Increasing demands for public dollars amplify needs to manage OUR infrastructure

• Issue
  – Public health
  – Environmental Quality
  – Community investment
  – Homeowner investment
  – Tax base

• Responsible Party
  – Health Department
  – Environmental agency
  – Elected officials
  – Tax payer
  – Elected officials
Operation and Management Keys to a Sustainable Onsite Wastewater Infrastructure
Presentation to NAWT Education Day Seminar
Louisville, Kentucky
By
R. Rubin, Professor Emeritus, NCSU-BAE and Senior Environmental Scientist
McKim and Creed, Raleigh, NC
Acknowledgement

Thanks to Tom for organizing this Education day session as a part of the Pumper Show and Convention
History

• Over 100 years performance history –
• Recent interest in performance monitoring
  – System performance
  – Environmental impacts
  – Management systems
Recognition

- The USEPA recognizes onsite and decentralized wastewater systems as a permanent and essential element of the nation’s wastewater infrastructure...
- Onsite systems MUST be managed as an element of infrastructure...
- Partnerships Essential
Vision:

Decentralized wastewater systems are appropriately managed, perform effectively, and are widely acknowledged as components of our nation’s wastewater infrastructure.

Mission:

EPA will serve as a catalyst for improving system performance through partnering to upgrade professional standards of practice and institutionalize the concept of perpetual management.
Responsible Management

• Where site and soil conditions allow, traditional, low maintenance options remain the option of choice

• Where site and soil conditions pose some limitations, alternative treatment and dispersal options become the option of choice

• Regardless – systems must be managed
Responsible Management Entity (RME)

- Responsible for activities necessary to sustain systems in service area
- Legal entity with Managerial, Financial, and Technical capacity to assure long term, cost effective management
- Professionals staff required functions
Treatment Systems/Dispersal Systems and the Organization

- **Treatment** – Component of System that Facilitates Physical, Chemical, Biological Processes that Render Liquid Suitable for Dispersal into Receiver Environment
- **Dispersal** – Component of System that Facilitates the Uniform Distribution of Liquid into Receiver Environment
- **Organization** – Component that assures MFT capacity in perpetuity
These management services/activities include, but are not limited to:

1. Inspection of onsite systems to assure operational status
2. Monitoring vital system functions
3. Operate and maintain system components (pumps, tanks, controls, field)
4. Measuring indicators of system performance and status
5. Reporting status of systems to homeowners, regulatory agencies, and manufacturers
6. Collect operational records regarding components of systems (pumps, controls, tanks, etc.)
7. Provide information to stakeholders in community
8. Repair or replace system components as required
9. Assure financing available to sustain systems, people, and organization

10. Management: all activities required to conduct routine inspections and monitoring, necessary maintenance and repair, and collect revenue to sustain program
Early Detection-Timely Correction

- Assure long term operation
- Facilitate remedial operations
- Prevent failures
- Protect public health, environmental quality, property values, community values, and create opportunity
**Figure 1, USEPA Program Elements and Activities**

<table>
<thead>
<tr>
<th>Element</th>
<th>Essential Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Education</td>
<td>Educate owners regarding proper system care</td>
</tr>
<tr>
<td>Planning</td>
<td>Coordinate with local planning agencies</td>
</tr>
<tr>
<td>Performance</td>
<td>Establish appropriate performance criteria and indicators of success/failure</td>
</tr>
<tr>
<td>Training/certification</td>
<td>Develop and administer programs as required</td>
</tr>
<tr>
<td>Site Assessment</td>
<td>Establish appropriate site requirements</td>
</tr>
<tr>
<td>Design</td>
<td>Establish appropriate design requirements</td>
</tr>
<tr>
<td>Construction</td>
<td>Oversee construction/installation</td>
</tr>
<tr>
<td>Operation/maintenance</td>
<td>Establish operation and maintenance requirements</td>
</tr>
<tr>
<td>Residuals management</td>
<td>Administer system for residuals management</td>
</tr>
<tr>
<td>Compliance monitoring</td>
<td>Establish program for compliance monitoring</td>
</tr>
<tr>
<td>Corrective action</td>
<td>Establish program for corrective action</td>
</tr>
<tr>
<td>Record keeping/reporting</td>
<td>Administer record keeping/reporting program</td>
</tr>
<tr>
<td>Financial assistance</td>
<td>Consider program of financial support to users to assure sustainability of local efforts</td>
</tr>
</tbody>
</table>

