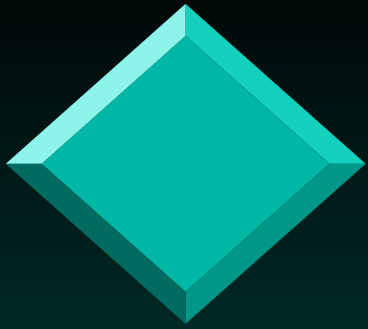




*Choices for Communities:
Wastewater Management Options for
Rural Areas*

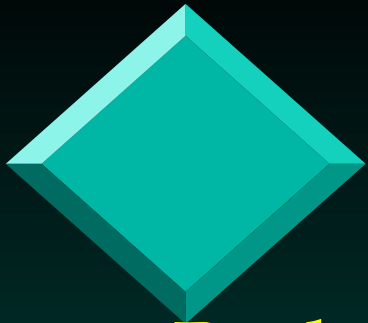
Michael T. Hoover



Presented to

Rural Community Leaders and
Decision-Makers

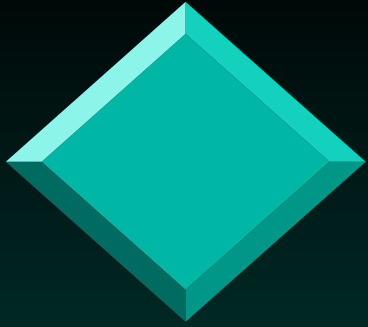
Interested in Wastewater Management



Overview

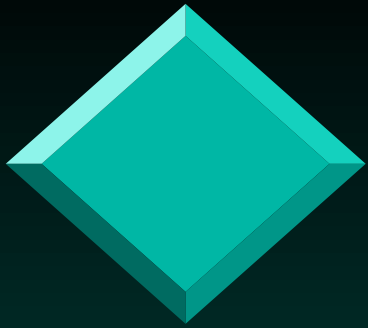
❖ *Background*

- ❖ A new long term strategy is needed
- ❖ Wastewater treatment options
- ❖ Community needs assessment
- ❖ Community options
- ❖ Alternative approaches
- ❖ Comparison of centralized and decentralized approaches



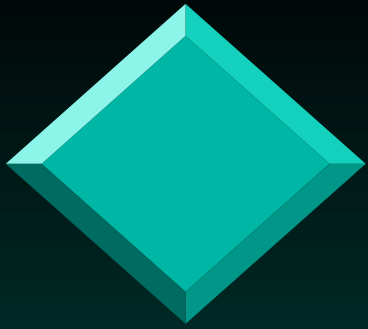
Background

- ❖ Decentralized wastewater treatment:
What is it?
- ❖ Potential benefits of decentralized systems
- ❖ Barriers to implementation of the decentralized approach to wastewater management



Background

- ❖ The combined use of conventional septic systems, advanced designs of on-site systems and cluster or other land-based systems to serve a community's wastewater management needs has been termed “decentralized wastewater treatment.”
- ❖ While the technology is decentralized (dispersed throughout the community to save costs), the management system should be centralized.



Potential benefits of decentralized systems

-EPA Response to Congress, 1997

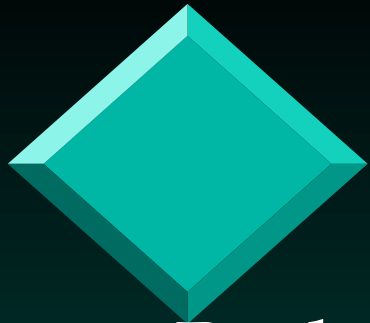
- ❖ Protects public health and the environment
- ❖ Appropriate for low density communities
- ❖ Appropriate for varying site conditions
- ❖ Cost savings in ecologically sensitive areas, and
- ❖ Provide recharge of local ground water aquifers and provide water reuse opportunities



