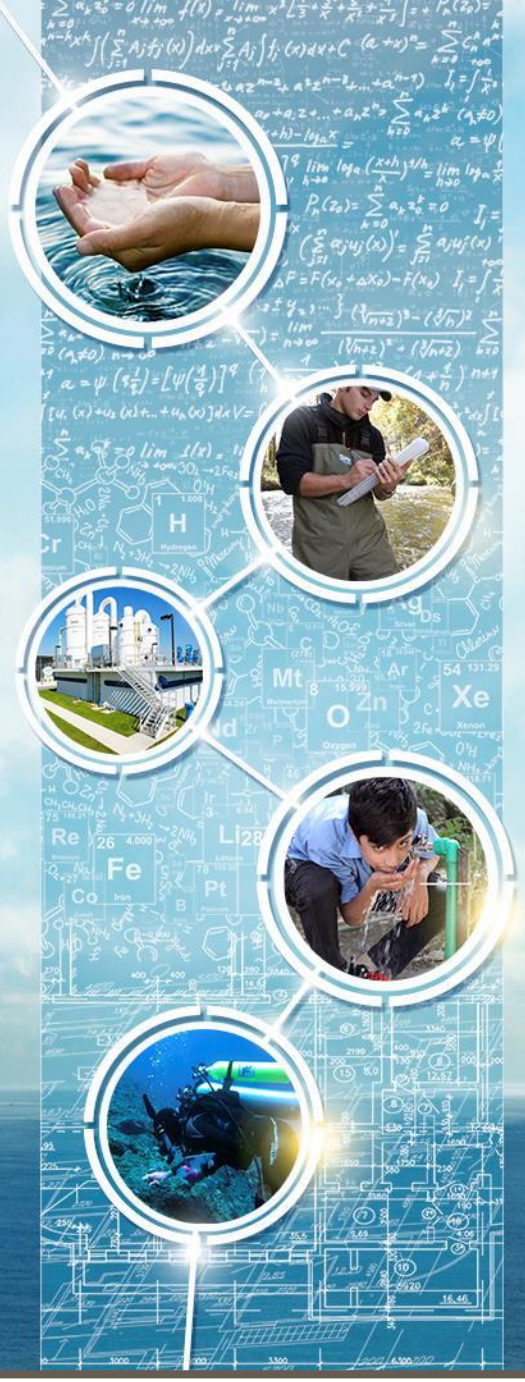


TETRA TECH

Wastewater Management Options

October 16, 2017

Chatham County, NC

Victor D'Amato, PE

Background

- First presentation to Chatham County BOC: November, 2001!
  - Individual and Community Wastewater System Options
- Chatham County wastewater management
  - Most development on individual onsite systems (well/septic) or cluster systems (package plants)
  - Bynum WWTP (owned/operated by Chatham Co.)
  - Chatham County Schools
  - Pittsboro and Siler City WWTPs
  - **Comprehensive Plan and UDO effort provides opportunity to be more proactive**

Subsurface Systems

- Wastewater systems with Subsurface Dispersal are permitted by Chatham County Environmental Health
  - Septic systems and larger systems with a “drainfield”
  - Systems >3,000 gpd must be approved by NC DHHS first

Surface (Land Application) Systems

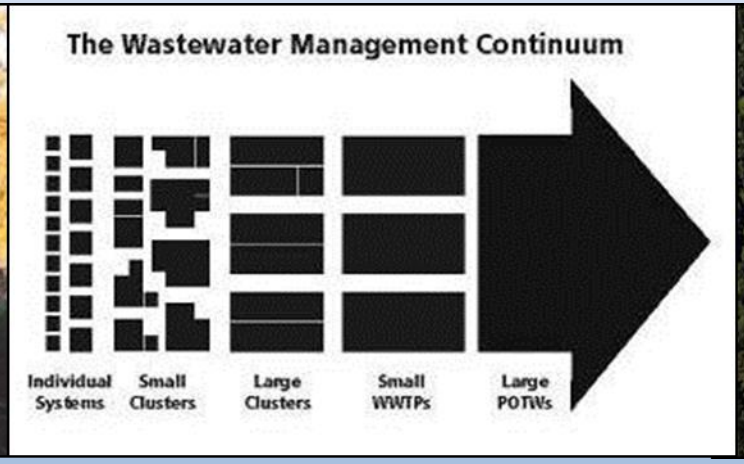
- Wastewater systems with Surface Dispersal are permitted by NC DEQ, DWR, Non-Discharge Permitting Unit
  - Spray irrigation and surface drip irrigation systems

Discharging Systems

- Wastewater systems with Surface Water Discharge are permitted by NC DEQ, DWR, NPDES Permitting Branch

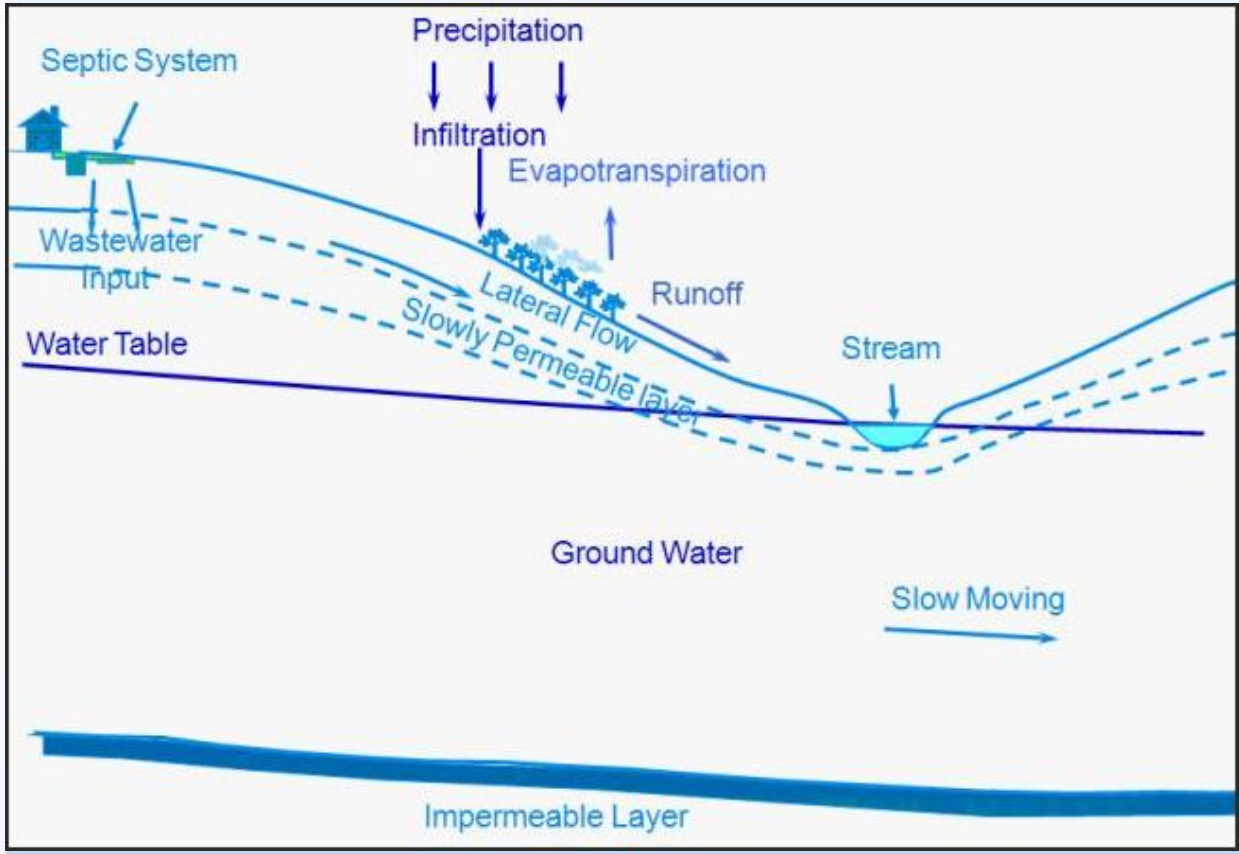
Distributed Wastewater Management

- **Decentralized systems**: multiple smaller systems
  - Onsite
  - Cluster
- **Centralized systems:** one large system for a given area
- **Distributed management**: all of the above
  - Recognizes the importance of scale in managing water
    - Small systems can be as or more effective than large ones
  - **Recognizes that ALL systems need to be managed**