Figure 2, Management Models Developed by USEPA,

<table>
<thead>
<tr>
<th>Model Program</th>
<th>Application</th>
<th>Potential cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory/awareness</td>
<td>Simple technology, little risk</td>
<td>Low user cost, amplification of ongoing operation</td>
</tr>
<tr>
<td>Contract</td>
<td>Mechanical technology, little risk</td>
<td>Moderate user cost,</td>
</tr>
<tr>
<td>Performance base, operating permits</td>
<td>Mechanical technology, moderate risk</td>
<td>Moderate costs, permits require renewal and performance review</td>
</tr>
<tr>
<td>Management entity operation</td>
<td>Mechanical technology, significant risk</td>
<td>Moderate costs, permits require renewal and performance review</td>
</tr>
<tr>
<td>Management entity ownership</td>
<td>Mechanical technology, serious potential risk</td>
<td>Potentially high user costs, permits require renewal and performance review</td>
</tr>
</tbody>
</table>

Trench Material

Gravelless or Gravel Filled Trench

Open bottom chamber
Performance of Onsite Treatment Technologies

**WASTEWATER FROM HOME**
- BOD: 110 - 400 mg/L
- TSS: 100 - 350 mg/L
- TN: 40 - 100 mg/L
- TP: 5 - 15 mg/L
- Fecal: $10^6 - 10^9$ col/100 ML

**SEPTIC TANK EFFLUENT**
- BOD: 110 - 200 mg/L
- TSS: 50 - 100 mg/L
- TN: 40 - 100 mg/L
- TP: 5 - 15 mg/L
- Fecal: $10^6 - 10^9$ col/100 ML

**SEPTIC TANK EFFLUENT, WITH RECYCLE**
- BOD: 80 - 120 mg/L
- TSS: 50 - 80 mg/L
- TN: 10 - 30 mg/L
- TP: 5 - 15 mg/L
- Fecal: $10^6 - 10^9$ col/100 ML

**AEROBIC UNIT EFFLUENT**
- BOD: 5 - 50 mg/L
- TSS: 5 - 100 mg/L
- TN: 25 - 60 mg/L
- TP: 4 - 10 mg/L
- Fecal: $10^3 - 10^4$ col/100 ML

**SAND FILTER EFFLUENT**
- BOD: 2 - 15 mg/L
- TSS: 5 - 20 mg/L
- TN: 10 - 50 mg/L
- TP: <1 - 10 mg/L
- Fecal: $10^1 - 10^3$ col/100 ML

**FOAM/TEXTILE FILTER EFFLUENT**
- BOD: 5 - 15 mg/L
- TSS: 5 - 10 mg/L
- TN: 3 - 60 mg/L
- TP: 5 - 15 mg/L
- Fecal: $10^1 - 10^3$ col/100 ML

**FURTHER ATTENUATION BY SOIL**
- BOD: >90%
- TSS: >90%
- TN: 10 TO 20%
- TP: 0 - 100%
- Fecal: >99.99%
## Management Programs

<table>
<thead>
<tr>
<th>Program Level</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inventory/awareness</td>
<td>Traditional system, low risk environment</td>
</tr>
<tr>
<td>2. Contract</td>
<td>Mechanical systems, low risk environment</td>
</tr>
<tr>
<td>3. Performance</td>
<td>Performance base, moderate risk environment</td>
</tr>
<tr>
<td>4. RME Operation</td>
<td>Performance base, professional operation</td>
</tr>
<tr>
<td>5. RME Ownership</td>
<td>Performance base, professional operation, high risk</td>
</tr>
</tbody>
</table>
Goals of the Management Guidelines