Barriers to implementation of decentralized systems

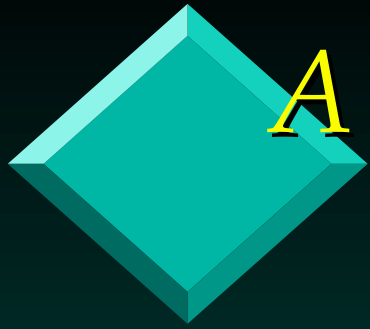
-EPA Response to Congress, 1997

- ❖ Lack of knowledge and public misperception
- ❖ Legislative and regulatory constraints
- ❖ Lack of management programs
- ❖ Liability and engineering fees
- ❖ Financial barriers



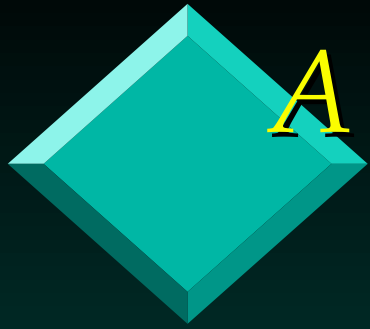
Overview

- ❖ Background
- ❖ A new long term strategy is needed
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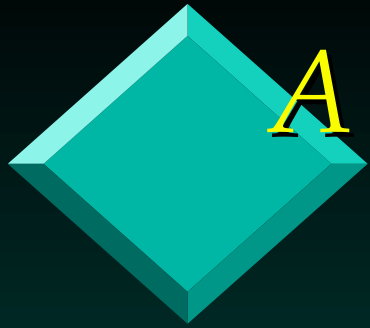
A new long term strategy is needed

- ❖ Many rural communities lack a wastewater management infrastructure that can effectively protect public health, environmental quality and add value to current living conditions, let alone accommodate future housing needs and facilitate sound growth



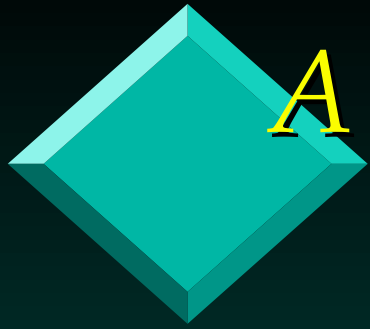
A new long term strategy is needed

- ❖ The unmet wastewater infrastructure needs in North Carolina can not be met in a cost-effective manner by exclusive dependence upon “traditional” wastewater treatment strategies



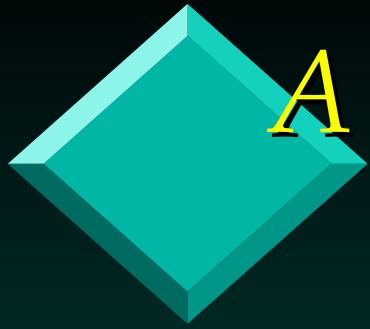
A new long term strategy is needed

- ❖ In the past, wastewater treatment has been viewed as a disposal process, but today emphasis is on reuse and recycling



A new long term strategy is needed

- ❖ History, not technology favors the centralized approach



A new long term strategy is needed

- ❖ Protection of personal family health, public health and the environment must be the goal regardless of the technology used



Wastewater treatment options

- ❖ Subsurface disposal, land-based technologies (conventional septic systems and more advanced on-site treatment systems)
- ❖ Surface disposal, land-based technologies (land application systems)
- ❖ Surface-water discharge systems (traditional WWTP with stream discharge)



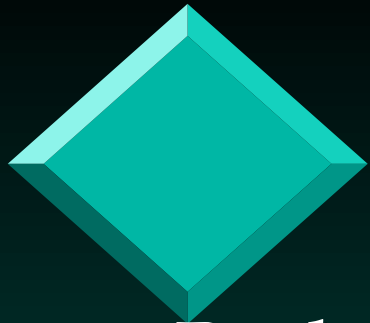
Wastewater treatment options

- ❖ Land-based systems are environmentally sound



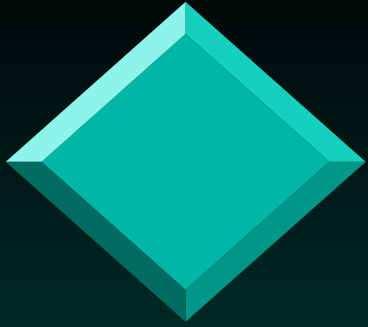
Community needs assessment

- ❖ The community must determine which wastewater management infrastructure approach best meets it's needs
- ❖ All too often the first options are ignored and decision makers are guided to the last option as the preferred choice



