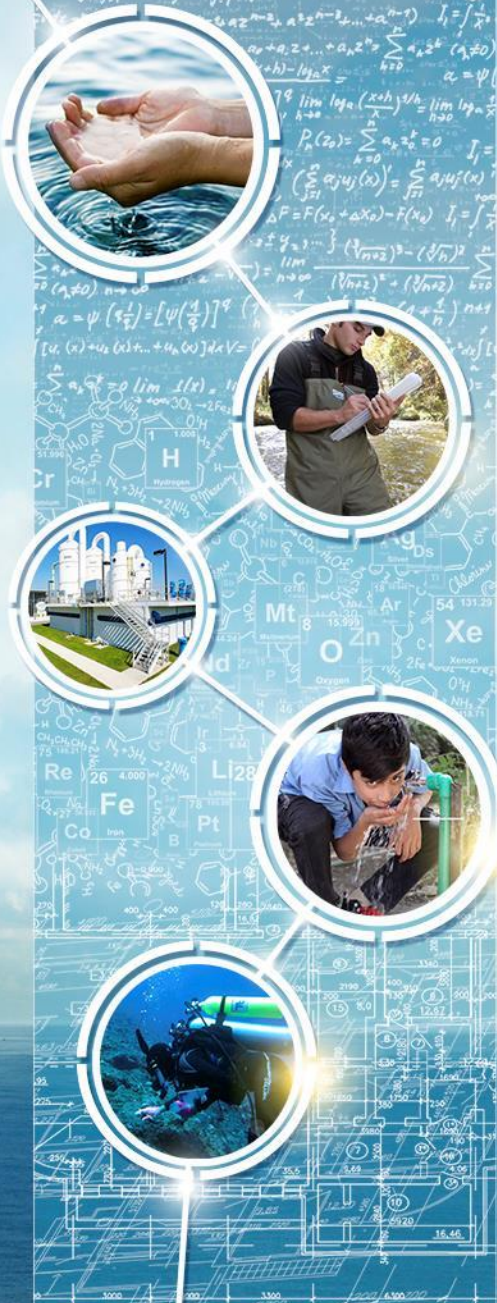




Preliminary Wastewater Evaluation for Seaforth Road High School Site

December 19, 2016

Victor D'Amato, PE



History

- Tetra Tech has worked for Chatham County Schools since 2011
 - Vic designed Chatham Central system in early 2000s
 - Bennett School sand filter rehab
 - Silk Hope Elementary concept plan
 - Ongoing small engineering on-call support for contract operators
- Contacted early last week about potential high school site on Seaforth Road
 - Provided rough range of onsite system costs
 - Provided list of North Carolina schools with surface and subsurface onsite systems installed in the past 10 years
 - Provided input about DWQ and DHHS permitting processes
 - Subcontracted with soil scientist for preliminary evaluation of site

Onsite Wastewater Permitting Processes

- DHHS process for large *subsurface* dispersal systems
 - DHHS approves design, Chatham County Environmental Health issues permits
 - Three-stage process
 - Improvement Permit = site approval (design flow + soil/site evaluation)
 - Construction Authorization = design approval (engineering design)
 - Operation Permit = installation approval (construction)
- DWQ – Land Application Unit for *surface* dispersal system
 - Approval and permitted by State
 - Main steps are largely the same as DHHS process

DHHS versus DWQ

- DHHS requires 100% repair area; DWQ requires large storage lagoon
- Surface dispersal = spray irrigation, surface drip irrigation
- Subsurface dispersal = conventional drainfield, low pressure pipe, subsurface drip irrigation