- To raise the level of onsite/cluster system performance through improved management programs
- To provide conceptual models that may be used by local units of government to assist in upgrading their programs
Social and Market Issues

• Marketing/Public Participation
  – Education!!!
  – Customer satisfaction

• Management and Sustainability
  – Highest level of local and state management must be involved
  – Funding essential to assure sustainability
    • Design
    • Build
    • Own/operating
Decentralized Approaches to Wastewater Treatment

Recognizing Managed Onsite and Decentralized Systems as a Permanent and Sustainable Element of the Nations Wastewater Infrastructure and a Mechanism to Assure Protection of Watersheds

U.S. Environmental Protection Agency
Office of Wastewater Management
Elements in a Comprehensive Wastewater Management Program—Sustainability Goal

- Public Involvement
- Planning
- Performance Requirements
- Training & Certification/Licensing
- Site Evaluation
- Design
- Construction

O&M
- Residuals Management
- Inspections/Monitoring
- Corrective Actions
- Record-Keeping/Reporting
- Financing
Elements

• Planning
  – Coordination between agencies at all levels
  – Watershed planning, water supply planning
  – Development patterns
  – Jurisdictions
  – Authorities
Elements (cont.)

- Outreach and Education
  - Educated/informed stakeholders
  - Elected and appointed officials
  - Public

- Performance
  - Success/malfunction criteria
  - Boundaries
    - Hydrologic
    - System
    - property
Elements (cont.)

• Site and Soil Evaluation
  – Landscape
  – Soil Morphology
  – Hydrology
  – Site limitations-assimilative capacity

• Design
  – Conventional – prescriptive standards
  – Performance
    • Soil
    • components
Elements (cont.)

• Construction and installation
  – Criteria
  – Oversight
  – Seasonality/site conditions

• Operation and Maintenance
  – Service providers
  – Frequency
    • monitor, measure, maintain, inspect, repair
Elements (cont.)

• Residuals
  – Septage
  – FOG
  – Options
  – 503

• Certification and licensing
  – All Professionals
  – competencies
Elements (cont.)

• Inspection and monitoring
  – Competencies
  – Frequency
  – components

• Corrective action
  – Responsibility
  – Authority
  – Consistent enforcement
Elements (cont.)

• Records and reports
  – Permits
  – Operational data/performance
  – Collection frequency
  – Reporting frequency

• Financial sustainability
  – Financial support for management agency essential
  – System funding (link loan)
Program 1: System Inventory/Maintenance Awareness

- Conventional septic systems
- Database of system locations
- Proper siting, sizing, installation
- Record location, reminder of maintenance
- Minimum level of management recommended
Albemarle Regional Health District

• Originally PPCC Health District now 14 County region in NE North Carolina
• Data-base of all systems in 4 county core and all innovative systems in remaining counties
• Management contract with counties
• Special Legislation passed
• $1.00/gal permit fee then 50-200/yr fee
ARHD Success?

• Albemarle region:
  – Shallow Watertable soils
  – Slowly Permeable Clays

• Repair rate:
  – Over 30 % failure and repair prior to implementation of management entity
  – Today, over 95 % successful system operation
Expanded ARHD Activities

- Stormwater management
- Surface water quality monitoring
- Well water sampling
- MOU with state to monitor non-municipal facilities permitted by state water quality agency and state solid waste agency
Program 2: Management through Maintenance Contract

- Enables more complex options
- Homeowner contracts with trained/competent service provider
- Routine maintenance assured
- Appropriate where mechanical systems used
Charlotte County, FL

- NSF Standard 40 Requires 2 year Maintenance Contract
- Charlotte County maintains data base, Requires advanced systems within 100 feet of surface water or on lots 10,000 ft.sq. or less
- Tax support and operating fees
Program 3: Management through Operating Permits

- Performance requirements requiring approved designs
- Renewable/revocable operating permits issued (Dated)
- Service afforded by competent personnel
- Regular reporting, monitoring
- Homeowner retains responsibility
- Appropriate in sensitive areas where performance base is critical
Sea Ranch, CA