Overview

- ❖ Background
- ❖ A new long term strategy is needed
- ❖ Wastewater treatment options
- ❖ Community needs assessment
- ❖ **Community options**
- ❖ **Alternative approaches**
- ❖ Comparison of centralized and decentralized approaches



*Community options for
establishing a wastewater
management infrastructure*



Are there more than two options?

Poorly maintained
conventional septic
systems

Highly maintained
centralized wastewater
treatment plants



Conventional septic systems

- ❖ Low to medium development density
- ❖ Rural to suburban landscape
- ❖ Low construction costs
- ❖ No maintenance costs
- ❖ Costs vary dramatically from user to user



Conventional septic systems

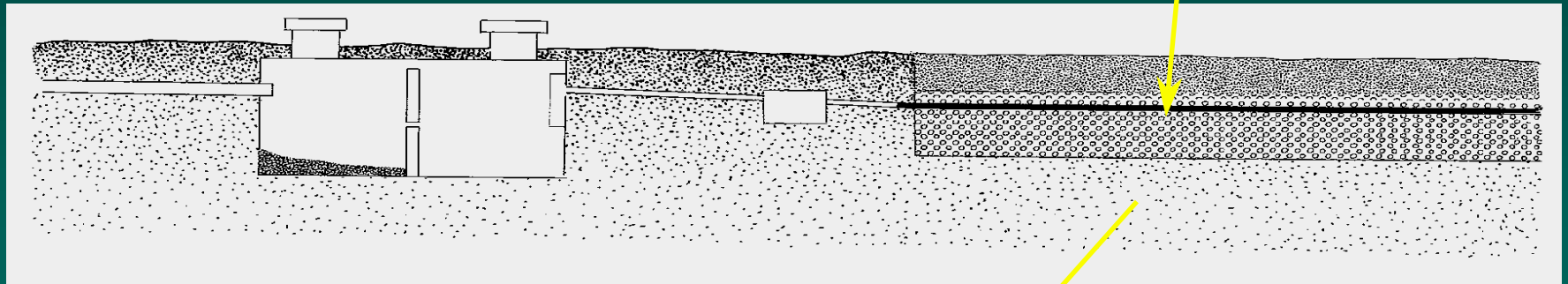
- ❖ Throw away technology
- ❖ “Put it in the ground and forget it” mentality
- ❖ System function never evaluated
- ❖ System performance never upgraded until technology is thrown away



Conventional septic systems

- ❖ No flexibility in siting and design because there is no room for error
- ❖ Rigid siting criteria to assure long term performance of a system that is never monitored or maintained
- ❖ Narrowly focused technology selection and no design flexibility for the same reason

Siting and design without long term monitoring



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assumptions
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Are there more than two options?

Poorly maintained
conventional septic
systems

Highly maintained
centralized wastewater
treatment plants



Centralized treatment plants

- ❖ High to very high development density
- ❖ Suburban to urban landscape
- ❖ High construction costs
- ❖ Substantial maintenance costs
- ❖ Complex technology
- ❖ Closely controlled O & M



Centralized treatment plants

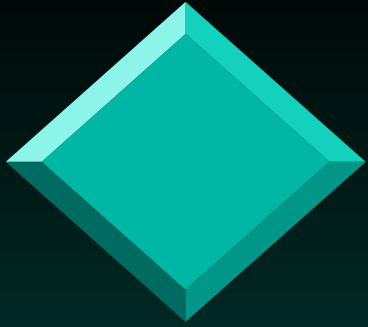
- ❖ System function evaluated by (daily, monthly, or seasonal) performance criteria
- ❖ System technology upgraded to meet emerging performance needs of the community and the environment