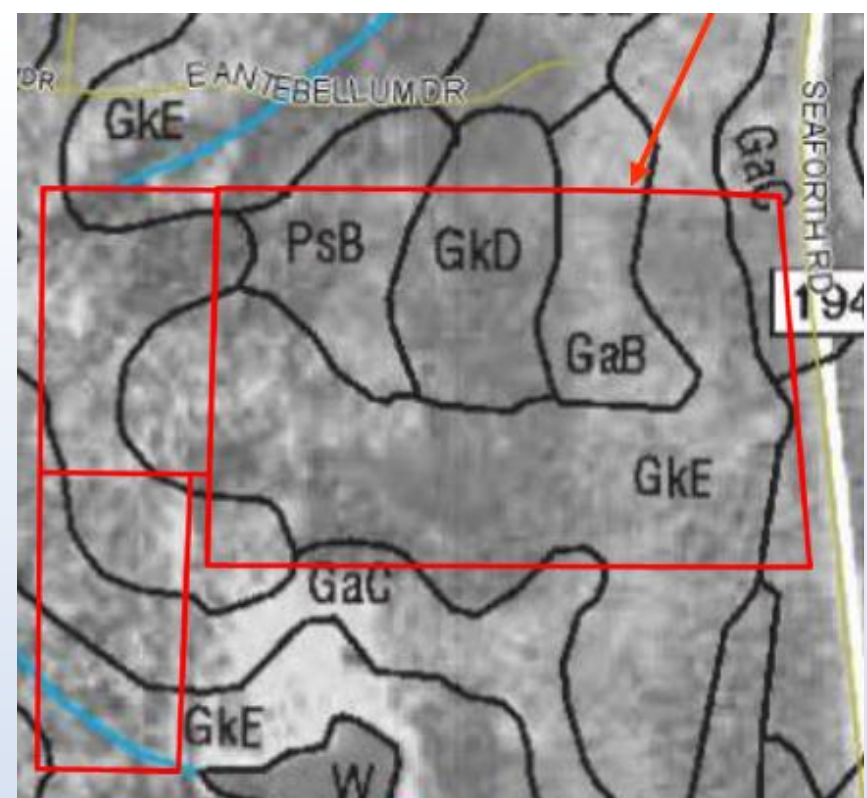
Seaforth Road Site



Natural Resources Conservation Service

In cooperation with North Carolina Department of Environment and Natural Resources, North Carolina Agricultural Research Service, North Carolina Cooperative Extension Service, Chatham Soil and Water Conservation District, and Chatham County Board of Commissioners

Soil Survey of Chatham County, North Carolina



GaB—Georgeville silt loam, 2 to 6 percent slopes

Setting

Landscape: Piedmont uplands; mainly in the central and western parts of the county, in the Carolina Slate Belt

Landform: Broad ridges

Shape of areas: Rounded or irregular

Size of areas: 5 to 300 acres

Composition

Georgeville and similar soils: 90 percent

Dissimilar soils: 10 percent

Typical Profile

Surface layer:

0 to 7 inches—brown silt loam

Subsoil:

7 to 10 inches—yellowish red silty clay loam

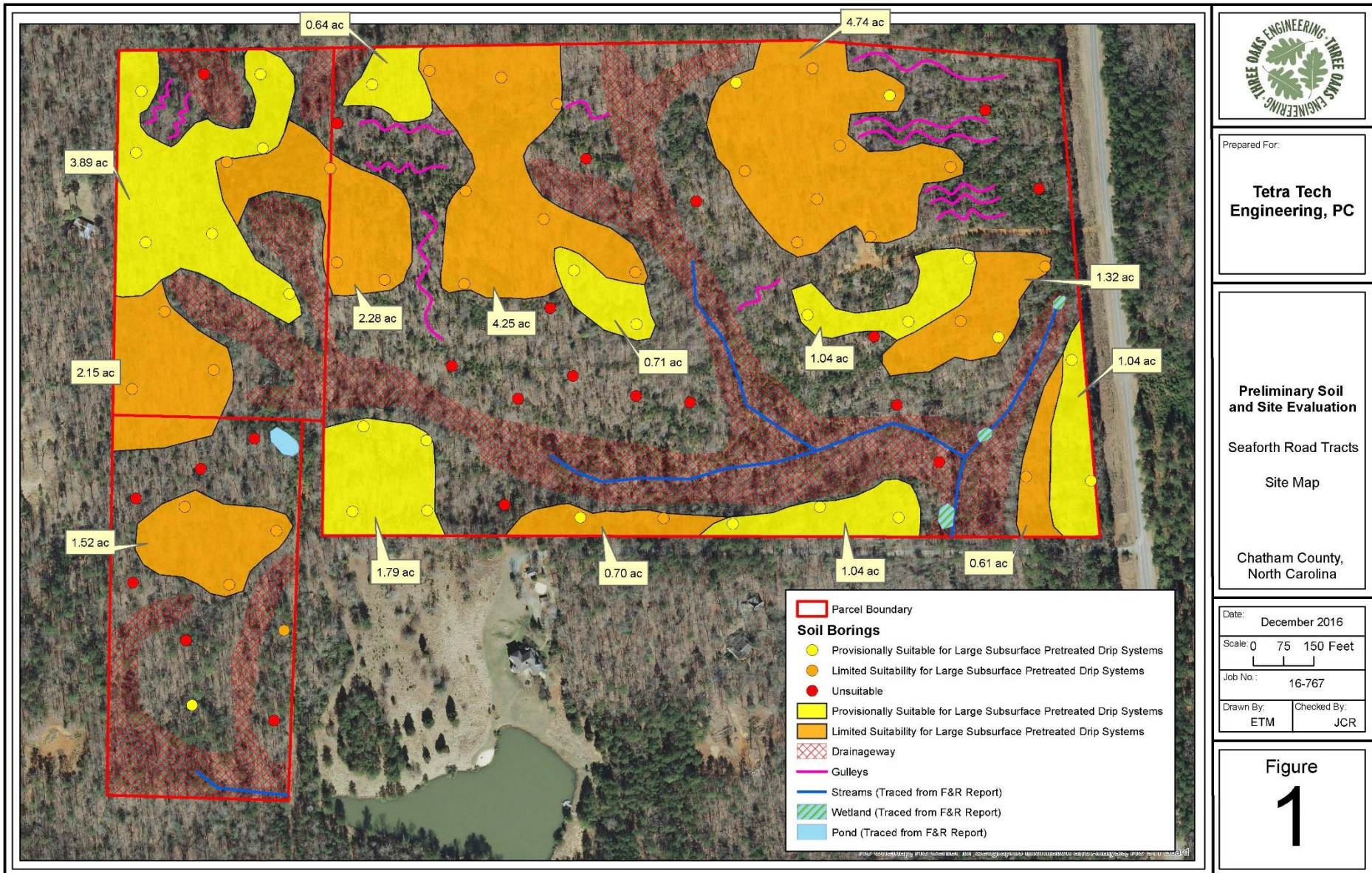
10 to 36 inches—red clay

36 to 44 inches—red clay that has strong brown mottles

Soil/Site Evaluation

- **Preliminary:** hand-augered borings to identify potential sites, issues, and other considerations
- **Detailed:** backhoe-dug pits on a 50' grid to characterize soils for site sizing, layout, and permitting
- **Hydraulic Analysis:** saturated hydraulic conductivity (K_{sat}) across site in various soil layers; calculation of site's hydraulic capacity for large system approval

Preliminary Evaluation Results



Prepared For:
Tetra Tech Engineering, PC

Preliminary Soil and Site Evaluation
Seaforth Road Tracts
Site Map
Chatham County, North Carolina

Date: December 2016
Scale: 0 75 150 Feet
Job No.: 16-767
Drawn By: ETM
Checked By: JCR

