DEVELOPING A COUNTYWIDE ROADMAP FOR WASTEWATER MANAGEMENT

6th Northeast Onsite Wastewater Treatment Short Course and Equipment Exhibition

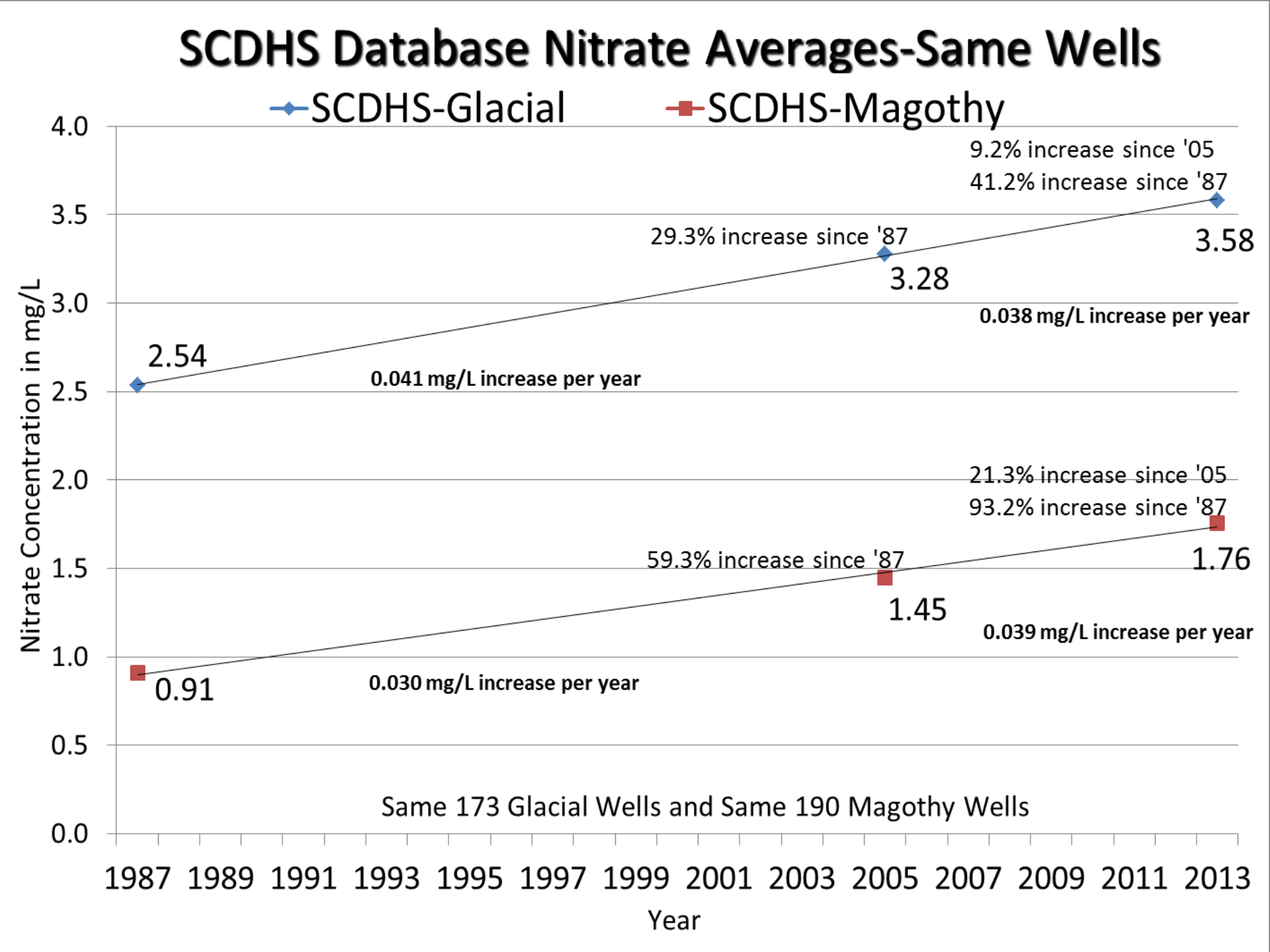
WWW.RECLAIMOURWATER.INFO

KEN ZEGEL, PE, ASSOCIATE PUBLIC HEALTH ENGINEER
KEN.ZEGEL@SUFFOLKCOUNTYNY.GOV
631-852-5809

AGENDA

- Problem Statement
- Why Prepare a Subwatersheds Wastewater Plan?
- Subwatersheds Wastewater Plan Methodology and Findings
  - Model Examples
  - Priority Area Ranking
  - Load Reduction Goals
  - Phased Wastewater Upgrade Program
  - Other Recommendations
- Questions?

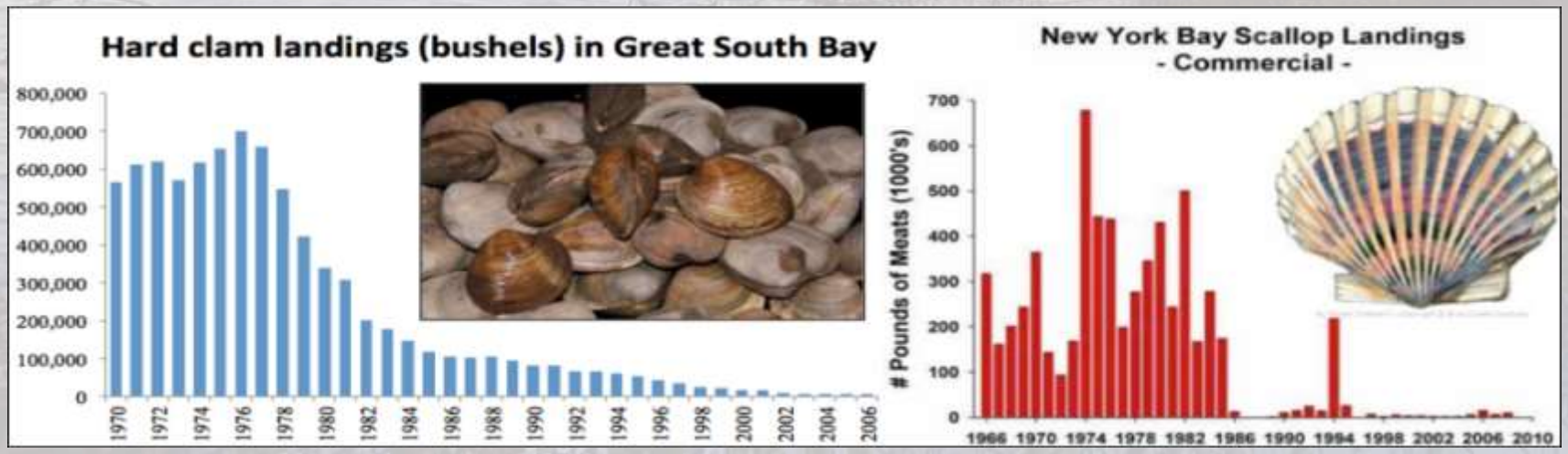
- ~1.5 million people, >900 sq miles/600,000 acres
  - Mostly unsewered (~74% of population)
- Vulnerable sole source aquifer
  - Diffuse public water supply well network (>900 wells)
    - Often relatively shallow (upper glacial aquifer)
  - ~35,000 private wells; 200 sewage treatment plants
- Wetlands, surface waters, 3 major estuary systems
  - Groundwater and surface waters are connected
  - All Suffolk estuary systems **IMPAIRED** by **NITROGEN**
    - Peconics, South Shore Estuary Reserve, Long Island Sound
    - Eutrophication and low dissolved oxygen
    - Harmful algal blooms
    - Shellfish impacts
    - COASTAL RESILIENCY
      - Wetlands, eelgrass
- 190 Public Bathing Beaches
  - "The Environment is the Economy."