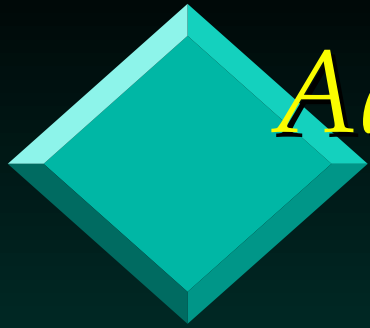
Are there more than two options?

Poorly maintained
conventional septic
systems

Highly maintained
centralized
wastewater
treatment plants

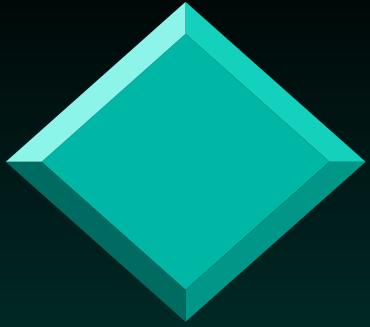


Choosing the Right Mix of Technologies

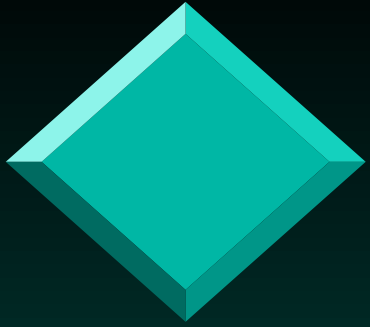


Advanced on-site treatment systems

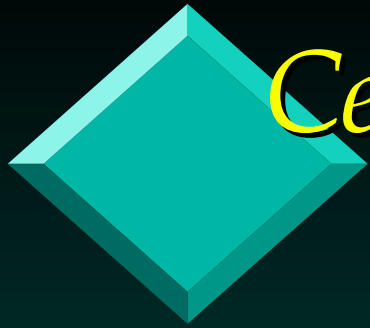
- ❖ Alternative systems
 - low pressure pipe systems
 - aerobic treatment units
 - areal fill systems
- ❖ Innovative systems
 - pressure-dosed sand filters
 - peat biofilters
 - drip irrigation
- ❖ Combined subsurface/ surface disposal



Land application systems

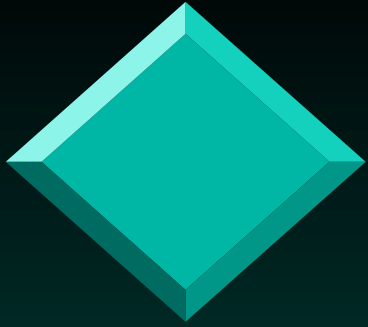


Matching the wastewater treatment approach to the community, it's soil and site conditions, needed level of performance and financial resources



Certified Subsurface System Operators

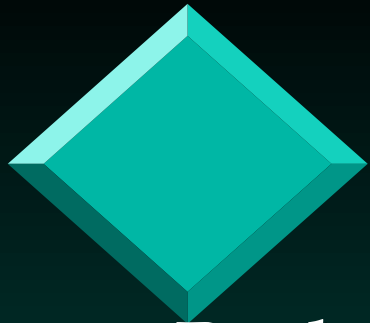
- ❖ Established July 1992
- ❖ Applies to a few alternative and innovative system designs
- ❖ Contract with a certified operator
- ❖ Training by NCSU, DWQ and DEH
- ❖ Certification by WPCSOCC
- ❖ Site by site maintenance contracts



Community-wide management can facilitate broader, more effective use of decentralized technologies



Estimating relative costs of on-site and small community alternative wastewater treatment technologies



Overview

- ❖ Background
- ❖ A new long term strategy is needed
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EPA Response to Congress, 1997