- 1560 systems onsite and 870 community
- District inspects to assure compliance
- Homeowner responsible for permitting, installation, maintenance and repair
- Fee – 900-1200/yr
- Flexible Permitting
  - 3 year if properly functioning
  - 1 year if marginal
  - 6 month if malfunctioning
Program 4: Independent Third Party Operation and Maintenance

- Independent management entity
- Responsible for O&M
- Permit issued to Management entity
- Routine inspections
- Consistent performance
- Private ownership retained
- Appropriate in very sensitive receiver environments
Charles City County, Va

- MOU with State DOH/DEQ
- Options and alternatives considered
- County management of alternatives
- All reasonable options allowed to protect health and environment
- Wide range of alternatives
- COUNTY MANAGEMENT IN SENSITIVE ENVIRONMENT
Program 5: Independent Third Party Ownership and Management

- Professional management of all program functions and activities
- Consistent with other professional or utility services (gas, electric, phone…)
- Enables area-wide planning
- Appropriate in sensitive receiver environments where consistent performance essential
Shannon City, IA

- 36 systems, unanimous vote for retaining onsite systems and developing clusters
- 3 compliant systems/33 non-compliant
- $ 3.1 Million to sewer vs. $ 0.76M for managed onsite
- $ 38.00 month water and sewer bill
- SIRWA Operates through interlocal agreement
Tennessee Onsite Utility Company (Pickney Brothers)

- Statewide franchise granted by TUC
- Cluster systems serve community/builder need
- Developer involvement
- Density benefits
  - Integrated green space
  - Lower infrastructure cost
  - Site specific technologies utilized
- $ 40.00/month sewer bill
Management requires cooperation

- Stakeholders must be involved from outset
- Example stakeholders
  - Health or permitting agency
  - Realtors
  - Pumpers, installers and other service providers
  - Concerned citizens
  - University personnel/Extension
Involving Stakeholders

Introductory meeting & overview → On-site wastewater demonstration site visit → Identify problems, needs, and issues

Brief Commissioners

Staff develops draft program plan based on decision → Decision: Where do we go from here? → Options: Where do we go from here?

Brief Commissioners

Develop agreement program plan → Funding the agreed-upon program → Wrap-up

Budgeting for 2008 program
Decisions, Decisions, Decisions

• Fees – how to pay for program

• Inclusion
  – All inclusive
  – Gradual
    • Point of sale
    • Repair

• Oversight and management review
NC Pumpers/Managers

- TTT – Boone, NC
- Stallings Septic Service, Greenville, NC
- Cannaday Brothers, Roseboro, NC
- Atlantic Nutrients, Nags head, NC
- Stanley Septic Service, Dallas, Stanley, NC
- And Many More
Comprehensive Water Management Approach

- Water supply – Wellhead protection
- Wastewater – All systems
- Stormwater
- Appropriate level of support (Funds, personnel)
Information sources

• Federal
• State
• Local
• Associations
• Colleges and universities
• Manufacturers
• Service providers
EPA Onsite and Decentralized Web Site

http://www.epa.gov/owm/septic
EPA Site

• Links to all EPA partners
  – NAWT
  – NEHA
  – NATAT
  – WEF
  – NACO
  – NOWRA

- Background and Use of Onsite Wastewater Treatment Systems
- Management of Onsite Wastewater Treatment Systems
- Establishing Treatment System Performance Requirements
- Treatment Processes and Systems
- Treatment System Selection
Training and Certification

- Many states require training and certification of individuals (designers, installers, operators)
- Needs-to-know developed
- Training by organizations and universities
- Certification by state
- It’s a profession!!!
Conclusions:

1. Onsite and distributed systems are permanent element of infrastructure and support is essential

2. The USEPA, State and Local Governments recognize importance of proper management for all wastewater treatment systems (USEPA, Response to Congress, 1997)

3. Management programs currently exist which address variety of technologies, environmental conditions, public health issues and local needs

4. NAWT Training excellent source of information for system managers