SCDHS Database Nitrate Averages-Same Wells
SCDHS-Glacial
SCDHS-Magothy
Nitrate Concentration in mg/L
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.2% increase since '05
41.2% increase since '87
3.58
29.3% increase since '87
3.28
0.038 mg/L increase per year
2.54
0.041 mg/L increase per year
21.3% increase since '05
93.2% increase since '87
1.76
59.3% increase since '87
1.45
0.039 mg/L increase per year
0.91
0.030 mg/L increase per year
Same 173 Glacial Wells and Same 190 Magothy Wells
1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
Year

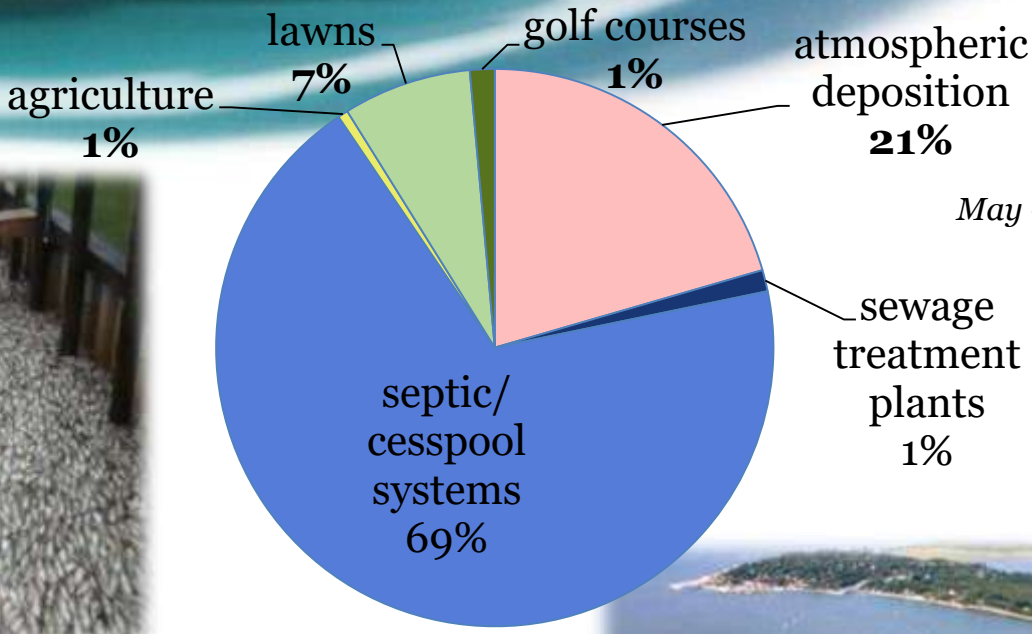
NITROGEN IMPACTS

- All 3 Estuary systems IMPAIRED (dissolved oxygen), PLUS:

~90% loss of SAV; major loss of wetlands



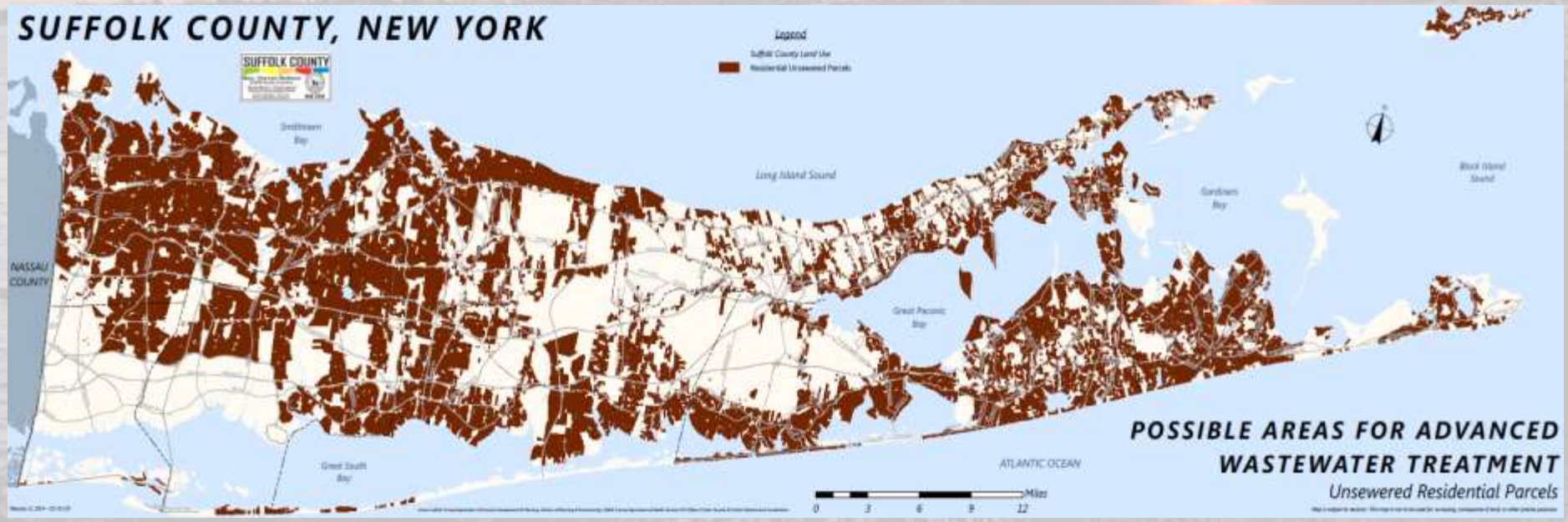
NITROGEN IMPACTS



May – June 2015

74% Non-Performing Wastewater Treatment

- Approximately 360,000 onsite sewage disposal system
- 209,000 systems in priority areas
- Approximately 252,530 pre-date requirement for septic tank



