RCAP
Rural Community Assistance Partnership
"Improving the quality of life in rural communities"

Alternative Wastewater Solutions

County Sanitary Engineers Association of Ohio

Ben Howard, RCAP
June 4, 2019

Rural Community Assistance Program (RCAP)

Water & Wastewater Technical assistance

Communities <10,000 people

- Mostly <5,000 people
- Many with a few hundred

Funders:

Ohio Environmental Protection Agency | Division of Drinking and Groundwaters

United States Environmental Protection Agency

USDA Rural Development

Ohio Water Development Authority

Department of Health & Human Services · USA

All of the easy places have been sewered.

Now we are down to the hard ones,

and they get harder and harder each year.

New – **SCEIG Alternative Wastewater Solutions Committee** to identify and champion solutions for these area!

RCAP

- Meets quarterly

- Facilitate solutions for communities where conventional collection and treatment is not feasible

AWW

Alternative Wastewater Solutions

OhioAlternativeWastewater.Wordpress.Com

Small Communities Environmental Infrastructure Group

Alternative Wastewater Solutions

Survey of Alternative Systems

	Frequency	Units	Source
Energy	Monthly	kWh	Electric Bill
Energy	Monthly	$	Electric Bill
Labor	Bi-weekly	Operator Hours	Payroll
Labor	Bi-weekly	$	Payroll
Treatment Media	Varies	$	Vendor Invoice
Pumps	Varies	$	Service Invoice
Sludge Removal	Varies	$	Service Invoice
Inflow and Infiltration	Varies	Gallons	Field Data (pump run times at pump stations, weather data, total flow – MOR, metered drinking water)
Budget for End of Life Asset Replacement	Yearly	$	Annual Budget
Depreciation	Yearly	$	Income Statement / CAFR

What's Affordable?

USEPA

1.5% of the Median Household Income (MHI)

> 2% unaffordable for LMI Residents

USDA Rural Development recognizes these thresholds, uses for grant determinations.

United States Environmental Protection Agency | Office of Water 4606 | EPA 816-D-97-001 November 1997

EPA

Information for States on Developing Affordability Criteria for Drinking Water

				Unaffordable >2.5%
				>200%
	affordability			
Multiple Sector Study (1988)	Household affordability	Annual user charge (AUC) / Median household income (MHI)	>1.12%	
Rural Development Administration (Grant	Financial capacity	Debt service portion of annual user charge (AUC) -and-	>0.5% and MHI is below the poverty line or below 80% of the statewide nonmetropolitan MHI	
1991)				

U.S. EPA Affordability of the 1986 SDWA Amendments (1993)	Household affordability	Pre and post-SDWA costs as percentage of median household income	> 2.0% not affordable
		Pre and post-SDWA costs as percentage of median household income for impoverished households (worst case)	> 2.0% not affordable
		Aggregate pre- and post-SDWA costs as percentage of aggregate household income (best case)	> 2.0% not affordable

Amesville, Ohio Decentralized Project

Beyond capital project savings, a big factor in keeping customer rates affordable was the savings in annual Operations, Maintenance and Reserve costs.