- ❖ Cost comparison for centralized and decentralized approaches for a hypothetical rural community
- ❖ 450 people living in 135 homes
- ❖ One-acre lots served by conventional septic systems
- ❖ 50% of systems failing



EPA Response to Congress, 1997

- ❖ Three wastewater management options considered for the rural community:
 - a centralized system
 - cluster systems and
 - managed on-site systems



EPA Response to Congress, 1997

- ❖ Expenditures included the capital costs to install the systems and annual costs to operate and maintain them
- ❖ Capital costs annualized over 30 years (the life of the system) for each technology
- ❖ Discount rate of 7%
- ❖ Costs presented in 1995 dollars



Summary of hypothetical EPA rural community technology costs

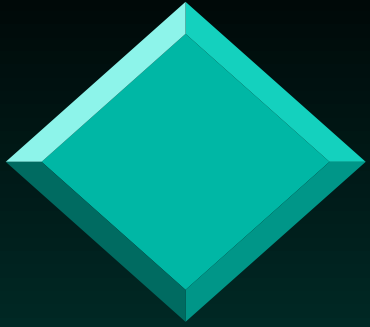
Technology Option	Total Capital Cost (1995 \$)	Annual O&M Cost (1995 \$)	Total Annual Cost (1995 \$)
Centralized systems	2.3 - 3.8 million	\$29,740 - \$40,260	\$216,850 - \$342,500
Alternative SDGS collection and cluster	\$598,100	\$7,290	\$55,500
On-site systems	\$510,000	\$13,400	\$54,500

Note: The rural community consists of 450 people in 135 homes

O&M means operation and maintenance

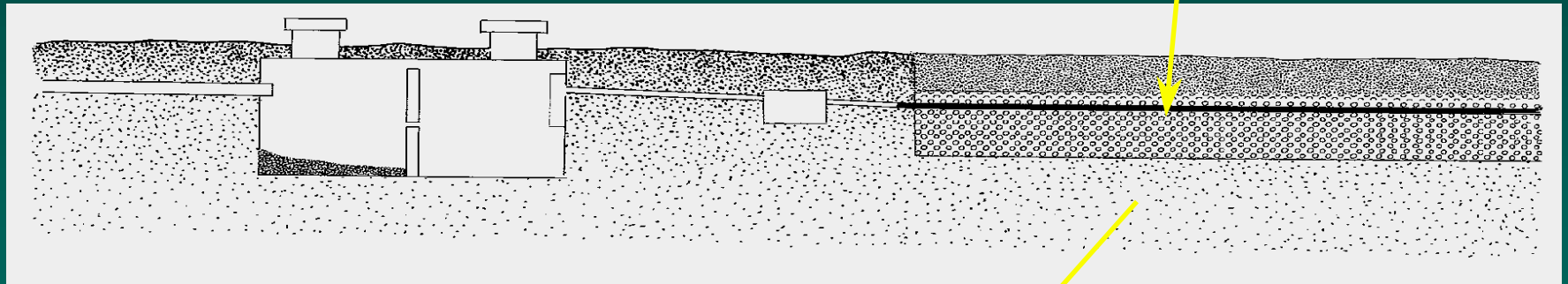
SDGS stands for small-diameter gravity sewers

(Adapted from EPA, 1997)



Summary

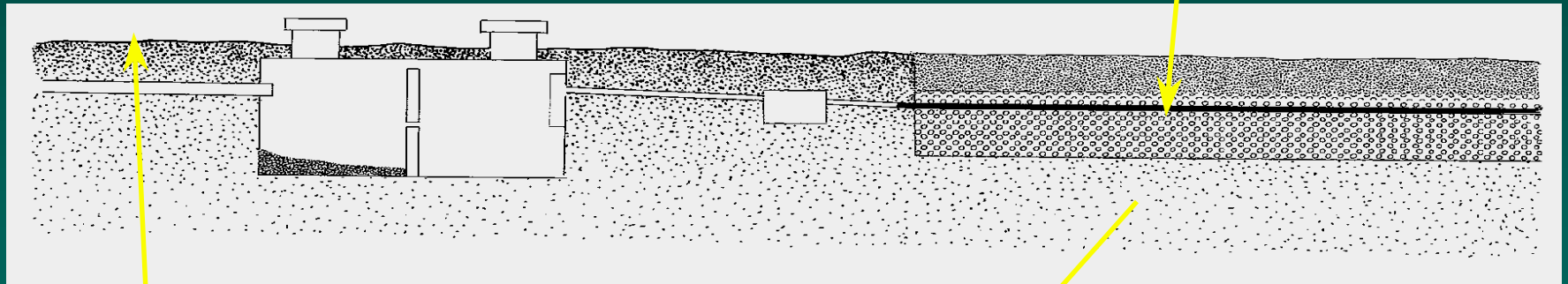
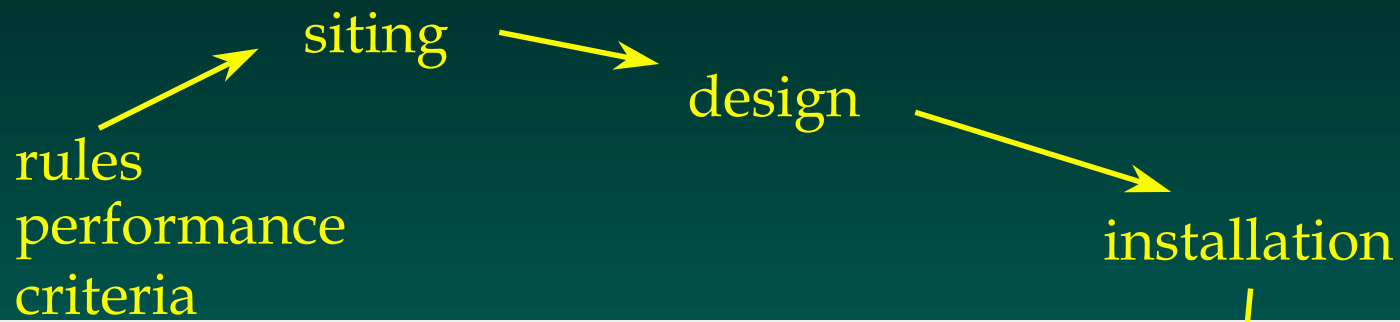
Siting and design without long term monitoring



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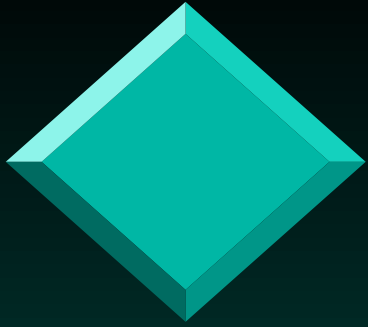
Siting and design with long term monitoring



performance monitoring

operation & maintenance





Conventional
septic systems

Small scale
alternative and on-
site systems

Centralized
treatment
plants

- ❖ Low to very high development density
- ❖ Rural to urban landscape
- ❖ Moderate costs
- ❖ Moderately complex technology
- ❖ Regular O&M review and adjustment
- ❖ Assessment of environmental impacts
- ❖ System technology upgraded to meet emerging community and environmental needs



Summary

- ❖ Management districts with community-wide permits and trained operators could provide a measurable high level of wastewater treatment and substantial cost savings to communities.
- ❖ Such a district would provide very real benefits to the siting and design process for small-scale alternative and on-site wastewater treatment systems



Summary

- ❖ NCSU and the NC Cooperative Extension Service developed the first hands-on training center in the world for on-site wastewater technology.
- ❖ There are now 20+ such centers throughout the North America including five in Canada, one in Australia and one under development in Ireland.
- ❖ The Land and Water hands-on training facility adjacent to NCSU's campus in Raleigh provides professional training and public education needed for effective use of these wastewater technologies.
- ❖ Four other NC on-site wastewater system training facilities are in Fletcher, Plymouth, Greensboro and Bolivia.