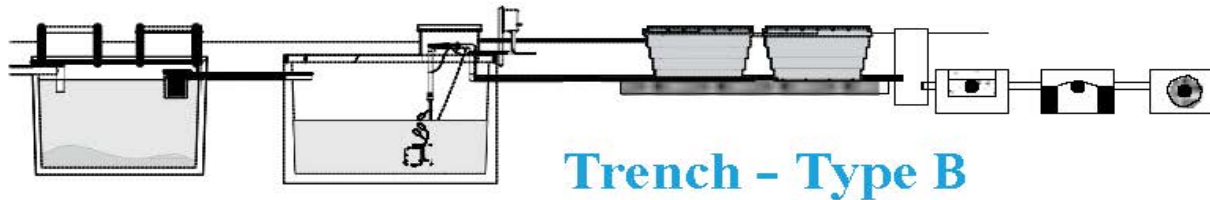
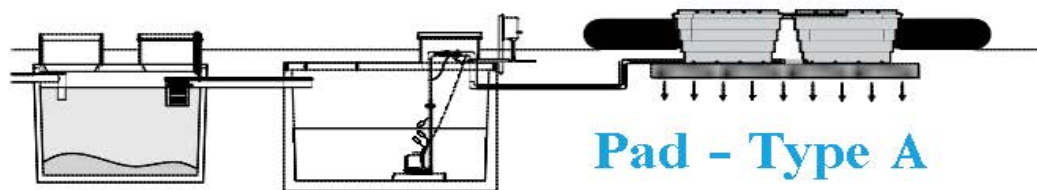


**Septic tank, pump tank, and peat modules
waiting for Commission inspection**



PEAT FIBER BED FILTER

Peat Module Installation Options





Field of Peat Fiber Module Filters

SALCOR UV DISINFECTION



Model
3 G



The Finishing Touch

- Gravity Flow to 6 GPM - Onsite Systems
- Quick Install In Ground or Pump Tank
- Environmentally Superior - No Harmful Byproducts/Enabling Water Reuse
- Energy Efficient - Uses Less Than 30 Watts
- Teflon® Film Resists Fouling - Continual Performance
- Electronic Performance Monitoring
- Unit and UV Lamp Two Year Warranty
- NSF and Other Third Party Tests Confirm Superior Bacteria and Virus "Kill"
- UL and oUL Certified, Standard 979
- Multiple Units Economically Treat up to 100,000 Gal/Day
- Minimum (Annual) Easy Maintenance
- NEMA 6P (Passed 30 Day UL Submergence Test)

Residential, Commercial & Municipal UV Leader Since 1978

Salcor Inc.

PO Box 1090, Fallbrook, CA 92088

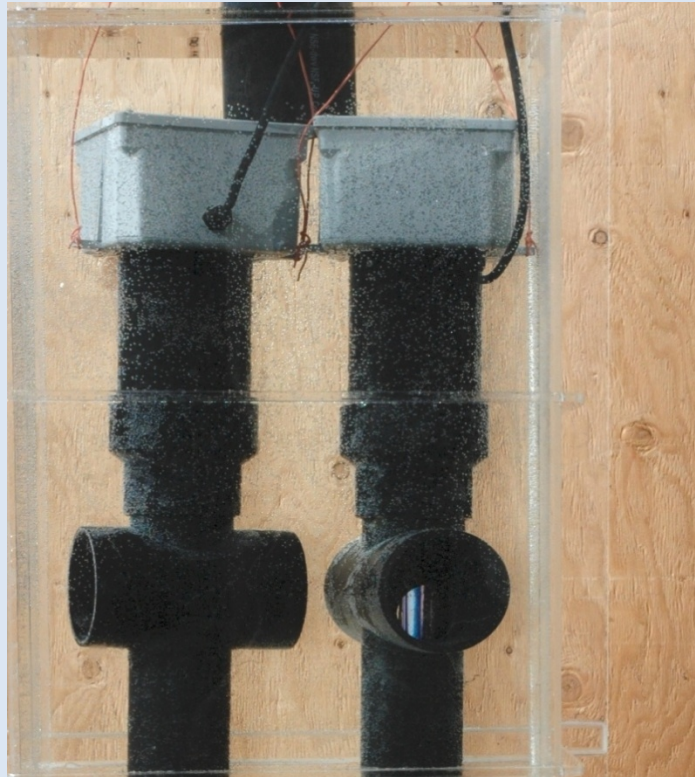
Made in the USA

(760) 731-0745

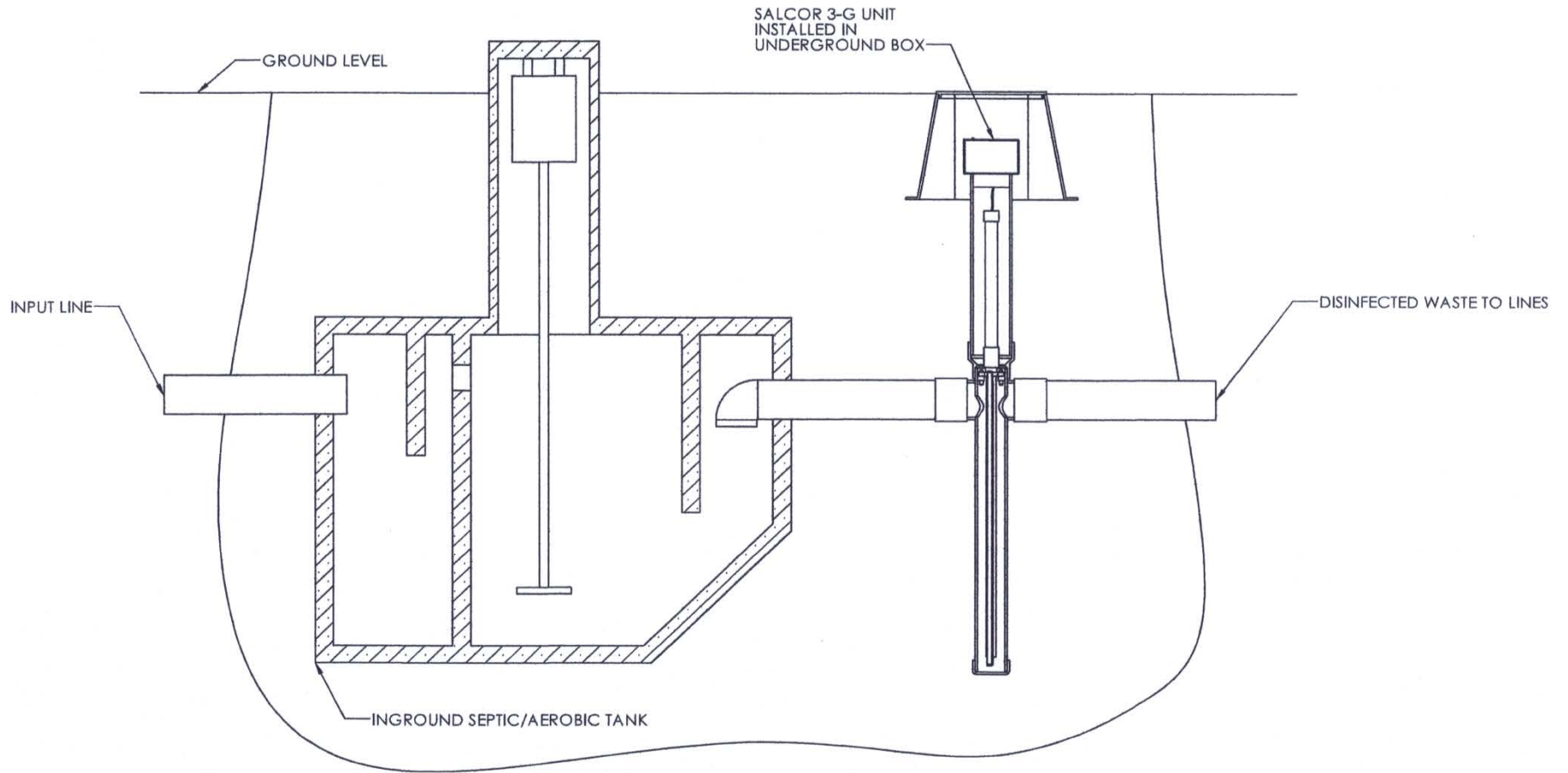
Fax: (760) 731-2405

"Everyone's Friend," Homeowners, Installers, O&M Providers, Environmental/Public Health Specialists, Engineers, Designers, Pretreatment Manufacturers, Treatment Plant Manufacturers

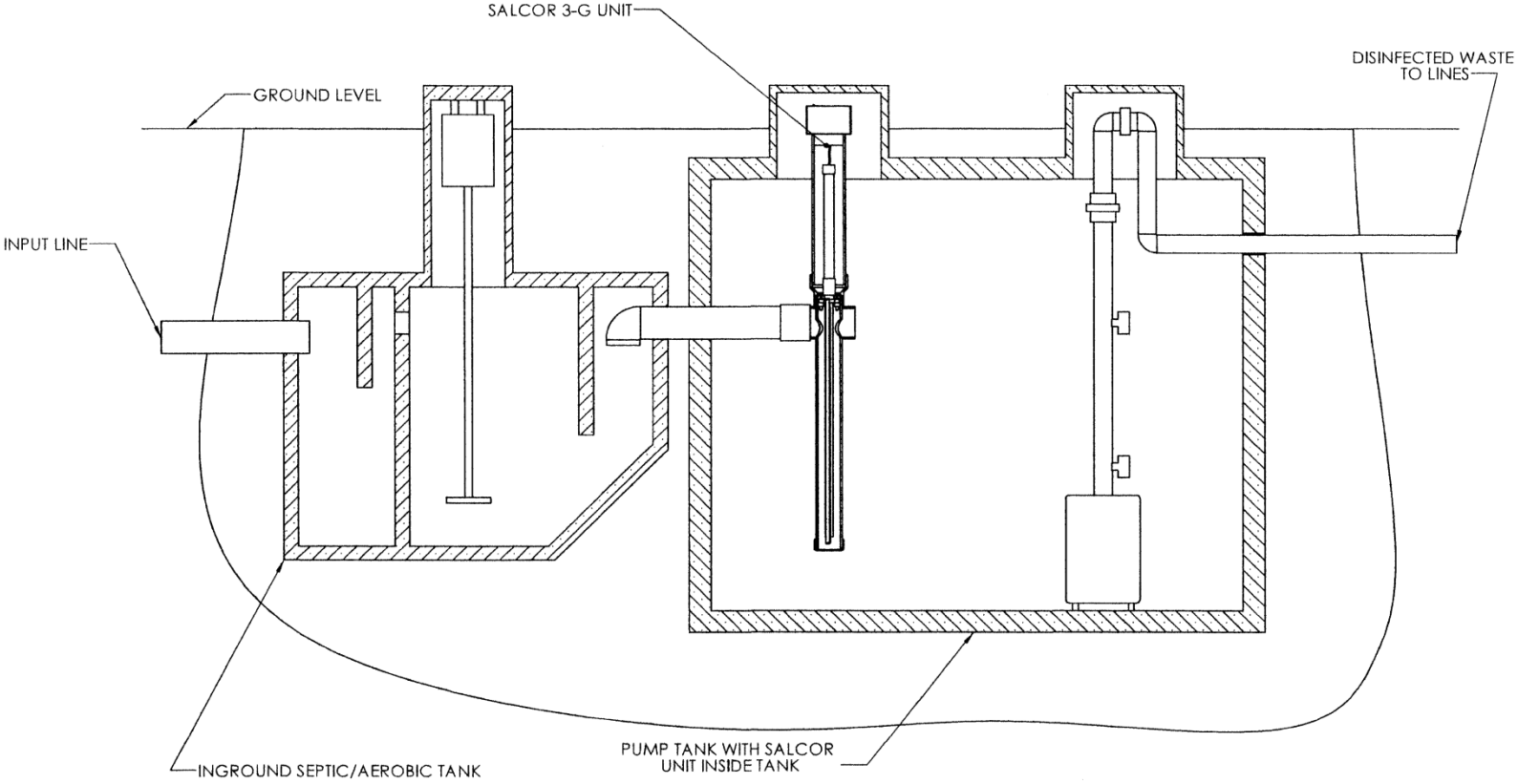
NEMA 6P 30-Day Submergence Test Two SALCOR Model 3G Units Operating in a Water Tank



In Ground Installation



In Tank Installation



Third Party Testing

University of Rhode Island

George Loomis 1999 - 2005

- FAST Unit effluent
- Annual Service
- Lamp replacement every two years
- Geometric mean fecal coliform count
9.4/100 ml

University of California, Davis

George Tchobanoglous, 2005

- Advantex AX – 20 Effluent
- Seven log MS2 Virus reduction
- Five log coliform reduction
- No micro organisms could be detected in the UV effluent

WASHINGTON STATE TESTING

- Advanced Treatment Unit & SALCOR UV
- NSF Standard 40 & WA State Fecal Coliform Reduction Protocol
- Duration 26 weeks
- Nineteen Tests have been initiated. Seventeen are complete, and two are in progress.
- 3G UV Effluent Fecal Coliform counts ranged from 2 – 35 per 100 ml (Geometric Mean)
- Demonstrates that the 3G UV unit operates reliably without maintenance over 6 months

Manufacturers Who Have Tested With the SALCOR 3G Unit Using the Washington State Protocol

1. Consolidated Treatment, Enviro-Guard .75	9. Jet Inc.
2. Consolidated Treatment, Multiflo	10. Enviro Flo
3. Delta Whitewater DF-60	11. Bord na Mona
4. Delta Whitewater,. Ecopod	12. Norweco - Singlair
5. Orenco, AX 20N	13. AK Industries, Hydro Action
6. Bio Microbics, Microfast 0.5	14. Aero Tech
7. Quanics, ATS-CSAT-8-AC-C500	15. Ecological Tanks, Aqua Safe,
8. Hoot Aerobics	16. Clearstream

WASHINGTON STATE TEST RESULTS SUMMARY

Treatment Type	Geometric Mean Fecal Coliform/100 ml
Suspended Growth	18 – 33
Fixed/Suspended Growth	26 – 56
Fixed Growth – Textile	1.7
Fixed Growth – Peat	2.1
Fixed Growth – Foam	16



Preparing For A New System



Typical narrow hollows present multiple problems for appropriately sighting systems



All direct discharge sites have NPDES permits and signs.



Sampling occurs during all seasons of the year in various watershed locations

<i>Home</i>	<i>Sampling Date</i>	<i>E. coli colonies at Port</i>	<i>E. coli colonies at Final Discharge</i>
Hess (10 feet between Port and Final Discharge)	8/3/2010	<10	<10
Hess (10 feet between Port and Final Discharge)	2/23/2011	<10	<10
Adkins (150 feet between Port and Final Discharge)	8/3/2010	<10	<10
Adkins (150 feet between Port and Final Discharge)	2/23/2011	<10	<10

Bacterial counts at the start and end of direct discharge pipes

Length of Direct Discharge Pipes. The Project believes that the distance from UV light to final discharge into the tributary does not have significant impact on bacterial counts. Some technology engineers and manufacturers involved in Phase 1 suggested that longer discharge lines could allow bacteria to regenerate or grow inside those lines. Phase 2 set up experiments at two installations to see if there were differences in bacterial counts in longer discharge lines. At one site (Hess) the distance from the UV light to the final discharge was 10 feet; at another (Adkins), 150 feet. Each had a sampling port immediately after the UV light. Samples taken from the port were compared to samples from the end of the discharge line. At both sites for every sampling, the bacterial counts were the same.

ARRA Green Wastewater Project

Lincoln County, WV

Direct Discharge Sampling

2010 - 2011

- Eight months of direct discharge sampling
- 18 different homes, 55 different samples taken
- All of the samples had fewer than 200 E. coli colonies per 100 mL
- 78% of the 55 samples had fewer than 10 E. coli colonies per 100 mL

ARRA Green Wastewater Project

Lincoln County, WV

Tributary Sampling

Phase 1, 2005 – 2010

- 40 systems installed
- Nine locations in watershed
- Seventy-nine samples taken
- Only twenty-one or **27%** of these samples had fewer than 200 E. coli colonies per 100 mL limit.

ARRA Green Wastewater Project

Lincoln County, WV

Tributary Sampling

Phase 2, 2010 – 2011

- 20 systems installed Using Bord na Mona Filter And Salcor UV System
- Eight tributary locations
- Fifty samples taken
- Twenty-nine or **58%** of these samples were positive and had fewer than 200 E. coli colonies per 100 mL

ARRA GREEN WASTEWATER PROJECT ***LINCOLN COUNTY, WV***

Tributary Sampling

Phase III, In Progress

➤ 30 systems installed using Bord na
Mona Filter and Salcor UV

System

➤ Results available next year

Mud River Project

Phase 3 Direct Discharge Samples:

E. Coli colonies per 100 mL / Acceptable Limit 200

<u>Home</u>	<u>12/29/2011</u>	<u>11/9/2011</u>	<u>11/2/2011</u>	<u>10/5/2011</u>	<u>8/29/2011</u>	<u>8/9/2011</u>
Glenna Adkins		Home vacant	Home vacant	Home vacant	Home vacant	Home vacant
Mona Adkins				<10	18 est	
Wayne Adkins		1,220	3,500		<10	<10
Clayton Billups		81 est			<10	99 est
Andrea Bowman				<10	<10	9 est
Teddy Canterbury					<10	
Doug Clark				<10	<10	
Elizabeth Elkins			<10		<10	9 est
Kevin Ferrell				<10		
Billy Hager, Sr.		9 est				
Edna Hager			27 est		81 est	
Glenna Hager	<10				9 est	
Jerry Hager	<10					
Lee Hager			<10		<10	
Richard Hager		<10				
Mark Hasen	<10					
Sherri Huffman		144 est		60,000		
Randy Justice		<10		<10		
Krystle Lilly			<10			
Grace McQuillan			<10		<10	<10
Maxel Roberts		<10		<10		
Joy Saddler			<10		<10	<10
Timmy Terry				54 est		
Lisa Young		<10				

Mud River Project: Post Installation Tributary Sampling: E. Coli Analysis

Italicized numbers are over acceptable limits of 200 colonies per 100 mL

Site ID, Tributary Homeowner	<u>12/13/11</u> Ric	<u>10/24/11</u> Ric	<u>9/13/11</u> Ric	<u>7/25/11</u> Craig	<u>6/20/11</u> Craig	<u>4/19/11</u> Craig	<u>3/21/11</u> Craig	<u>2/9/11</u> Ric	<u>1/18/11</u> Ric	<u>12/15/10</u> Ric	<u>10/20/09</u> Ric	<u>8/3/10</u> Ric	<u>6/21/10</u> Ric	<u>5/11/10</u> Ric	<u>4/5/10</u> Ric	<u>2/3/10</u> Ric	<u>Historic</u> 11/2005 to 12/2009
# 16 Wolf Branch <i>Diane Adkins</i>	90 Est.	90 Est.	171 Est.		920	180 Est.	117 Est.	450			300	480	400	108 Est.	144 Est.	350	<i>11 of 17 over</i>
# 51 House Road Culvert	54 Est.	220	<10		3300	45 Est.	1640 Est.	18 Est.			108 Est.		36 Est.		126 Est.	9 Est.	
# 28 Flat Creek <i>Delmar White</i>	81 Est.	81 Est.	108 Est.		1300	280	220	250			126 Est.	2000	200	210	108 Est.	135 Est.	<i>8 of 12 over</i>
# 40 Flat Creek <i>Kevin Ferrell</i>	72 Est.	108 Est.	72 Est.		2800	135 Est.	200	144 Est.			700	360		81 Est.	4500	90 Est.	<i>11 of 11 over</i>
# 12 Flat Creek <i>Below Sycamore</i>	72 Est.	63 Est.	108 Est.		470	171 Est.	210	108 Est.			200	135 Est.	450	580	135 Est.	54 Est.	<i>9 of 13 over</i>
# 52 Owl Creek <i>No homes or farm animals</i>	108 Est.	208 Est.	63 Est.		600	27 Est.	45 Est.	<10			81 Est.	350	63 Est.	135 Est.	27 Est.	<10	<i>2 of 4 over</i>
# 53 Bark Camp <i>Danny Collins</i>	1730 Est.	320 Est.	420	400 Above # 53: 550	300	90 Est.	171 Est.	54 Est.	90 Est.	27 Est.	153 Est.	108 Est.	350	870	189 Est.	126 Est.	<i>2 of 5 over</i>
#54A Left Fork <i>Above Obed's</i>	230																
# 54 Left Fork <i>Obed Clay</i>		35,000	250		2900	90 Est.	108 Est.	500			1000	470	90 Est.	1060	108 Est.	171 Est.	<i>7 of 8 over</i>
# 9 Dog Bone <i>Above Brenda Adkins</i>	500	2,180	28,300		860	880	400	5,500	3,000	3,500							<i>9 of 9 over</i>
# 55 Left Fork <i>Bulger & Left Fork Rd</i>	250	1,090	360		960	>200,00 0	40000	200	7500	50000							
# 21 Camp Lake View	18 Est.		<10									<10	18 Est.	9 Est.			<i>14 of 14 acceptable</i>

ARRA Green Wastewater Project **Lincoln County, WV**

Installing newer, more effective, alternative, and decentralized systems has positively impacted bacterial counts in the tributaries of the watershed.

Clearly, as more and more new systems are installed, the health of the watershed improves.

Green SRF Wastewater Projects

Phase 4

Left Fork Watershed of the Mud River

Tributary Sampling: E. Coli Analysis

2005-2013

Project's acceptable limit:

200 E. coli colonies per 100 mL

Site ID, Tributary	Total Samples November 2005 to January 2013	Percentage Acceptable 2005-2010	Percentage Acceptable January 2011 - January 2013
# 16 Wolf Branch <i>Diane Adkins</i>	29	0.12	0.75
# 51 House Road Culvert <i>Sampling Started 2/10</i>	10	N/A	0.8
# 28 Flat Creek <i>Delmar White</i>	30	0.44	0.58
# 40 Flat Creek <i>Kevin Ferrell</i>	28	0.12	0.83
# 12 Flat Creek <i>Below Sycamore</i>	30	0.42	0.73
# 52 Owl Creek <i>No homes or farm animals</i>	21	0.7	0.82
# 53 Bark Camp <i>Danny Collins</i>	25	0.67	0.62
#54A Left Fork <i>Above Obed Clay</i> <i>Sampling Started 12/11</i>	4	N/A	0.5
# 54 Left Fork <i>Obed Clay</i> <i>Sampling Stopped 12/11</i>	20	0.29	0.33
# 9 Dog Bone <i>Above Brenda Adkins</i>	22	0	0.08
# 55 Left Fork <i>Andrea Bowman</i> <i>Sampling Started 1/11</i>	12	N/A	0.17
# 21 Camp Lake View	19	1	1

Contacts

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Clean Water. Clean Air.

Celebrating
20 Years in
North America