Evolution of I/A OWTS in Suffolk County

2014

*** IBM Smarter Cities Report Issued**

* County Septic Tour to Review I/A Programs of neighboring States

*** 1st I/A Septic Demo and Lottery**

* Crap Shoot Film Contest

2015

***SC Comprehensive Water Resources Management Plan**

***I/A Demo Systems Begin to be Installed**

2016

***Article 19 (Establish RME)**

* I/A Stds Issued / Res Stds w/ I/A

* 2nd I/A Septic Demo & Lotto

* Meschutt Beach I/A Demo

***Provisional Approval 21 I/A's**

* SWP Begins

* LW Training

2017

***SC SIP Program/Law**

***Article 6 Amendments Approved**
~Grandfathering
~ Cesspool phase-out

* Revised Commercial & Residential Stds

* 1st Constructed Wetlands Installed @ Sylvester Manor

2018

*** NYS SSRP - $10 M SC**

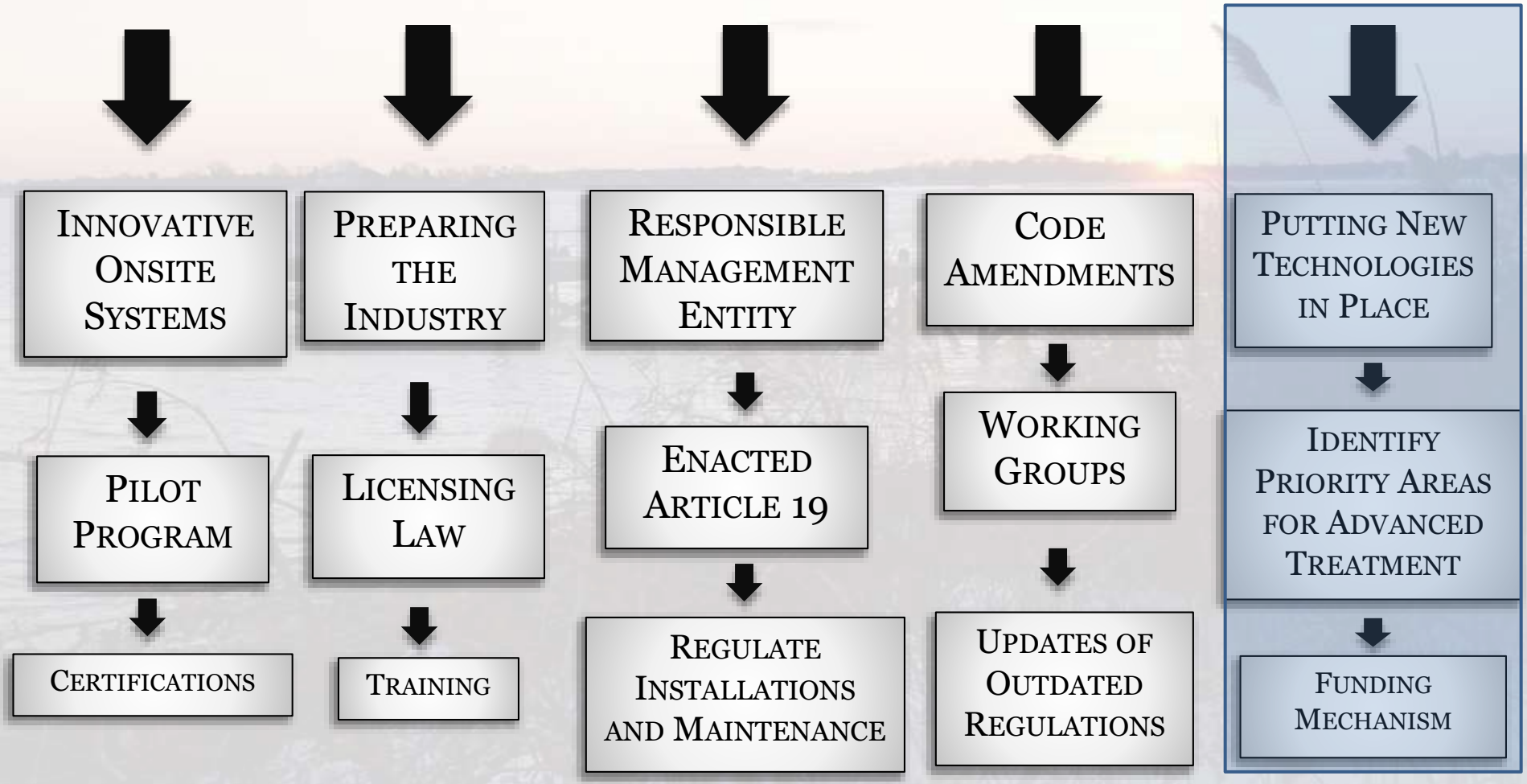
***SHIP Program**

* 1st NRB's Installed

2014 2015 2016 2017 2018

County Wastewater Approach

Evolution to Use of Innovative Treatment Systems



SUBWATERSHEDS WASTEWATER PLAN

In accordance with Suffolk County's Reclaim Our Water initiative and theLong Island Nitrogen Action Plan (LINAP), Suffolk County is pursuing proactive measures to reduce nitrogen pollution to our [surface] waters.

The Suffolk County Subwatersheds Wastewater Plan (SWP) is being prepared to provide early action recommendations for nitrogen load reduction goals and a recommended wastewater management strategy for all of the priority subwatersheds of Suffolk County.

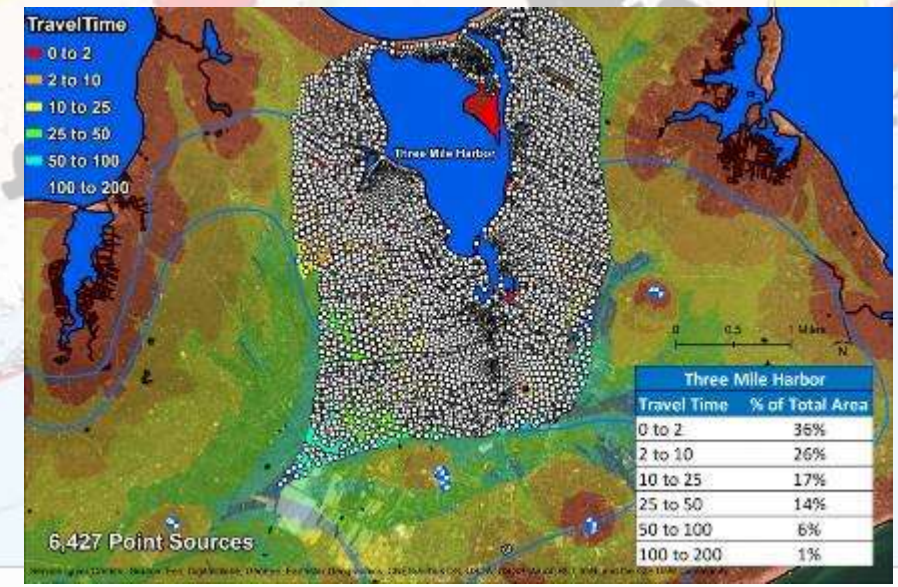
Reclaim Our Water

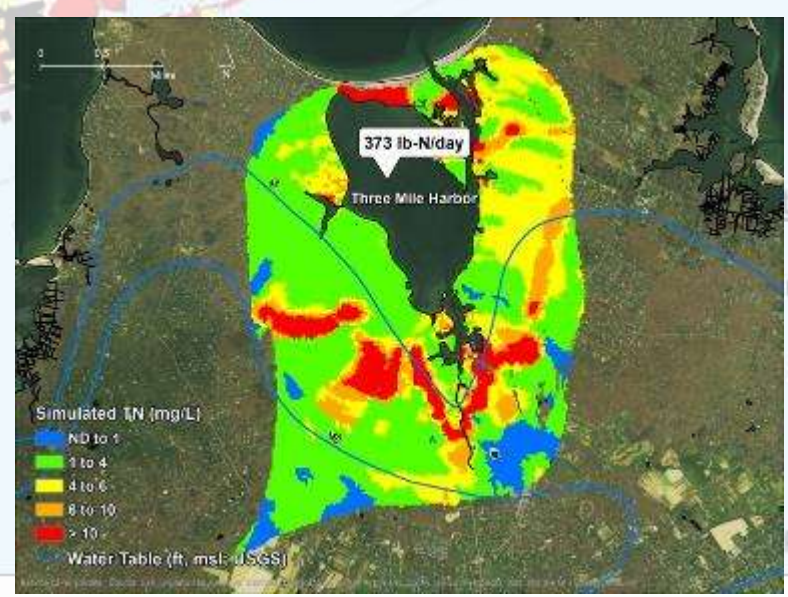
SUBWATERSHEDS WASTEWATER PLAN

- **Provide recommendations to policymakers on how to implement a countywide phased wastewater upgrade program that considers priority areas, load reduction goals, potential revenue streams, and timing**
- **<u>FIRST EVER</u> use of a Countywide integrated groundwater model to establish a uniform and consistent set of subwatershed boundaries and develop nitrogen load estimates for all priority areas (surface water, drinking water, groundwater)**
- **<u>FIRST EVER</u> development of a Countywide surface water quality database**
- **<u>FIRST EVER</u> development of residence times for almost all surface waterbodies in Suffolk County**
- **<u>FIRST EVER</u> development of nitrogen load reduction goals to restore and protect surface waters**
- **<u>FIRST EVER</u> of its kind establishment of tiered priority areas for wastewater upgrades**

SWP BY THE NUMBERS…

- **191 surface waterbodies evaluated**
- **~900 supply wells evaluated**
- **>800,000 surface water quality data points**
- **>500,000 parcels updated to 2016 Land Use**





EXPERT WORKGROUPS

Modeling

Nitrogen Load Model

- Chris Gobler – SUNY SoMaS
- Chris Schubert – USGS
- Lorraine Holdridge – NYSDEC
- Koon Tang – NYSDEC
- Susan Van Patton – NYSDEC
- Kristin Kraseski - NYSDEC
- Alison Branco – PEP
- Ken Zegel – SCDHS
- Julia Priolo - SCDHS
- Stephen Lloyd – TNC
- Jaime Vaudrey – UCONN
- