Barriers to Using Decentralized Wastewater For Community Solutions: 2007 to 2019

Mary Clark
Indirect Discharge Program Manager, State of Vermont
Why Should We Consider Decentralized Wastewater Systems?

- Uses soils to treat and disperse water back into the environment;
- Can provide similar or better treatment as direct discharge systems;
- Can be cost effective by saving piping wastewater distances;
- Scalable/phasing flexibility;
- Frees up land uses and facilitates economic growth.

20,000 GPD Community System in Recreational Field, Warren, Vermont
Public Perceptions

- Centralized sewers are the ultimate solution;
- Older/substandard onsite systems can pollute groundwater and surface waters;
- Onsite systems can’t treat wastewater to the same levels as a WWTF;
- Failing systems are individual homeowner problems, not the community;
- Solutions cost too much to construct and operate
Path to Wastewater Solutions for Villages

**Typical Engineering Studies**

<table>
<thead>
<tr>
<th>Pre-Engineering Tasks</th>
<th>Feasibility Study</th>
<th>Preliminary Engineering Report (PER)</th>
<th>Other Tasks - Depending on Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help for a local wastewater steering committee</td>
<td>Hire an engineering firm</td>
<td>Engineer completes a PER if project will involve public funds for construction</td>
<td>Additional work may be necessary before proceeding to final design</td>
</tr>
<tr>
<td><strong>What do you want?</strong></td>
<td><strong>Determine existing conditions:</strong></td>
<td><strong>Report on work so far:</strong></td>
<td><strong>Wastewater project ready for:</strong></td>
</tr>
<tr>
<td>Identify community vision for future of village</td>
<td>• Review work to date</td>
<td>• Existing conditions</td>
<td>• bond vote</td>
</tr>
<tr>
<td>Survey businesses &amp; residents on plans for future</td>
<td>• Conduct soil tests and other site investigations (obtain archaeological review)</td>
<td>• Need for project</td>
<td>• final design</td>
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<tr>
<td><strong>What do you need?</strong></td>
<td><strong>Conduct environmental review</strong></td>
<td><strong>Alternatives considered</strong></td>
<td>• construction</td>
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<td>Survey locations and status of existing wells and septic systems</td>
<td><strong>Identify alternative wastewater solutions</strong></td>
<td>• Recommend wastewater (or drinking water) project:</td>
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<tr>
<td>Identify permitting and enforcement concerns including archaeological</td>
<td>• Propose 3 or more alternatives</td>
<td>• Preliminary design</td>
<td>• Preliminary purchase and sale</td>
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<td>Test wells to determine if there is contamination</td>
<td><strong>Evaluate alternatives</strong></td>
<td>• Project schedule</td>
<td>• Zoning and other land use permitting issues</td>
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<td><strong>What solutions are possible?</strong></td>
<td>• Identify pros and cons of each alternative</td>
<td>• Permit requirements</td>
<td><strong>Securo funding</strong></td>
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<td>GIS analysis of soils and environmental constraints</td>
<td>• Develop cost estimates</td>
<td>• Sustainability</td>
<td>• Coordinate with business and housing projects that need wastewater</td>
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<td>Preliminary soil tests</td>
<td>• Identify finance strategies and possible fee structures</td>
<td>• Financing</td>
<td>• Income surveys to qualify for USDA-RD funds</td>
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<td>Investigate available technologies</td>
<td>• Identify long term management structures</td>
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<td>• Apply for public funds</td>
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<td><strong>How to Proceed?</strong></td>
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<td></td>
<td>• Engage public in preparation for bond vote</td>
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<td>Define a scope of services</td>
<td></td>
<td></td>
<td>• Set up a local loan program</td>
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<td>Discuss with community and stakeholders</td>
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<td></td>
<td><strong>Decide on system management</strong></td>
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<td></td>
<td></td>
<td>• Who will be responsible for long term system management?</td>
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<td></td>
<td></td>
<td></td>
<td>• How will fees be structured and collected?</td>
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US EPA Funded Study
Via the Water Research Foundation 2004-2007

- Led by Stone Environmental Inc.
  http://ndwrcdp.werf.org/research_project_04-DEC-2.asp

- Summarizes perceptions of industry representatives to identify
  - Barriers to using decentralized wastewater solutions and
  - Opportunities for overcoming the barriers
Reported Major Categories of Barriers

- Consulting engineer’s financial reward for using centralized wastewater treatment systems
- Engineer’s lack of knowledge of decentralized systems
- An unfavorable regulatory system for decentralized systems
- Lack of systems thinking applied to wastewater issues
Barriers: Funding

- Engineering contracts are higher for larger scaled projects
- Engineers are used to sewer-type projects with increased design and oversight fees vs. smaller scaled specs and limited inspections
- Funding programs like the Clean Water State Revolving Fund (SRF) are designed for large sewer projects
  - Priority point system categories
  - Federal and State limitations for qualified projects
  - Additional Federal paperwork/studies
Recommended Actions for Improving Funding

- SRF - expand eligibilities to allow decentralized solutions
  - Federal and state statutes changed to allow use
  - Priority point system ranking changes for better competition of funds
  - Expand eligibility to include individual upgrades
- USDA Rural Development
  - Better priority ranking system
  - Cost-effectiveness
- Incorporate integrated water resource management, public health and environmental risks to ranking factors
Funding: 2019 Snapshot

- CWSRF was expanded in 2008 ARRA infrastructure efforts
- CIDWT/Univ. of TN: Projecting Costs of Decentralized Wastewater Management Options, 2010
- New Water Infrastructure and Resiliency Finance Center
  - https://www.epa.gov/waterfinancecenter

The Center's Strategic Goals

- Research
- Advise
- Innovate
- Network
Funding: 2019
Vermont Snapshot

- Statutes revised to expand on eligibilities to decentralized wastewater, stormwater, CSO’s, green infrastructure, water quality
- State Env. Protection Rules, Chapter 2 revised 12/1/2017
  - New definitions for water pollution abatement and control facility; publicly owned treatment works and privately-owned wastewater systems
  - New Project Rating System for determining Priority List Criterion
Funding: 2019
Vermont Snapshot

- Solving Village Water/Wastewater Infrastructure Solutions, Statewide Support
- DEC NBRC Grant
  - Three pilot villages; East Burke, West Burke, and Wolcott
  - Goal is to help communities get to bond vote/final design & construction stages
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<td>- Identify community vision for future of village</td>
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<td>- Legal agreements with landowners, land trusts and other entities</td>
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Barriers: Education

- Decentralized designs not a part of engineering course curriculums
- Newer decentralized technologies and techniques may not have a proven track record, limited studies
- Engineer’s soil and groundwater training may not be applicable to soil-based wastewater treatment and dispersal systems
Recommended Actions for Improving Engineer’s Education

- Increase Curriculum Topics to Include Decentralized System Design
- Increase Funding for University Research of Decentralized Systems
- Increase Data Sharing on Decentralized System Performance
- Apply Reliability and Costing Tools in an Asset Management Framework
Education: 2019 Snapshot

- University-Sponsored Regional Onsite Wastewater Training Centers
- Universities including decentralized curriculum
- Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT)
- National Assn. of Wastewater Technicians (NAWT.org)
Education: 2019 Snapshot

- Water Finance Center
  - New onsite septic system learning module for homeowners and database of various funding programs
- Water Research Foundation (www.werf.org) Research Projects and Webinars
  - 2018 LIFT Technology Webinar Series
  - 2016 Onsite Non-Potable Water Programs
  - 2010 When to Consider Distributed Systems in Urban and Suburban Context
- One Water
Education: 2019 Snapshot

- Examples, Text Books And Guides
  - Engineering:
    - *Soil-based Wastewater Treatment* (Jose A. Amador and George W. Loomis, 2018)
  - UMN: *Small Community Wastewater Solutions, H2O&M, Community Septic System Owner’s Guide*
Education: 2019 Snapshot

- New On-Line Training
  - NOWRA Online Learning Academy: NOWRA.org
- New Curriculum
  - NOWRA: Advanced Design of Onsite Wastewater Systems
What’s your state/town doing to solve education barriers?
Barriers: Complex Regulatory System

- Decentralized regulatory jurisdictions at state, county and local boards of health
- No centralized approval process for new technologies/techniques that is universally accepted
- Regulations may be too lax, too inflexible, too prescriptive
Recommended Actions for Improving The Regulatory Climate

- Achieve greater uniformity in decentralized technologies
  - Model Regulations
  - Decentralized Wastewater Glossary
- Improve data sharing
  - Regulators have high-quality permit, maintenance and monitoring tools
- Brainstorm how regulatory framework can facilitate use
Regulatory Climate: 2019 Snapshot

- Decentralized Glossary published
- No major changes to complex regulatory scheme
- SORA listserv important communications bridge amongst regulators
- EPA/Chesapeake Bay watershed nutrient data sharing agreement
- Use of proprietary and government data management programs
Regulatory Climate: 2019 Vermont Snapshot

- New Wastewater System & Potable Water Supply Rules including new design criteria like for bottomless sand filters, eliminating need for “perc” test, adding wastewater strength criteria
- Working on reducing barriers between these rules and Indirect Discharge Rules (6,500 GPD+ indirect discharge systems)
  - Design criteria, redundancy
  - Monitoring, inspection and reporting
  - Annual operating fees, 5-year permit renewals
What’s your state/town doing to solve regulatory barriers?
Consulting engineers are not required to consider decentralized solutions when conducting community alternatives analyses.

The unintended consequences of siloed regulatory programs.

There is a lack of information on assessing needs, life-cycle costing.
Recommended Actions for Improving Use of Systems Engineering

- Require wastewater planning to include relationships to other water sectors
- Utilities encourage integrated water resources approaches
- Train engineers in broad systems thinking
Systems Engineering: 2019 Snapshot Continued

- Interdisciplinary Engineering
- Sustainable Community Development
- Ecological Design
- WRF & WEF LIFT Intelligent Water Systems Challenge
Systems Engineering: 2019 Vermont Snapshot

- Integrated Water Resources Project (Burlington, Vermont)
- Network Analysis Tool
Integrated Water Quality Planning: Municipal Wastewater and Stormwater

- Examine all obligations as a whole
- Identify the community's relative priorities for addressing human health and water quality improvements (and what tools will used preferentially, such as green infrastructure), and then
- Address these priorities through appropriate sequencing and scheduling of work based on implementing the projects with the highest cost benefit (including non-water quality related benefits) first.
Network Analysis

- Identifies existing community network connections,
- Key local features,
- Ways to enhance network functioning
Network Analysis Overview

- Two main network features:
  - Nodes (Circles); could be people, places, organizations
  - Edges (Links); relationships between nodes

- Insights:
  - Spreading (resources, disease, ideas, etc.)
  - Robustness and fragility
  - Optimization
Cultural Resources Network

Andrea Wright - Project Delivery Bureau-Enviro Eng.
Paul Bruhn - PTV
Michael Descroyers - DPS-VDFE
Karen Freeman - VT-HCB
John Crock - UVM-Anthropology
Judith Ehrlich - VTrans-Historic Preservation
Tom Visser - UVM-Historic Preservation
Laura Trieschmann - State Historic Preservation Office

Engineering Network

Luce Hillman - UVM-Facilities
Deb Sachs - Netzero VT
Kathy Beyer - Housing Vermont
Kari Goetze - Efficiency Vermont
Bob McCullough - UVM-Historic Preservation
Jamie Duggan - DHP-VDHCD
Dryver Husson - UVM-ME
Nick Artim - Heritage Preservation Group
Jerry Francis - Shelburne Farms
John Lens - UVM-CEE
Donna Rizzo - UVM-CEE
Bob Neeld - Engineering Ventures
Doug Porter - UVM-CEE
Carolyn Carlson - VTrans-Bridges
Mandar Dewolkar - UVM-CEE
Asim Zia - UVM-CDAD
What’s your state/town doing to solve systems thinking barriers?
Conclusions: More Work to Do!

- The use of decentralized systems continues to lag due to barriers
- The good news is we have a strong team at EPA that is dedicated to finding solutions for our industry
- The EPA MOU Partnership work and strategic goals are developing products that will move us forward
Questions?