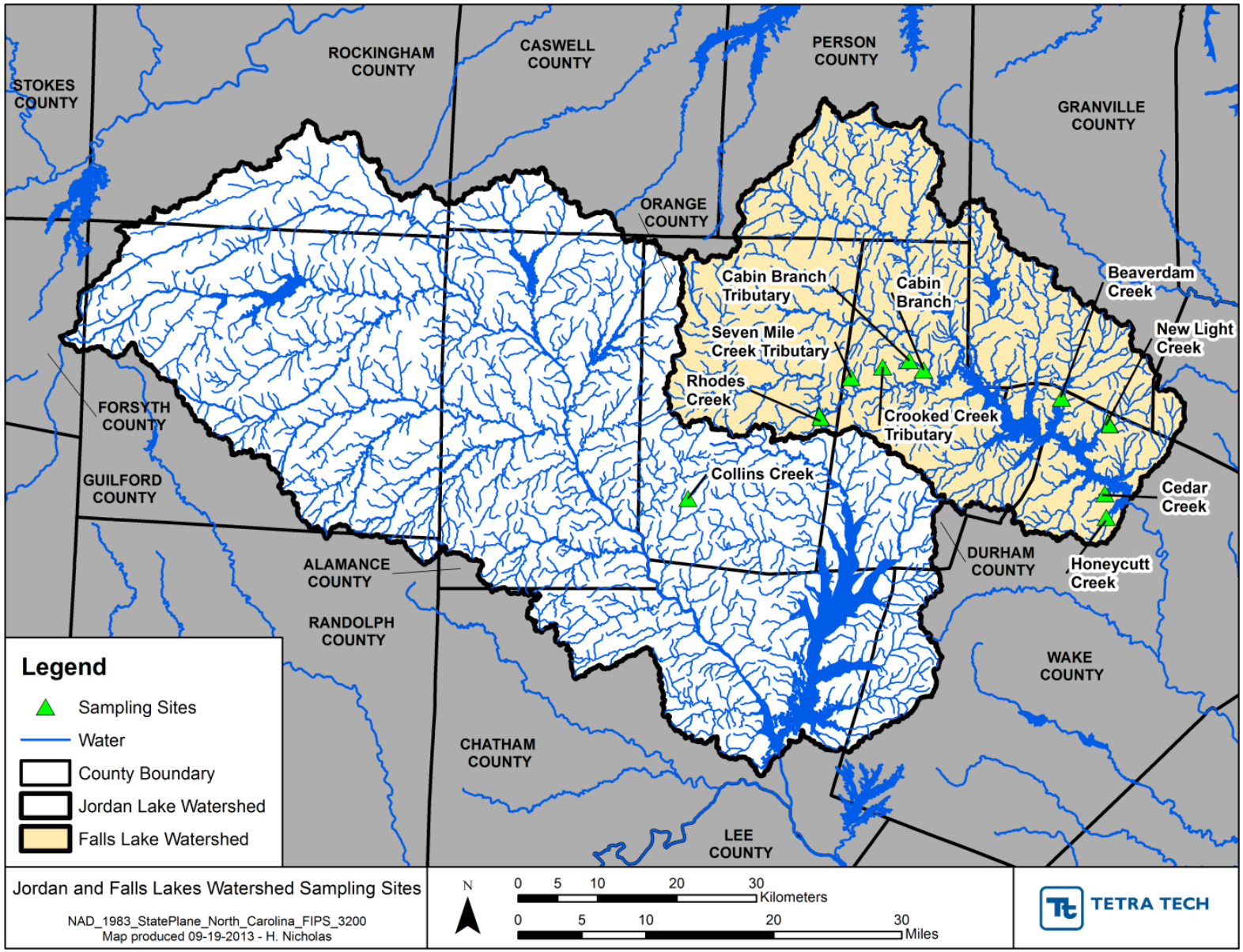


Benefits: Effective

- Decentralized technologies are robust
- Multiple soil dispersal areas enhance assimilation
- Conserves water/restores local hydrology through groundwater recharge
- Soil is an effective treatment medium



Jordan and Falls Lake Watershed Water Quality Monitoring Locations



NC Piedmont Onsite System Performance

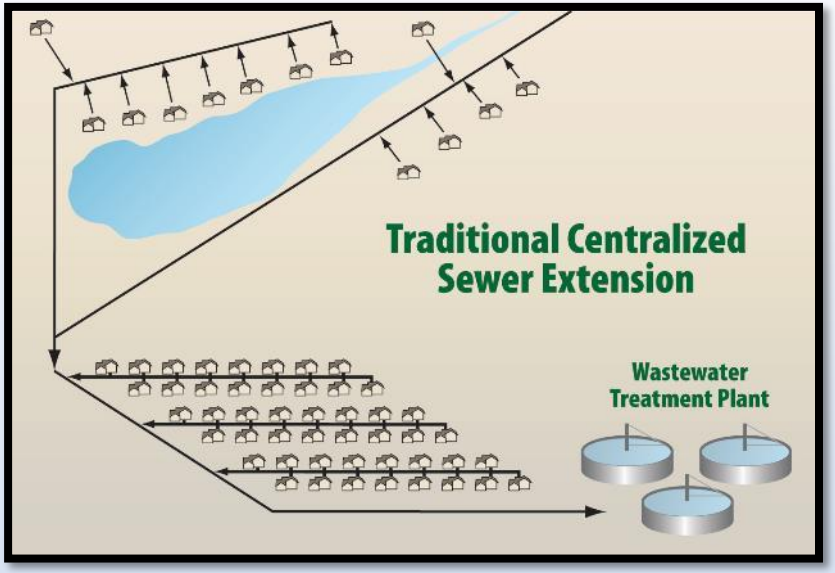
Basin	Stream Order*	Septic-Generated Nutrients		Measured Load in Stream		Percent Septic Load Delivered to Stream	
		TN ($lb/d/mi^2$)	TP ($lb/d/mi^2$)	TN ($lb/d/mi^2$)	TP ($lb/d/mi^2$)	TN (%)	TP (%)
Rhodes Creek	unk.	-	-	0.57	0.012	-	-
Seven-Mile Creek	4^{th}	30.4	3.9	0.139	0.0068	0.46	0.18
Cabin Branch	8^{th}	30.2	3.86	0.57	0.0178	1.89	0.46
Crooked Creek	2^{nd}	27.0	3.45	1.53	0.0286	5.67	0.83
Beaverdam Creek	unk.	3.83	0.42	0.20	0.024	5.1	5.7
New Light Creek	unk.	4.68	0.60	0.37	0.033	8.0	5.4
Honeycut Creek	unk.	15.5	1.99	0.33	0.025	2.2	1.3
Cedar Creek	unk.	29.7	3.81	0.66	0.039	2.2	1.0
AVERAGE		**20.2**	**2.6**	**0.55**	**0.023**	**3.6**	**2.1**