RCAP

AMESVILLE WASTEWATER PROJECT

	PRELIMINARY ENGINEERING REPORT ALTERNATIVES (2005)				CONSTRUCTE	
Alternative	Centralized Alternative	Individual Alternative	Clustered Alternative	Preferred Alternative	Constructed Project (2008)	2009
Customers	84	84	84	84	84	82
PROJECT COSTS	**ESTIMATED**				**ACTUAL**	
Construction	$1,295,675	$ 952,249	$ 782,425	$ 817,515	$1,089,859	20% more tha
Bond	$ 129,567	$ 95,225	$ 78,243	$ 81,752		
Mobilization	$ 8,000	$ 8,000	$ 8,000	$ 8,000		
Contingency	$ 129,567	$ 95,225	$ 78,243	$ 81,752	$ 13,491	
Design and survey	$ 140,000	$ 177,000	$ 140,000	$ 140,000	$ 140,000	
Construction inspection and mgmt	$ 44,000	$ 44,000	$ 44,000	$ 44,000	$ 105,700	
CDBG administration	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	
Ohio EPA PTI Fee	$ 8,422	$ 6,190	$ 5,086	$ 5,314	$ 5,513	
Land/easement acquisition	$ 5,000	$ 15,000	$ 1,000	$ -	$ -	
Pre-Development Plan	$ -	$ -	$ -	$ -	$ 13,600	
Additional Engineering	$ -	$ -	$ -	$ -	$ 23,000	
OWDA DL Fee	$ -	$ -	$ -	$ -	$ 400	
Startup Operator	$ -	$ -	$ -	$ -	$ 11,700	
Environmental Review Advertisements	$ -	$ -	$ -	$ -	$ 400	
AEP Electric Installation	$ -	$ -	$ -	$ -	$ 1,640	
Audit	$ -	$ -	$ -	$ -	$ 9,000	
Fencing	$ -	$ -	$ -	$ -	$ 25,000	
TOTAL PROJECT COST	**$ 1,770,232**	**$ 1,402,888**	**$ 1,146,996**	**$ 1,188,332**	**$ 1,449,303**	
ANNUAL OMR COSTS	**ESTIMATED**					
Operator (treatment centers)	$ -	$ -	$ 1,600			
Operator (individual units)	$ -	$ 15,000	$ 1,500			
Operator (treatment plant)	$ 24,000	$ 6,500	$ 6,500			
Sampling and monitoring	$ 800	$ 800	$ 800			
Energy costs (units)	$ -	$ 1,600	$ 200			
Energy costs (treatment plant)	$ 2,000	$ 300	$ 300			
Treatment plant repair	$ 2,000	$ 300	$ 300			
Pump replacement	$ -	$ 6,300	$ 785			
Bulb replacement	$ -	$ 2,000	$ 250			
Septic sludge removal	$ 800	$ 4,800	$ 4,800			
Additional billing	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 2,000	[illegible]
Audit fees	$ -	$ -	$ -	$ -	$ 1,500	$ -
Other operating expenses	$ -	$ -	$ -	$ -	$ -	$ 1,576
TOTAL ANNUAL OMR COSTS	**$ 31,100**	**$ 39,100**	**$ 18,535**	**$ 12,015**	**$ 15,335**	**$ 10,230**
FINANCING						
ARC Grant	$ 250,000	$ 250,000	$ 250,000			
CDBG W&S Grant	$ 500,000	$ 500,000	$ 500,000			
OWDA planning & Development Grant	$ 110,300	$ 110,300	$ 110,300			
OPWC Grant	$ 59,999	$ 59,999	$ 59,999			
OPWC Loan 20 0.00%	$ 90,000	$ 90,000	$ 90,000			
OEPA Loan 20 0.00%	$ 759,933	$ 32,589	$ 136,697			
TOTAL FINANCING	**$ 1,770,232**	**$ 1,042,888**	**$ 1,146,996**			
ANNUAL DEBT	**ESTIMATED**					
Annual OPWC Payment	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500
Annual OEPA Payment	$ [illegible]	$ 1,629	$ 6,835	$ 8,902	$ 21,950	[illegible]
ANNUAL DEBT & OMR	**$ 73,597**	**$ 45,229**	**$ 29,870**	**$ 25,417**	**$ 41,785**	**$ 36,685**
AVERAGE MONTHLY COST PER EDU	**$ 63.89**	**$ 39.26**	**$ 25.93**	**$ 22.06**	**$ 36.27**	**$ 37.28**
					$ 40.00	ACTUAL

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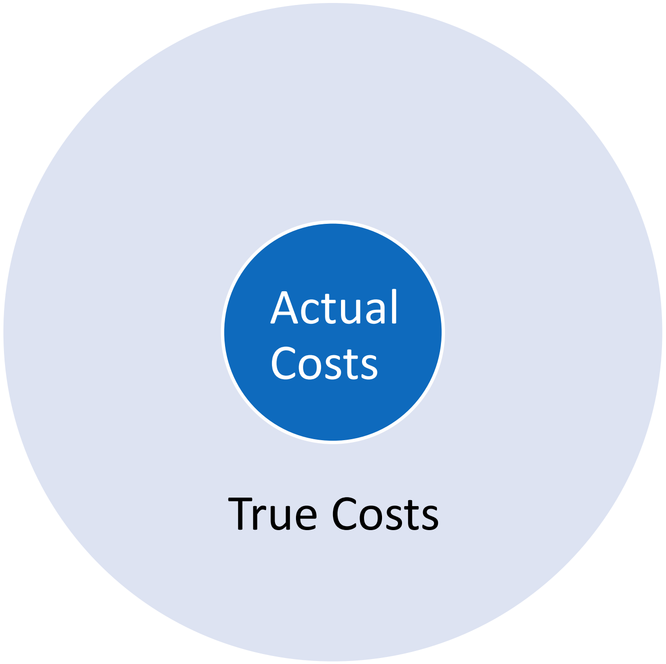
FINANCING						

The Small Utility Challenge

Smaller Economies of Scale, Smaller Budgets

Actual costs: Daily costs of operations, utilities, compliance and expendables (chemicals &supplies, etc.)

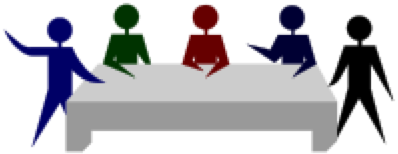
True Costs: Capital improvements planning, preventive maintenance, replacement, capital depreciation, asset management, debt reserves, and capital reserves.



For utilities to work for our communities in the long-term, they need to focus on the true costs, which requires TMF expertise

Thin resources = Thin TMF

Part time mayors, city councils, administrators

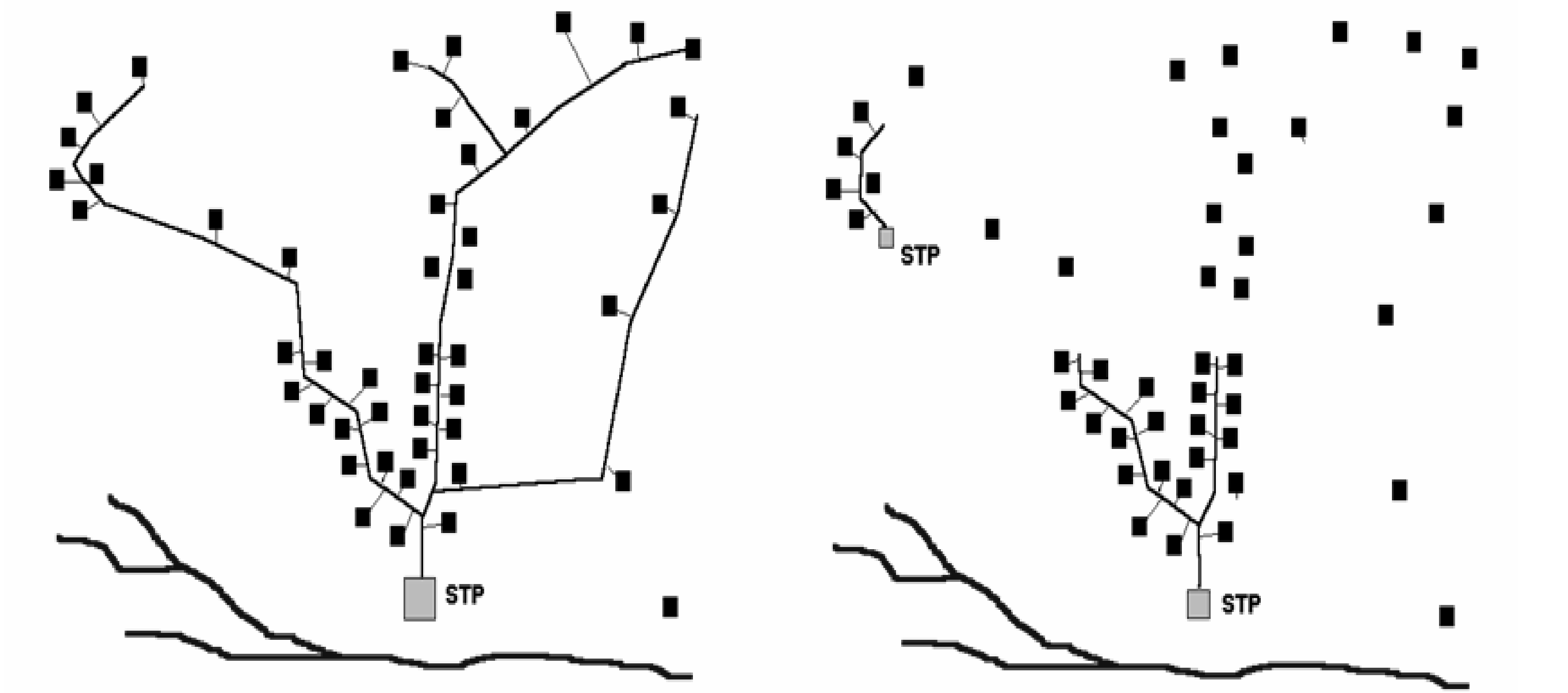


Labor pool

Strategy based on volunteers

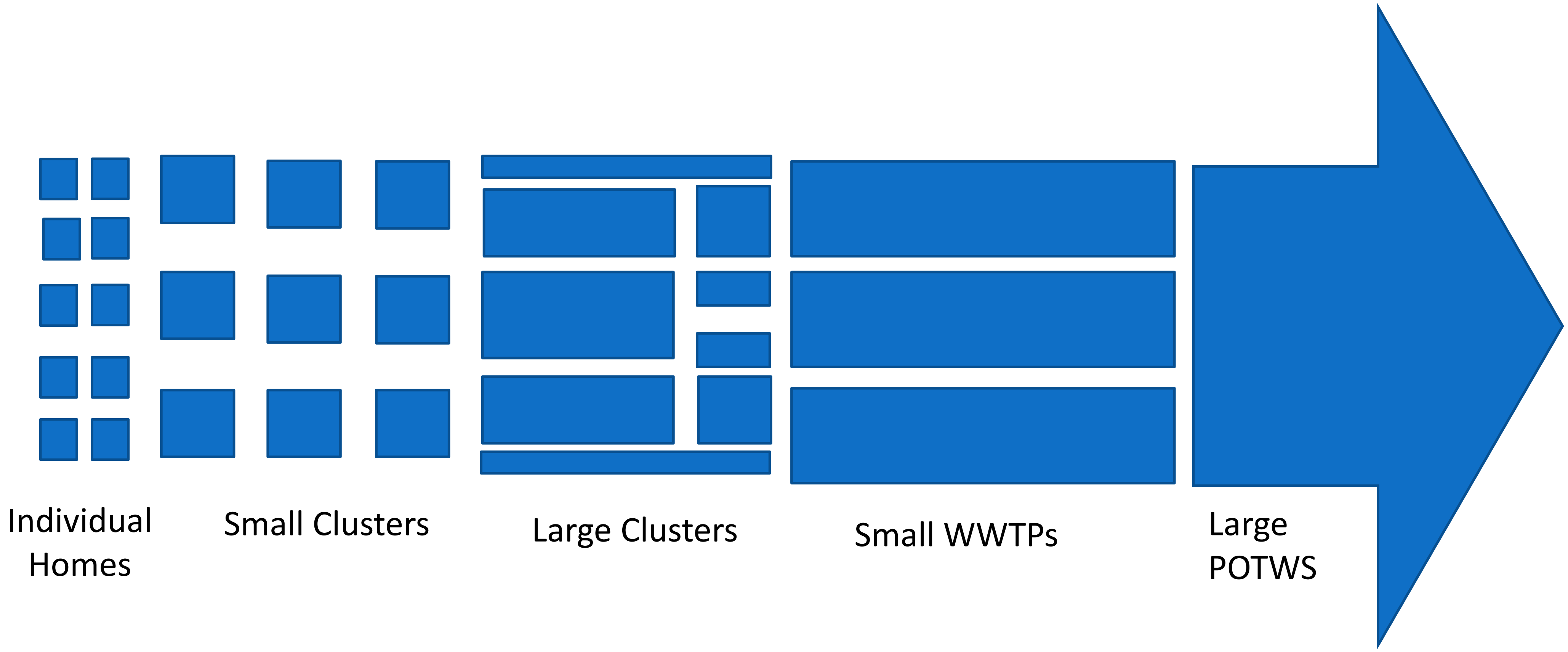
Conventional vs. Alternative

(Centralized) *(Decentralized)*



In reality, it's a spectrum of how decentralized, not one or the other

Wastewater Management Continuum



Cost of collection system can be as high as 80% of a conventional wastewater system.

Avoid this cost with decentralized wastewater systems by treating near the point of generation.

1997 USEPA *"The Sewer Isn't Coming"*

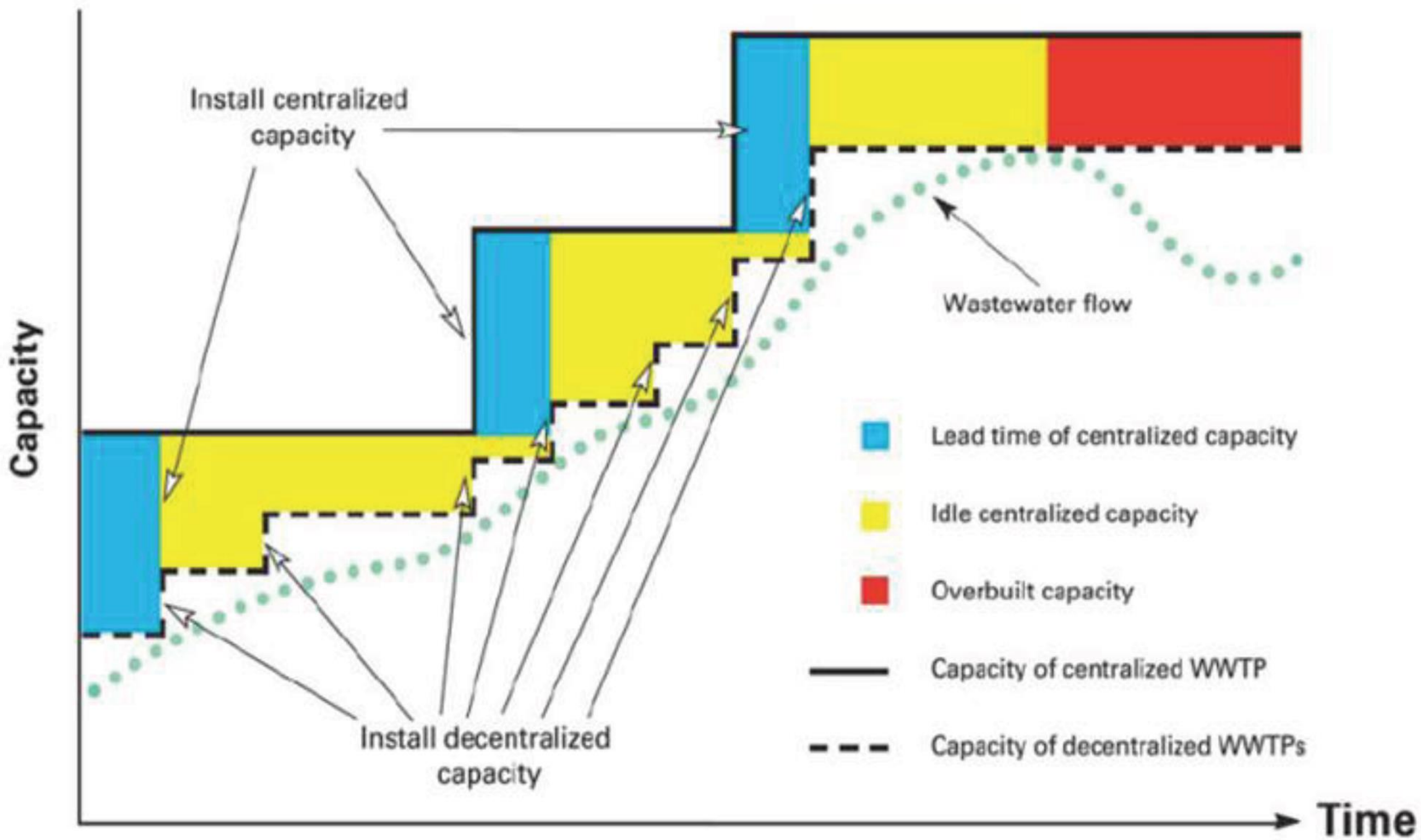
"Adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas"

Underscores a focus shift from construction of POTWs to O&M sustainability.

Keep Costs on a Short Leash

Also, consider I&I

"Pay as You Grow" or "Right-Sized, Just-in-Time"



Source: Tetra Tech

Why an Alternative Wastewater System?

Cost

- Lower project costs
- Much lower operation / maintenance costs

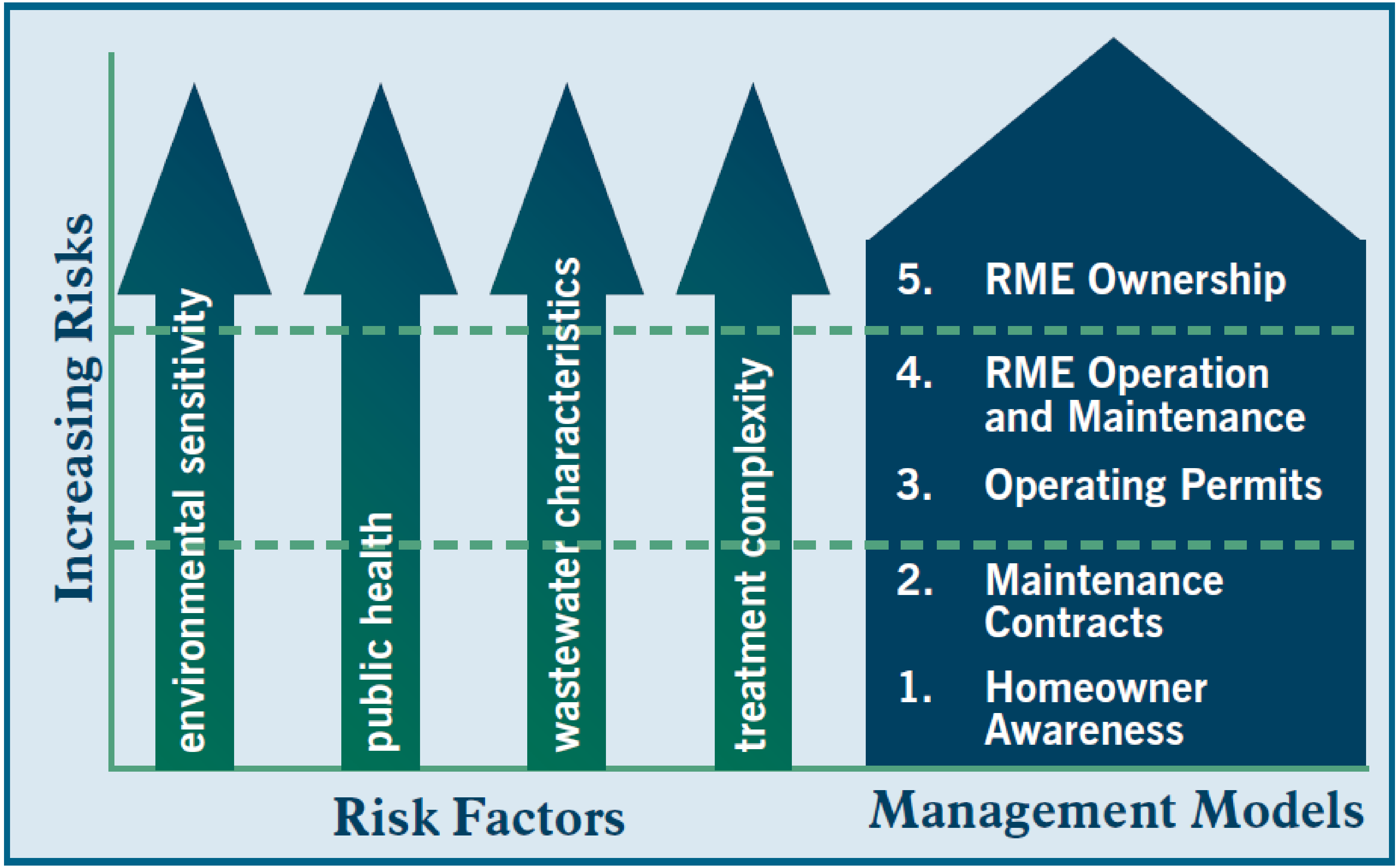
Simplicity

- Smaller environmental impact
- Easier to operate
- Employs the most passive technologies

Efficiency

- Maximizes soil dispersal and reuse opportunities (where possible)
- Targets the biggest problem areas and minimizes infrastructure investment

Types of Management



Source: *Handbook for Managing Onsite and Clustered (Decentralized) Wastewater Treatement Systems, EPA*

Responsible Management Entity (RME) may include:

Several small conventional centralized systems
Several cluster and onsite systems

WERF – approx. 750 EDUs for financial viability

T-M-F

Avoid high costs of interconnection and choose appropriate decentralized system according to development density, site conditions, and waste characteristics.

“The barriers to formatting (small and decentralized wastewater system) infrastructure are neither technological nor economic – they are institutional”

(Lindall, 2000)

What role might County Sanitary Engineers play?

How might we collaborate with County Health Departments?

Other comments / ideas?

Summary:

1

- Conventional collection & treatment systems are not affordable or sustainable in all communities.
- Those who plan, operate and fund rural systems are increasingly seeing unsewered area projects for which a traditional approach cannot work.

2

- There are organizational and technological alternatives!
- Alternative systems can offer significant costs savings, both in construction and long-term operation.

3

- Regardless of the system and technology, very small systems are much more difficult to sustain over time.
- Counties and larger entities are in a better position to effectively operate, manage, finance and sustain these systems.

Questions / Comments / Suggestions

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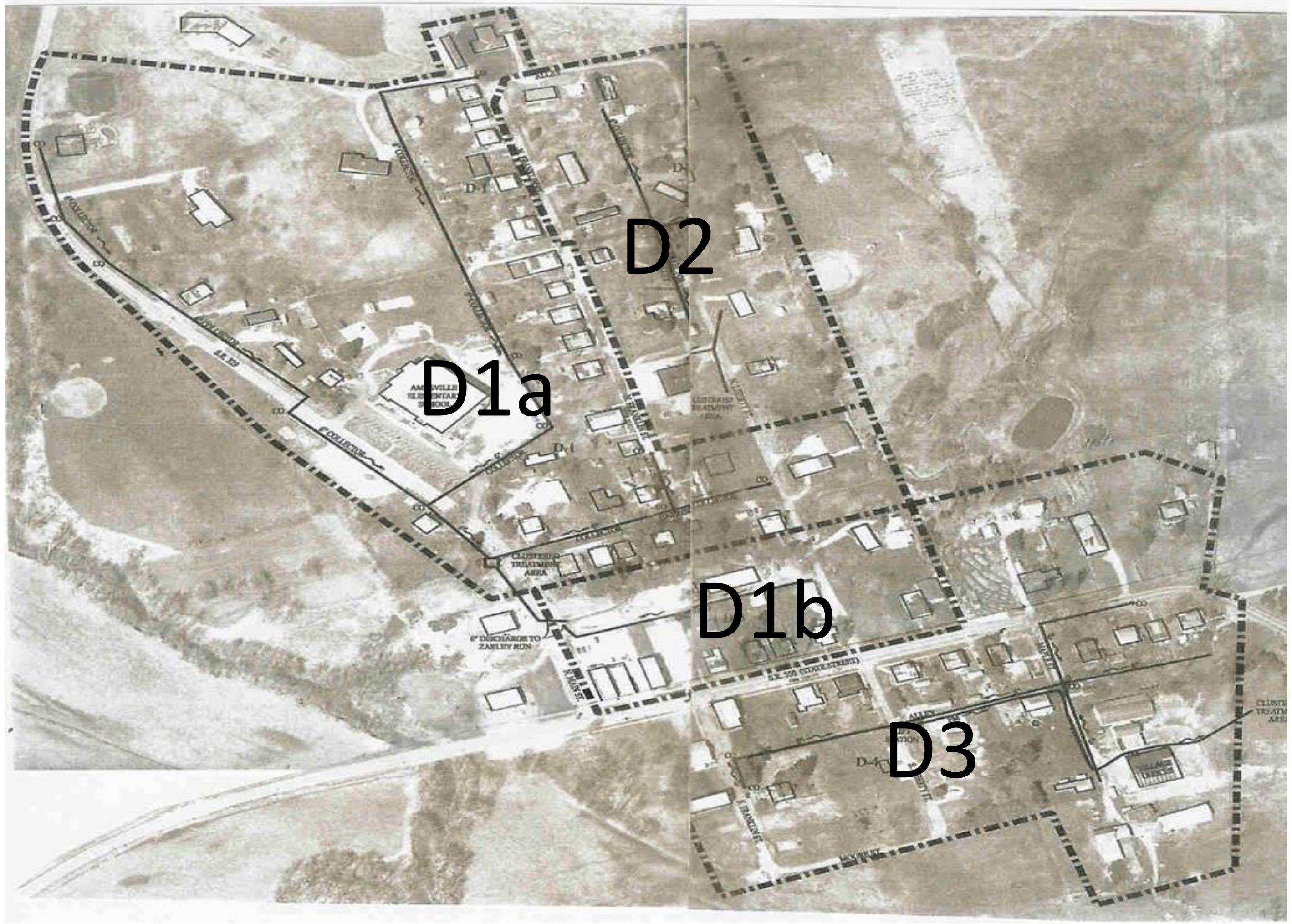
Example of Amesville

Amesville Project



~~One large collection system~~

4 drainage areas

(Districts 1A, 1B, 2 and 3)

Amesville Decentralized Wastewater Project

- Small Diameter Gravity Lines to Septic Tanks (individual and clustered)

- Septic Tank Effluent Gravity (STEG) collection lines and conventional force main lines to clustered AdvanTex® treatment units

- Treatment units discharge final effluent to Federal Creek or Zarley Run

AdvanTex System
-Recirculating packed bed filter that uses a highly absorbent engineered textile for the treatment media

Finer Details

2 of 4 collection systems repurposed existing storm sewers to transport final effluent from the treatment units to streams

- Clustered treatment sites located in close proximity to existing storm sewers
- Eliminated construction costs for discharge line
- Sampling is completed at the point where the effluent from the treatment unit enters the storm sewer

Amesville's Operators

- Current resident without water/wastewater experience
- Council member is backup operator
- Both obtained Class A Certification
  - Eases succession planning
  - No need to advertise to find experienced operator

Amesville - Project Costs

Item	Cost
Construction, Bond, Mobilization (Bid)	$ 1,089,859
Contingency	$ 13,491
Design & Survey	$ 140,000
Construction Inspection/ Management	$ 105,799
Additional Engineering	$ 46,600
Fencing	$ 25,000
Design Loan Fee	$ 400
Startup Operator	$ 11,700
CDBG Administration	$ 10,000
Ohio EPA Permit-To-Install	$ 5,513
Environmental Review Advertisements	$ 400
AEP Electric Installation	$ 1,640
Auditing Expenses (Federal Funds)	$ 9,000
Low-Income Hookups	$ 100,000
TOTAL PROJECT COST	$ 1,549,303

Amesville Annual Operating Costs

	Cost
Village Operator ($15/hr x 5 hrs/wk)	$ 4,000
Sampling & Monitoring	$ 800
Energy Costs	$ 1,200
Pump Replacement	$ 785
Bulb Replacement	$ 250
Septic Sludge Removal	$ 4,800
Clerical, Office Equipment, Billing	$ 2,000
Audit Fees	$ 1,500
TOTAL OPERATING COSTS	$ 15,355

Amesville Monthly Sewer Rate

Annual Operating Costs	$15,335
OPWC Loan Payment	$ 4,500
EPA Loan Payment	$21,950
Total Operating & Debt	**$41,785**
Divided By	96 (EDUs)
Annual Cost/Customer	$435.26
Divided By	12 (months)
Av. Mo. Cost/Customer	$36.27
Actual Avg. Sewer Rate	**$40.00**

Amesville – Alernative vs Conventional

	Alternative	Conventional
Total Cost	$ 1,549,402	$ 2,205,823
Total Operating Cost	$ 15,335	$ 33,100
Average Monthly Sewer Rate	$ 40.00	$ 84.98

Cost Data Observations (WERF, 2009)

Cost data was gathered from public and private systems owners and operators who were able and willing to share. Some amount of cost information was obtained for over 60 systems in eight states. Both construction and operational costs per treated gallon of wastewater vary widely for large-scale decentralized wastewater systems, with little correlation found between dollars spent and system performance or reliability.

- Initial capital costs ranged from $6 to $140 per gallon of daily design wastewater flow, but rose to $18 to $494 per gallon of average daily flow of treated wastewater once the systems were in operation, indicating that in many cases the systems might be oversized as designed.

- Monthly reported sludge removal/hauling costs ranged from $0.0034 to $0.92 per gallon of daily treated wastewater. Observed correlations between high effluent solids levels and hauling frequency point to operational problems at a given facility.

- Power costs ranged from $0.01 to $0.81 per average daily gallon of flow. Power usage tended to be higher for activated sludge plants than for systems using some type of packed media/filtration process as the principal method of secondary or advanced treatment.

- Operationally, residential user charges for cluster/community systems ranged from $15 to $80 per month.