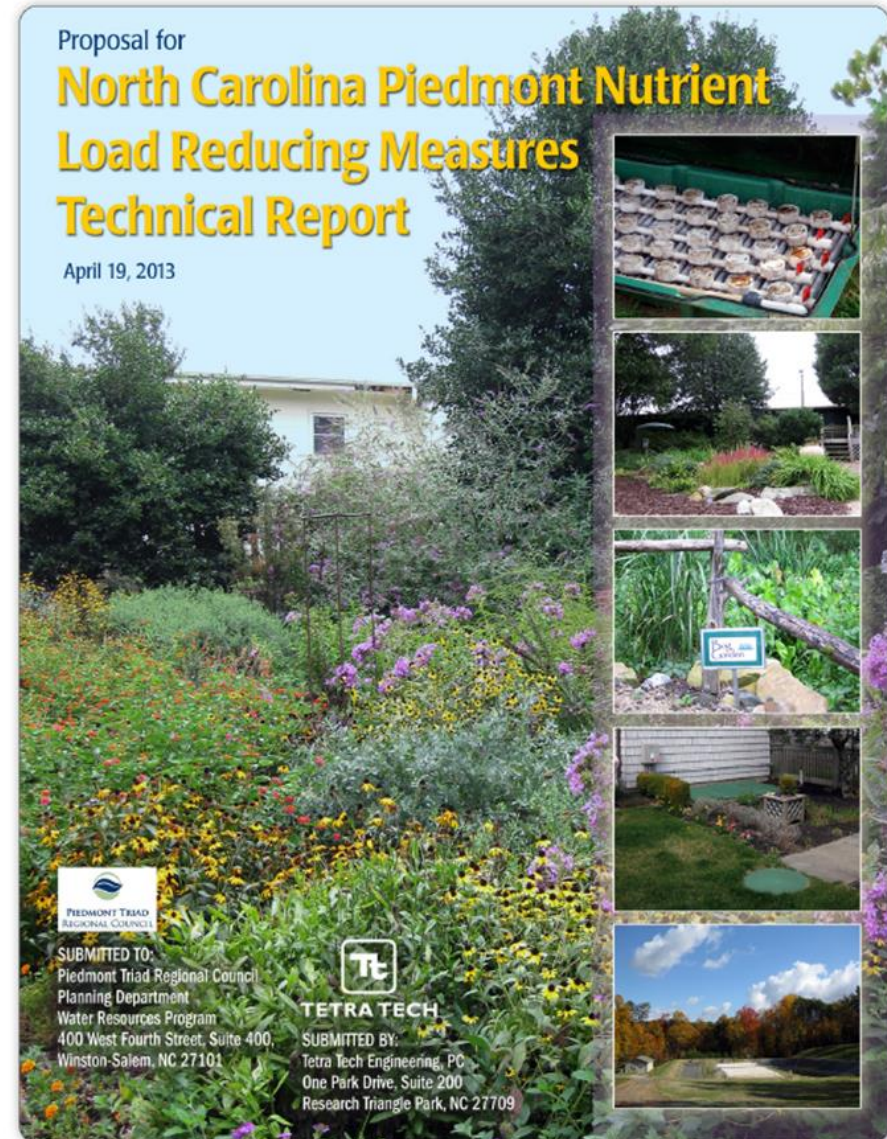
Figure 1

Preliminary Evaluation Summary

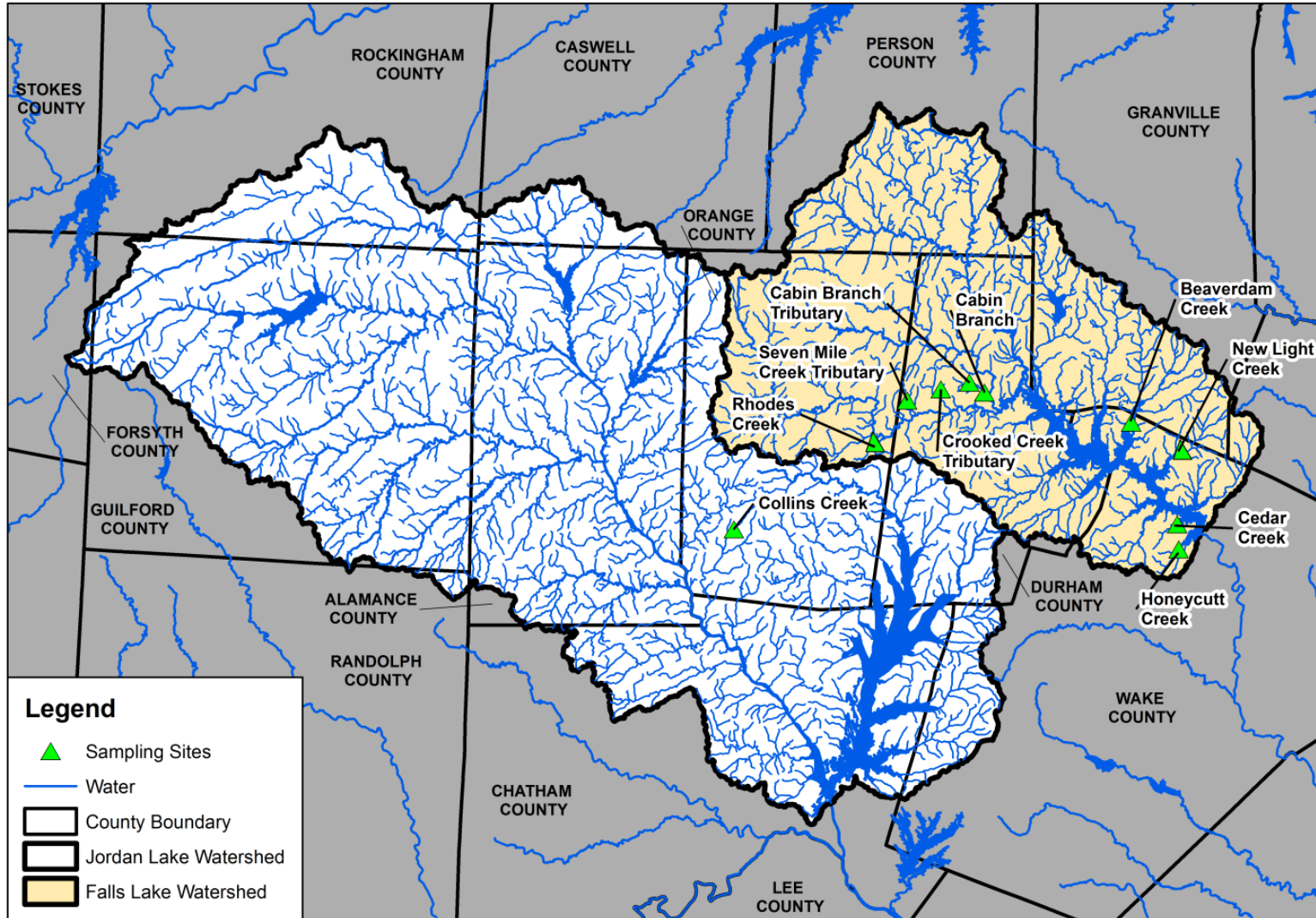
- Large onsite wastewater treatment system (OWTS)
 - 1,400 students = 21,000 gallons per day
- Although results are preliminary, there appears to be usable soil on the property for an OWTS
 - “Provisionally Suitable” soils are good – will require about 6 acres for primary and 6 acres for repair area
 - “Limited Suitability” soils are okay – will require more acreage
 - Reuse on ballfields, etc. is also possible
- Site is approximately 1 mile from Jordan Lake: what about water quality?

What About Water Quality?

- Tetra Tech developed the latest water quality model for Jordan Lake
 - Detailed inventory and nutrient load estimates for OWTS
- Data on nutrient loading from OWTS in the NC Piedmont
- We have developed applicable methodologies in the Chesapeake Bay watershed
- More detailed site assessment and modeling can be done
- Can use advanced treatment for water reuse



Jordan and Falls Lake Watershed Water Quality Monitoring Locations



Jordan and Falls Lakes Watershed Sampling Sites

NAD_1983_StatePlane_North_Carolina_FIPS_3200
Map produced 09-19-2013 - H. Nicholas



0 5 10 20 30 Kilometers

0 5 10 20 30 Miles



NC Piedmont OWTS 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

ChesBay OWTS Attenuation Expert Panel

Review science on how to factor nutrient attenuation into Chesapeake Bay TMDL OWTS load estimates

- Assess variable total nitrogen (TN) attenuation rates
- Determine whether 100% removal of total phosphorus (TP) is warranted
- Recommend methodologies to be used and specific attenuation rates to be used in different contexts
- Final report approved in October

The screenshot shows the Chesapeake Bay Program website. The header includes the logo, the text "Chesapeake Bay Program Science. Restoration. Partnership.", a search bar, and a "Contact Us" link. The navigation menu has links for Home, Discover THE CHESAPEAKE, Learn THE ISSUES, Track THE PROGRESS, Take ACTION, In The NEWS, Bay Resource LIBRARY, and About The BAY PROGRAM. Below the navigation is a banner with images and the text "About the Bay Program". The breadcrumb trail reads: Home > About the Bay Program > How We're Organized > Water Quality Goal Implementation Team > Wastewater Treatment Workgroup. The page title is "Wastewater Treatment Workgroup" with the sub-heading "Scope and Purpose". The main content area states: "Originally created in 1995, the group now serves to provide a formal means of interaction & communication amongst and between Federal agencies, state agencies/jurisdictions, & wastewater treatment plants. Functions include:" followed by a bulleted list of functions. A sidebar on the left lists organizational units under "Who We Are" and "How We Work". At the bottom, there are tabs for "Members", "Meetings", and "Publications". The "Publications" tab is active, showing a document titled "Recommendations of the On-Site Wastewater Treatment Systems Nitrogen Reduction Technology Expert Review Panel" with a publication date of July 14, 2014, and approval by the Water Quality Goal Implementation Team.

Chesapeake Bay Program
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Home > About the Bay Program > How We're Organized > Water Quality Goal Implementation Team > Wastewater Treatment Workgroup

Wastewater Treatment Workgroup
Scope and Purpose

Originally created in 1995, the group now serves to provide a formal means of interaction & communication amongst and between Federal agencies, state agencies/jurisdictions, & wastewater treatment plants. Functions include:

- Provide a forum for the discussion and exchange of information between the Bay Partners, stakeholders, and the CBP concerning: nutrient loading estimates and nutrient removal technologies, along with the associated implementation costs.
- Provide the technical leadership and provide input concerning point source issues for the Tributary Strategy Revision Process.
- Track annual nutrient reduction progress and coordinate the information to the NSC's Tributary Strategy Workgroup for inclusion in their annual Tributary Strategy Statement of Progress.
- Provide data and support for the Modeling Subcommittee activities.

Who We Are

How We Work

How We're Organized

- Chesapeake Executive Council
- Principals' Staff Committee
- Management Board
- Citizens Advisory Committee
- Local Government Advisory Committee
- Scientific and Technical Advisory Committee
- Communications Workgroup
- Scientific and Technical Assessment and Reporting Sustainable Fisheries

Members **Meetings** Publications

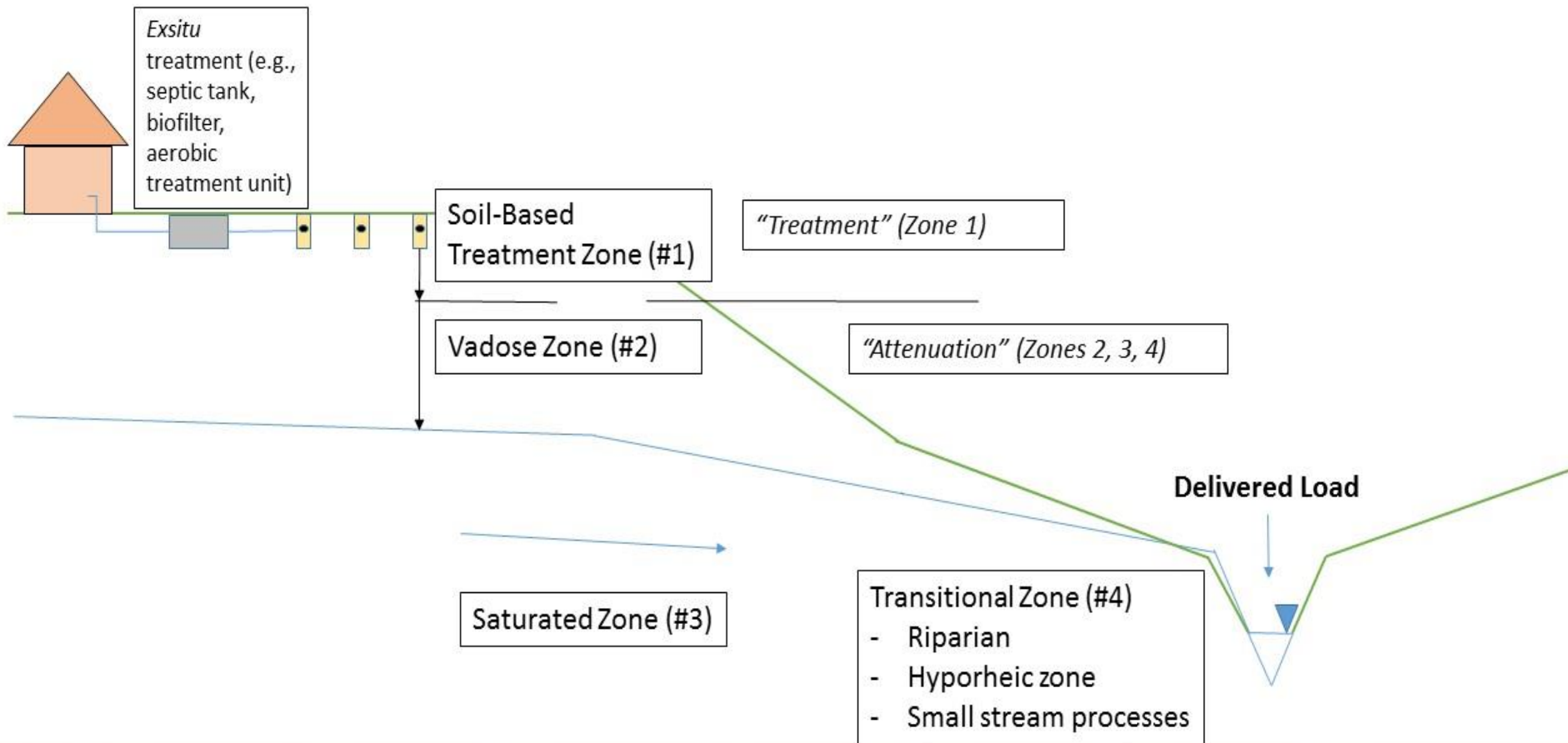
Recommendations of the On-Site Wastewater Treatment Systems Nitrogen Reduction Technology Expert Review Panel

Publication date: | Type of document: | Download: Electronic Version

Approved by the Water Quality Goal Implementation Team, July 14, 2014

Attenuation Panel Conceptual Framework

Assume: residential wastewater, 5 kg TN/cap/year



TN Reductions in OWTS Components

| Component | Comment |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <i>Exsitu</i> unit 1 (e.g., septic tank) | No TN reduction assumed in septic tank (e.g., TN = 5 kg/cap /day) |
| <i>Exsitu</i> unit 2 (e.g., intermittent sand filter) | TN reductions based on CBP approved BMP credits |
| <i>Insitu</i> Zone 1 (Soil-Based Treatment) | Varies by soil texture, based on STUMOD and field observations |
| <i>Insitu</i> Zone 2 (Vadose Zone) | Assumed low in comparison to Zones 1 and 3; not explicitly addressed by Panel |
| <i>Insitu</i> Zone 3 (Groundwater Zone) | Varies by physiography and geology, informed by SPARROW modeling and field observations |
| <i>Insitu</i> Zone 4 (Transitional Zones) | Small stream and riparian processing being partially addressed by other CBP efforts |

Overall Panel Recommendations

| Soil Textural Classification | USDA Soil Textures | Low TN Transmission Area | Medium TN Transmission Area | High TN Transmission Area | Very High TN Transmission Area |
|------------------------------|--------------------------------------------------------------|--------------------------|-----------------------------|---------------------------|--------------------------------|
| Sandy | Sand, Loamy Sand, Sandy Loam, Loam | 1.1 kg/cap/yr (-31%) | 1.7 kg/cap/yr (6%) | 2.3 kg/cap/yr (44%) | 2.7 kg/cap/yr (69%) |
| Loamy | Silt loam, Clay Loam, Sandy Clay Loam, Silty Clay Loam, Silt | 0.8 kg/cap/yr (-50%) | 1.3 kg/cap/yr (-19%) | 1.8 kg/cap/yr (13%) | 2.1 kg/cap/yr (31%) |
| Clayey | Sandy Clay, Silty Clay, Clay | 0.6 kg/cap/yr (-63%) | 0.9 kg/cap/yr (-44%) | 1.3 kg/cap/yr (-19%) | 1.5 kg/cap/yr (-6%) |

Represents delivery to Zone 4 (additional removal possible)
 Change from current CBP load (1.6 kg/cap/yr) in parentheses

Advanced Treatment and Reuse

- Advanced Treatment
 - Recirculating filters (can be vegetated)
 - UV disinfection
- Resource Recovery and Reuse
 - Water (advanced treatment)
 - Nutrients (urine diversion)
 - Energy (anaerobic digestion)



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