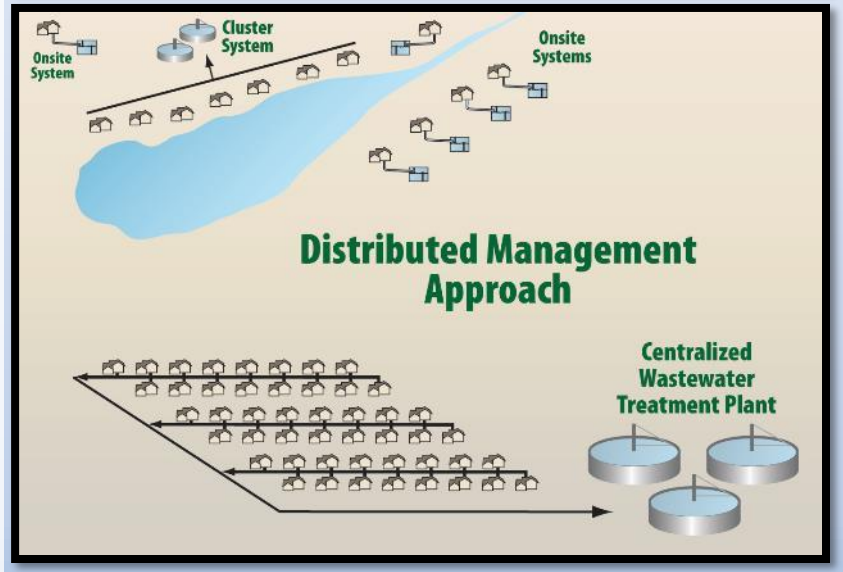
- Equivalent "effluent" concentrations: 2.0 mg/l TN, 0.2 mg/l TP
- **Equivalent reductions: 96% TN, 98% TP**
- Corroborated by more recent USGS and ECU data and ChesBay Program work

Data from:
NCDENR 2010
Berkowitz 2014

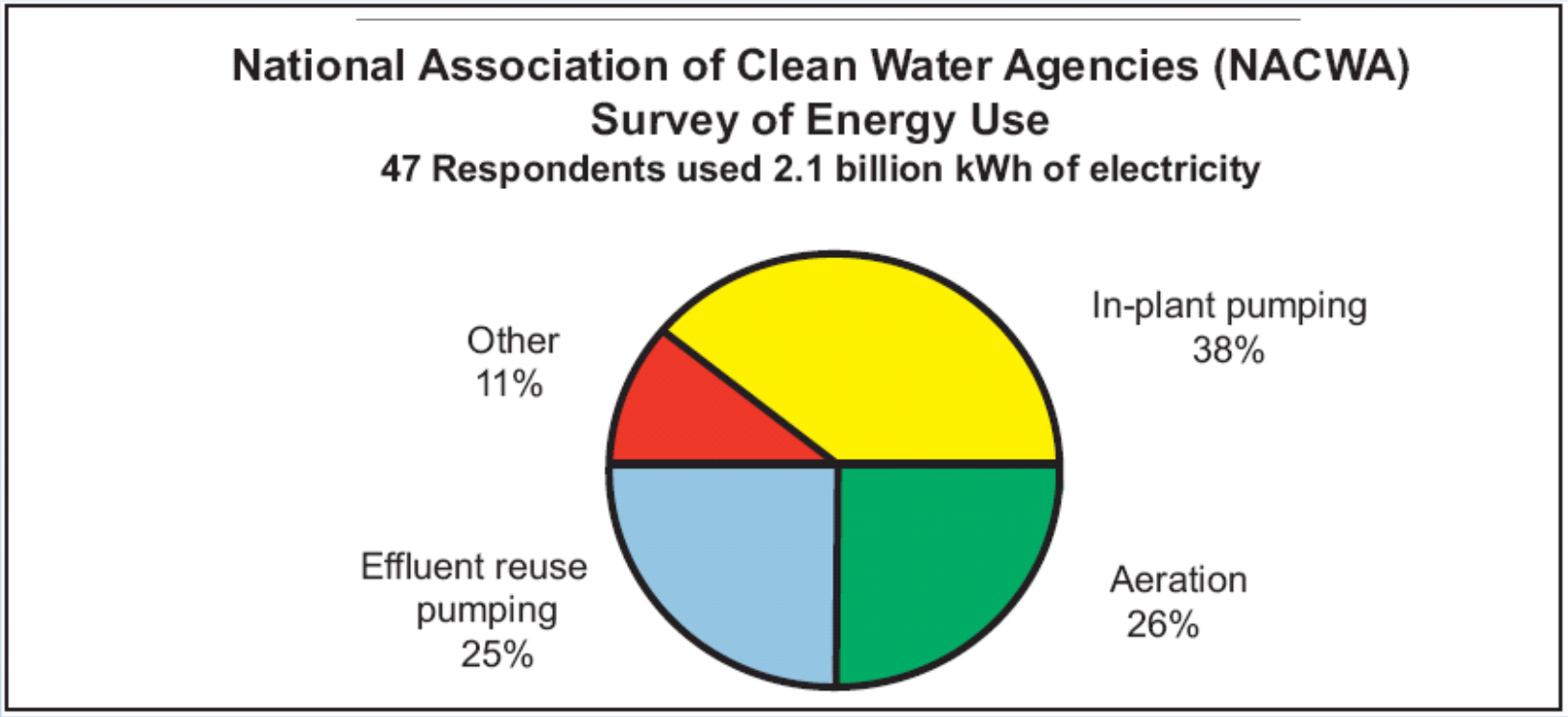
Benefits: Efficient

- Treatment close to the source and/or reuse requires less energy
- Urban reuse retrofits are more feasible
- *Smart, clean and green* technology
  - **Smart controls**: Remote monitoring of multiple systems
  - **Resource recovery** within facilities
  - **Fit-for-Purpose**: match water quality to intended reuse
  - **Multifunctional**: Landscape/facility integration
  - **Resilient**: Relatively infiltration-resistant; passive ecological treatment



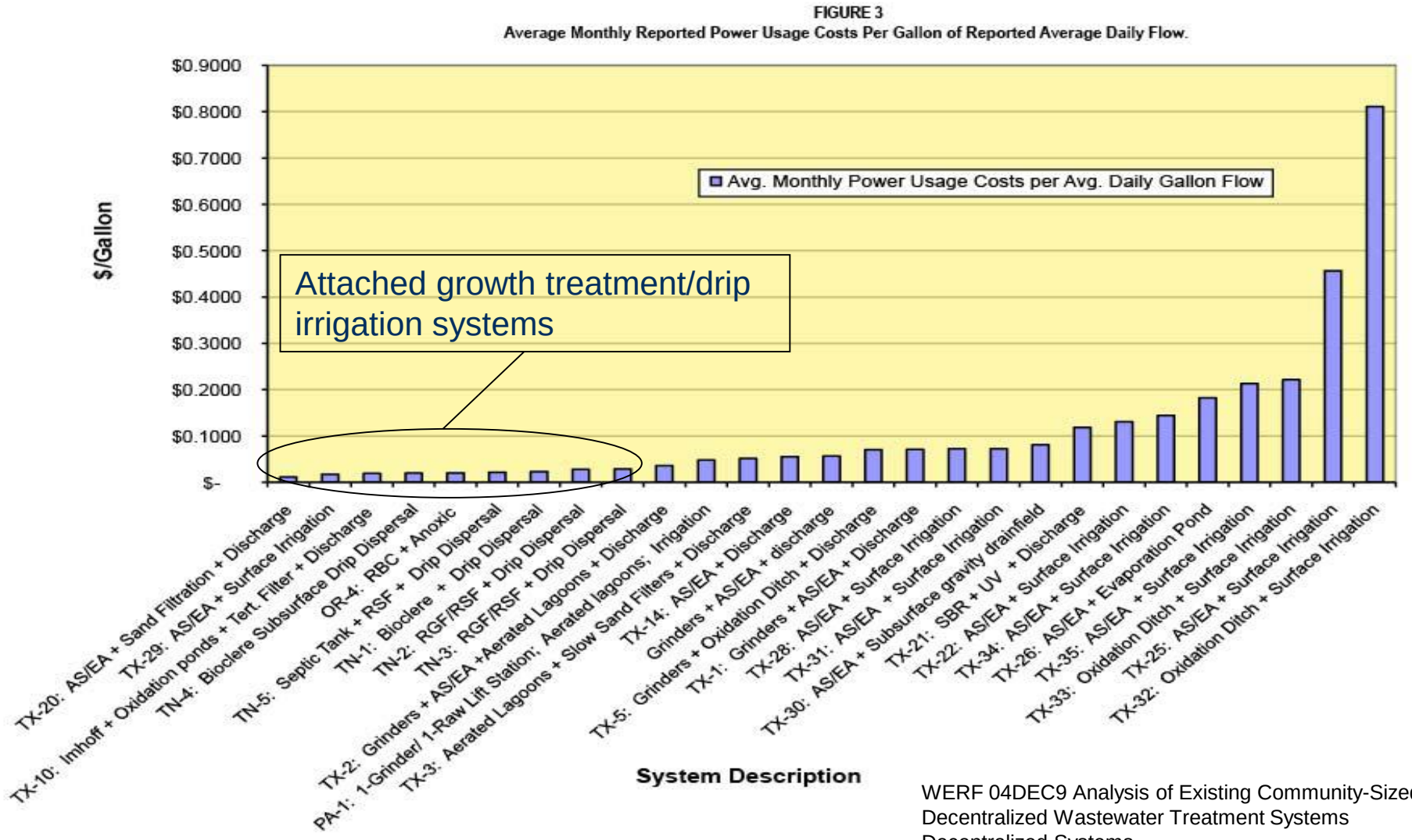


Wastewater Utility Energy Use



T. Jones, “Water-Wastewater Committee: Program Opportunities in the Municipal Sector: Priorities for 2006,” presentation to CEE June Program Meeting, June 14, 2006, Boston, MA. Available online at http://www.cee1.org/cee/mtg/6-06_ppt/jones.pdf.

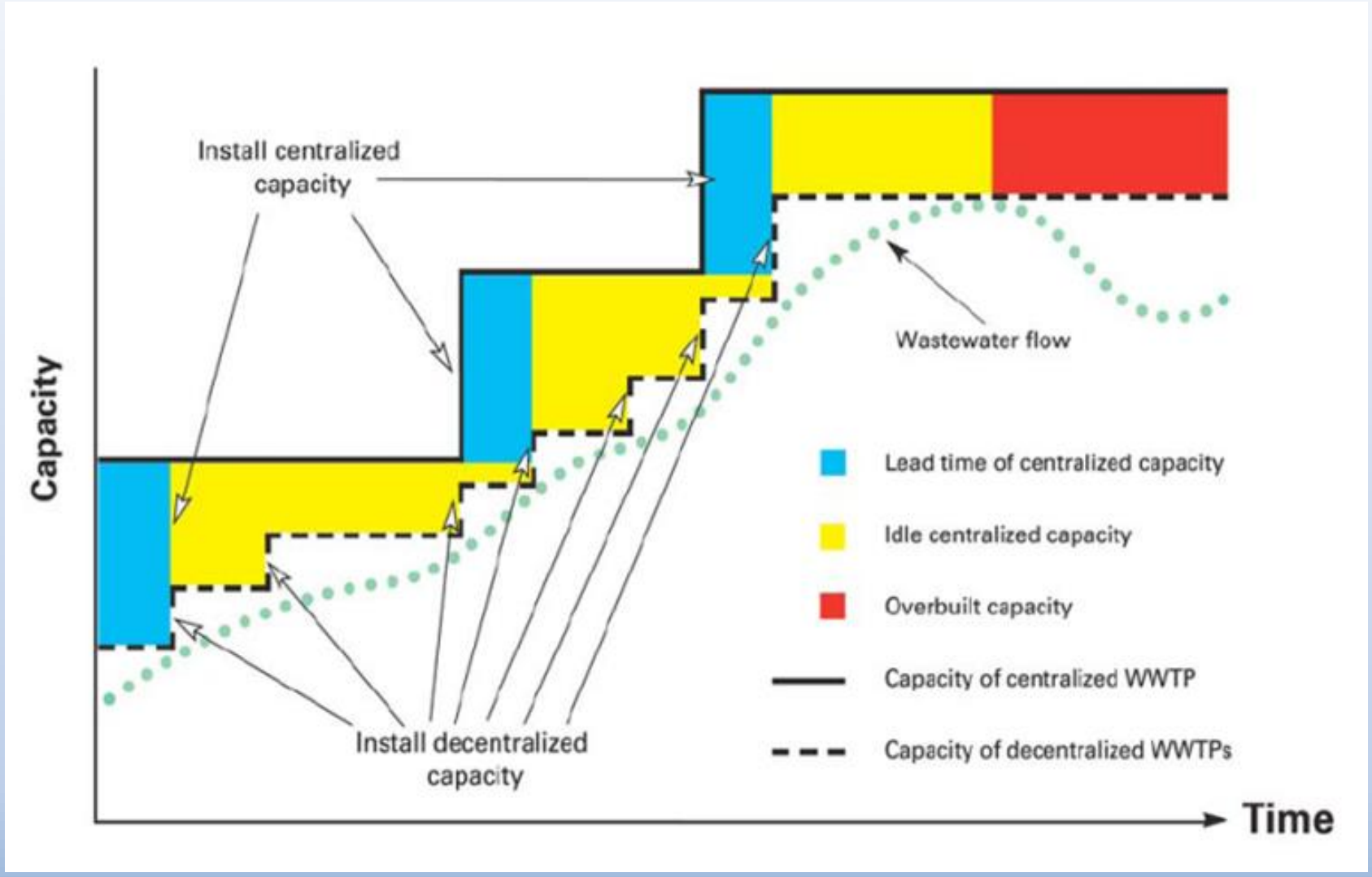
Power Demands of Decentralized Systems



WERF 04DEC9 Analysis of Existing Community-Sized Decentralized Wastewater Treatment Systems

Benefits: Affordable

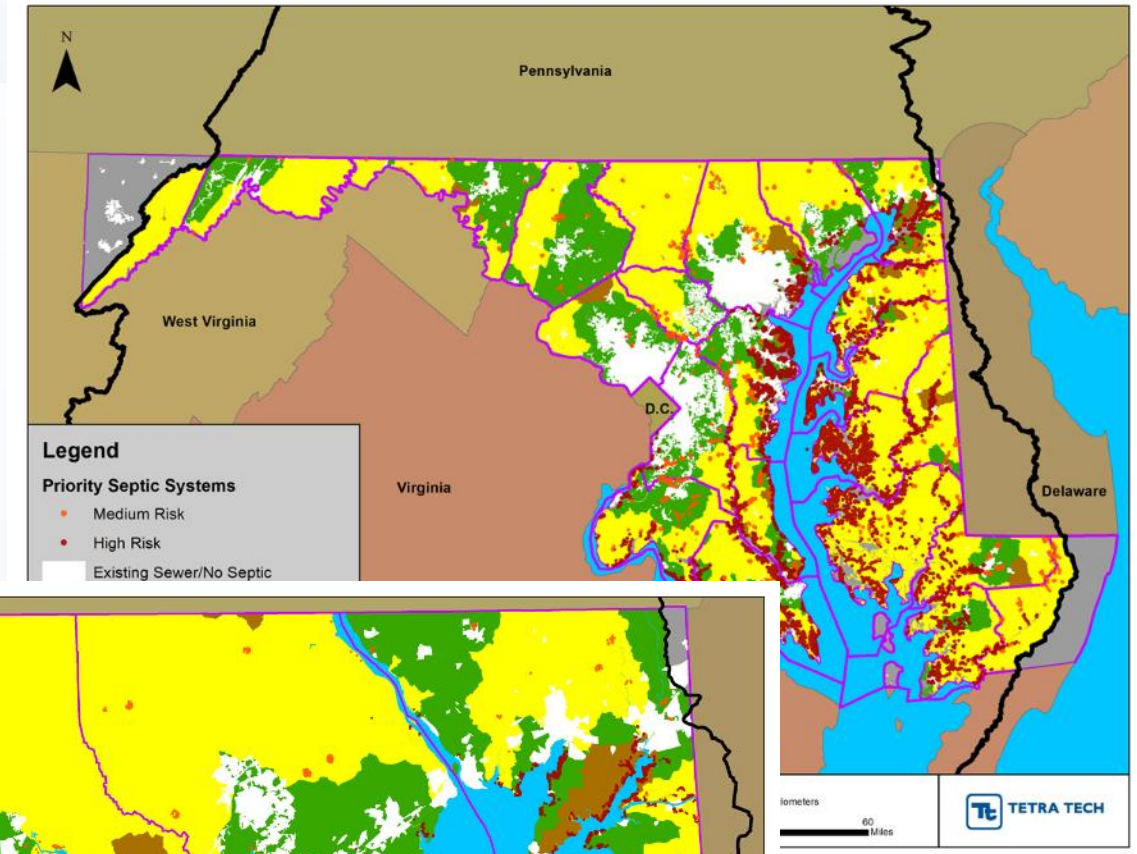
“Pay as You Grow” or “Right-Sized, Just-in-Time”

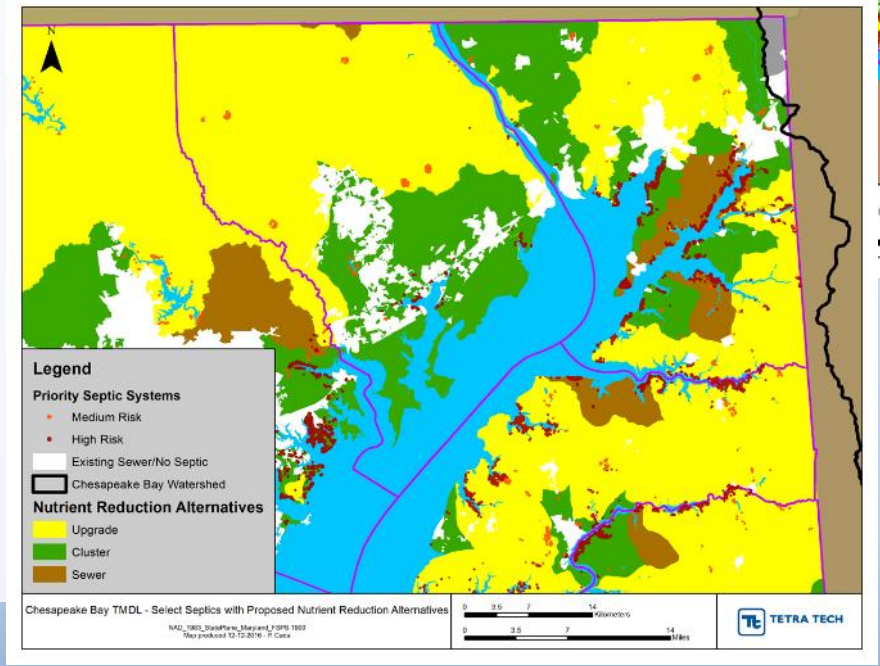


Treatment Technologies

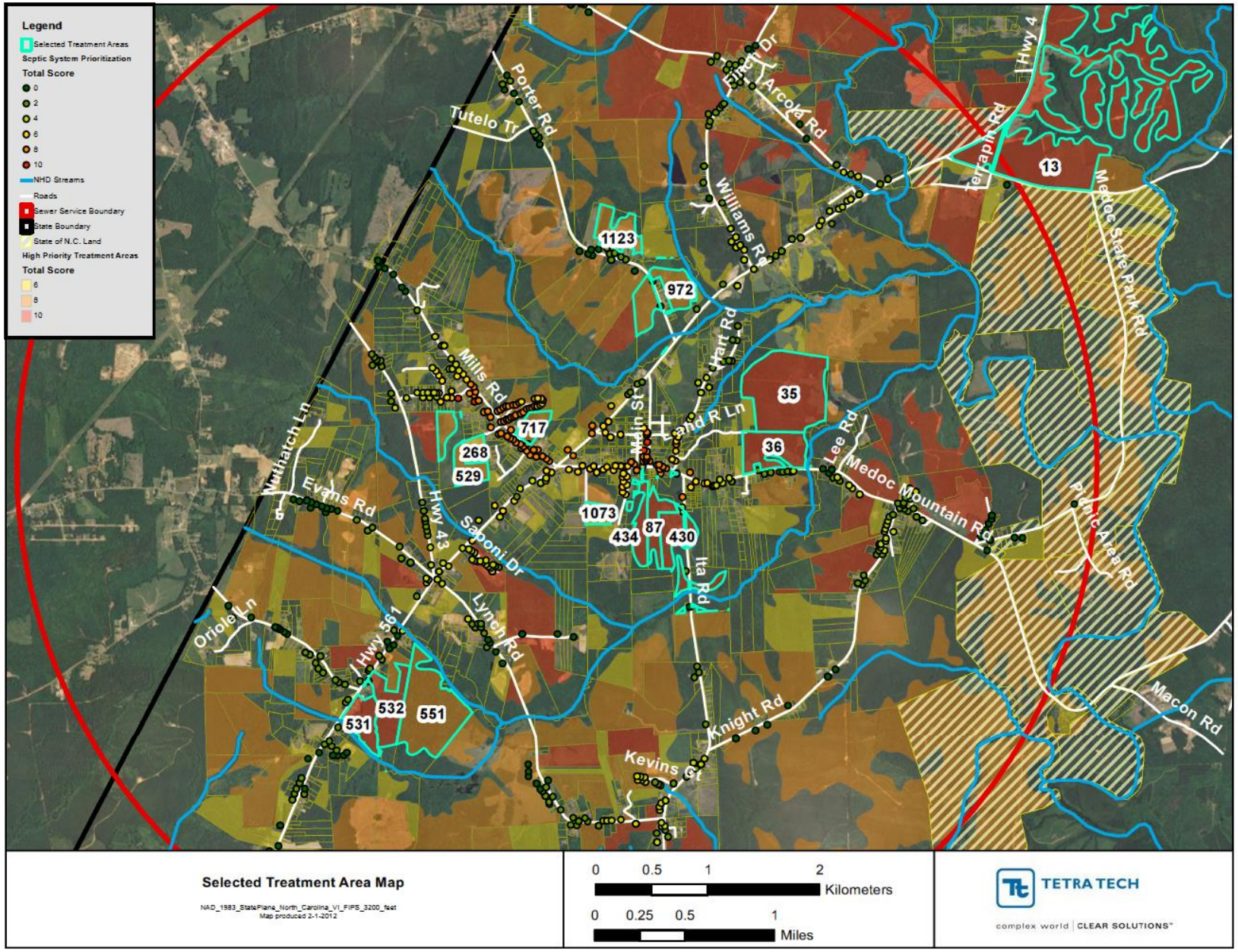
Maryland Plan for Chesapeake Bay TMDL

- Statewide plan for reducing nutrients from existing decentralized systems
  - Loading analysis
  - Reduction analysis
- Tied into State smart growth objectives
  - Onsite upgrades
  - Clustering
  - Sewering



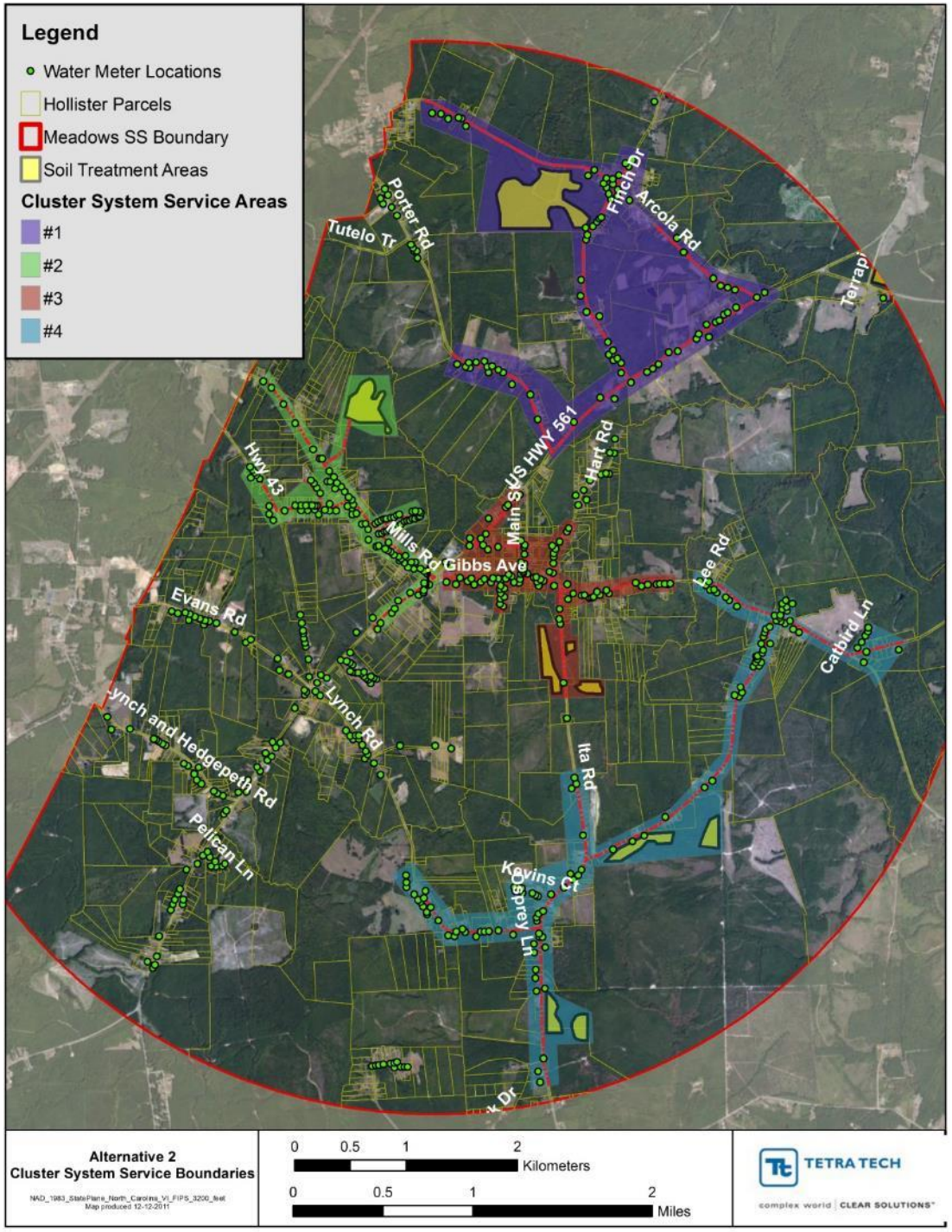


Planning: Meadows Sewer District

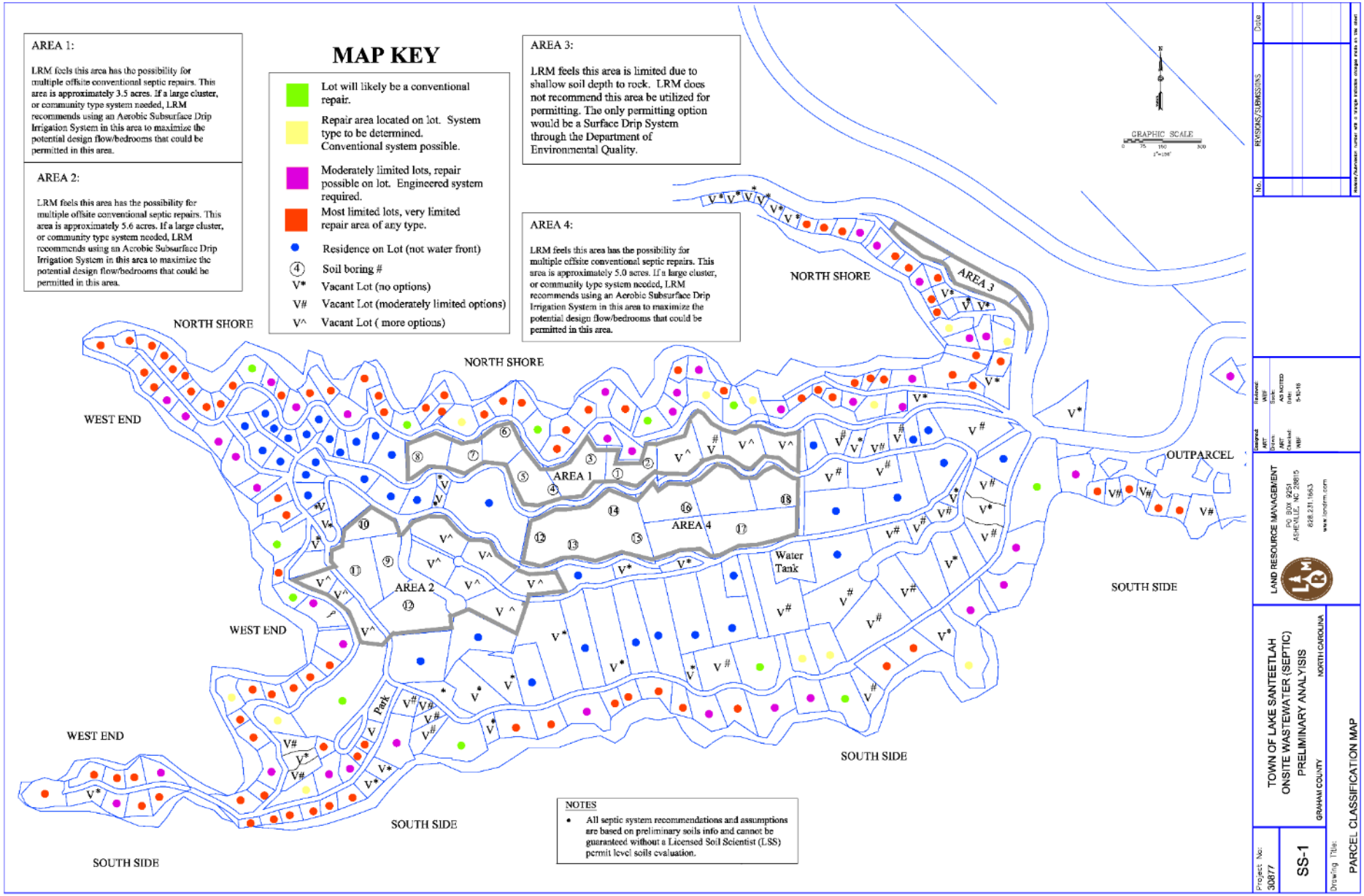


Meadows Sewer District: *Multiple Cluster Option*

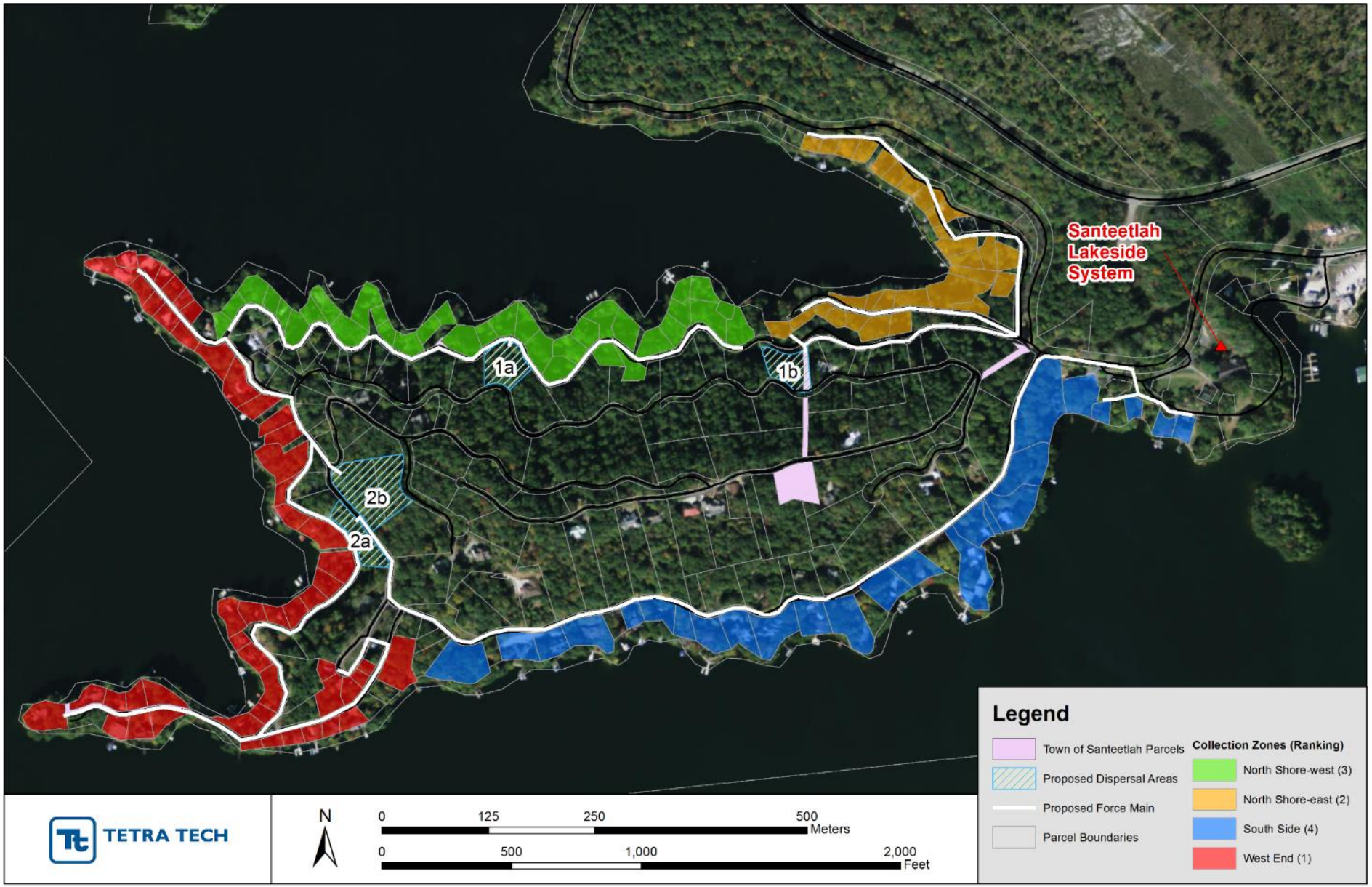
- Cost effective
  - Sewer connection… $22K/home
  - Single cluster… $12.8K/home
  - **Multi-cluster… $8.8K/home**
  - Smaller clusters…?



Planning: Town of Lake Santeetlah



Lake Santeetlah - Potential Cluster System Plan



Distributed System Applications

- **Green Buildings/Sustainable Sites**
  - Integration into buildings/landscapes
  - Resource recovery and reuse
  - Education and recreation
- **Independent Communities**
  - Maintain fiscal control
  - Preserve community character
  - Underserved communities
- **Utility Optimization**
  - Managed distributed systems
  - Sewer mining
  - Satellite reuse
- www.werf.org/distributedwater
  - Includes decision-support tool

Case Studies Listed by Type
Green Building/Sustainable Sites (GB)
Battery Park City, New York City (UO)
Couran Cove Island Resort, Queensland, Australia (IC)
Currumbin Ecovillage, Queensland, Australia (IC)
Dockside Green, Victoria, British Columbia, Canada (UO)
Philip Merrill Center, Annapolis, Maryland
Sidwell Friends School, Washington, D.C.
Workplace6 Recycled Water Factory, Sydney, Australia (UO)
Independent Communities (IC)
Bethel Heights, Arkansas
Gillette Stadium, Foxborough, Massachusetts (GB)
Lake Elmo, Minnesota
Piperton, Tennessee
Warren, Vermont
Weston Solar Aquatics, Weston, Massachusetts (GB)
Wickford Village, Rhode Island
Utility Optimization (UO)
LOTT Alliance, Lacey, Olympia, and Tumwater, Washington
Loudoun Water, Loudoun County, Virginia (IC)
Mobile Area Water and Sewer System, Mobile, Alabama
Pennant Hills Golf Club, Sydney, Australia
Sand Creek, Aurora, Colorado
University of North Carolina at Chapel Hill, North Carolina (GB)

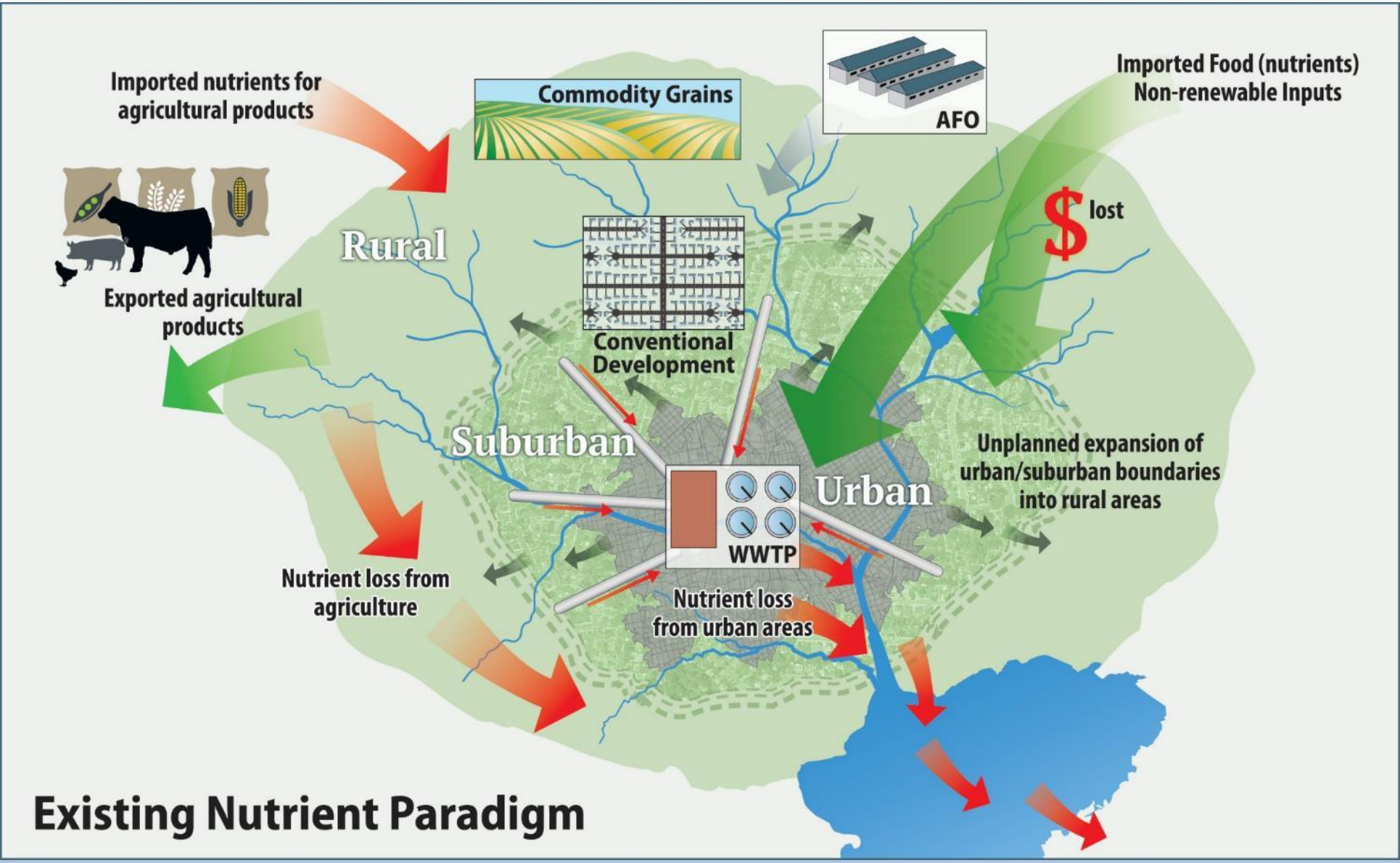
Distributed System Applications

- **MAWSS, Mobile Alabama**
  - Owns and operates two conventional and at least 12 decentralized wastewater facilities
- **Sydney Water**
  - Privately-driven *sewer mining* project
  - Treated water is used to irrigate 55 acres of greens, tees and fairways
- **Bethel Heights, Arkansas**
  - Rapidly-growing population on septic systems
  - City selected two cluster systems phased-in to meet increasing demand with growth
- **Dockside Green, Victoria, B.C.**
  - On-site, closed-loop treatment provides *fit-for-purpose*, reclaimed water supply
    - Toilet flushing, landscape irrigation, green roof watering, and natural stream/pond

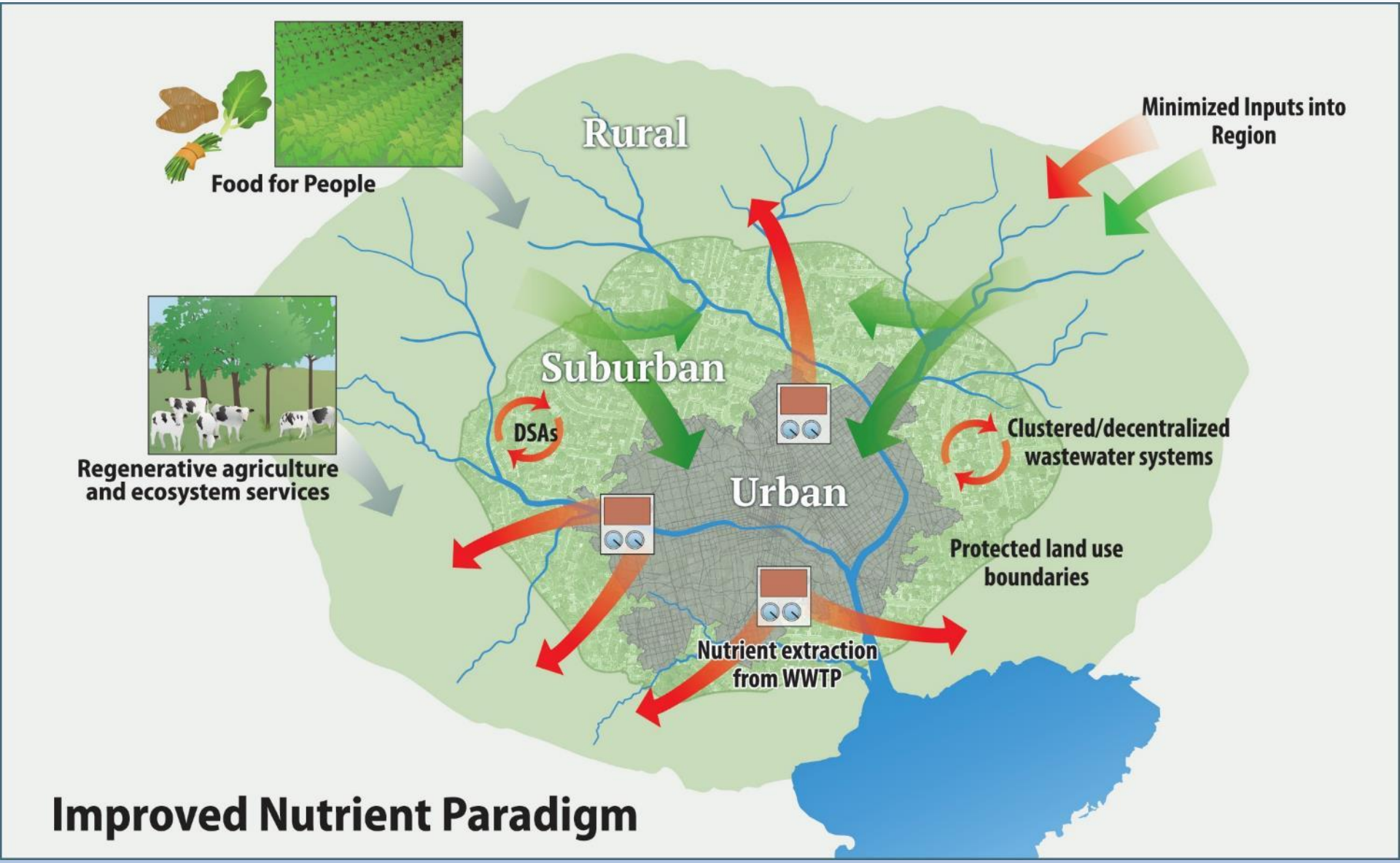
Resources in Wastewater

- Clean water
  - Landscape/agriculture irrigation
  - Flushing toilets
- Nutrients: nitrogen and phosphorus primarily
  - Fertilizer for landscape/agriculture
- Carbon/energy
  - Biogas for direct burning or electricity generation
  - Compost for soil amendment

An Unsustainable Model



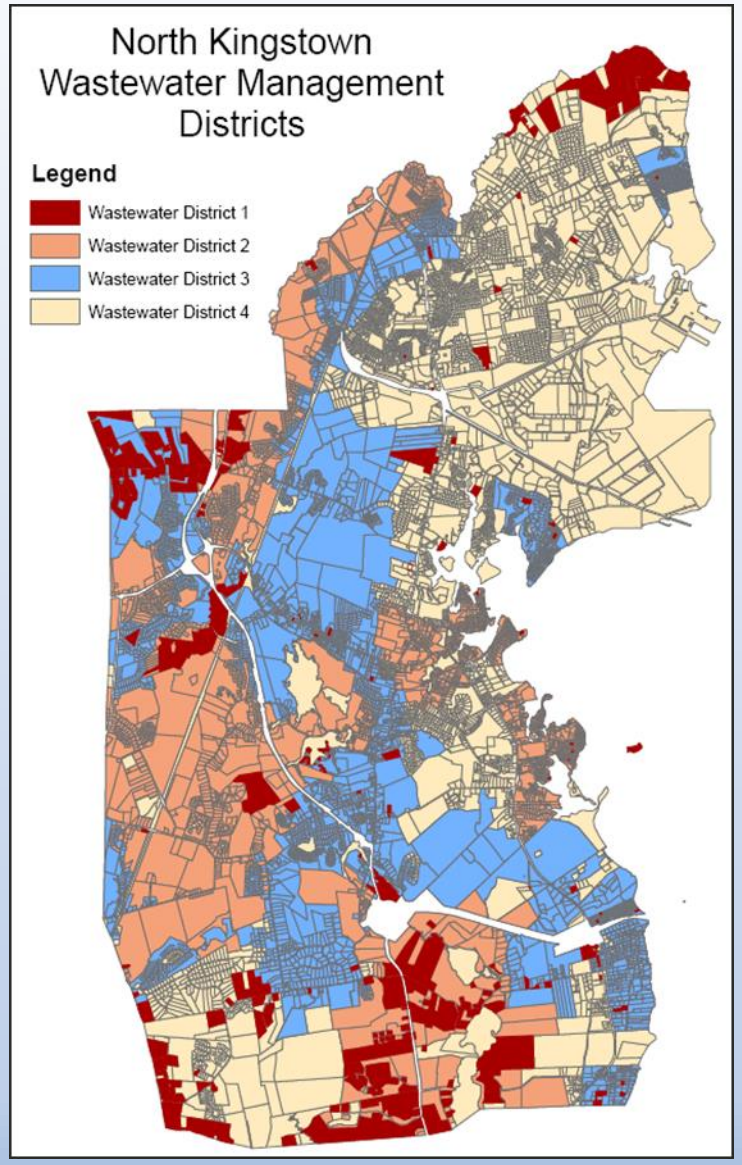
A Resilient Model



Dragonfly EcoResort – Moncks Corner, SC

Paths Forward

- Status quo
  - Health Department continues permitting septic systems and privately owned and operated "cluster" systems *ad hoc*
  - Centralized sewer implemented over time
- Proactive wastewater management
  - **Inventory**: what do you have?
    - GIS data, permit data, field reconnaissance
  - **Prioritize** systems for improvement
    - Stakeholder goals and values
    - Indicators might include: proximity to water, soil characteristics, system age, etc.
  - **Manage**: intensity tied to risk
    - Onsite improvements, cluster systems, sewer
    - Implementation (design, installation, OM&M)
    - Capacity building



Recommendations and Contact Information

- Recognize attributes of centralized and decentralized approaches
- Recognize importance of a distributed sewer architecture
- Consider water/sewer approaches when identifying development zones
- Avoid “leapfrog” development
- County-side wastewater scoping study

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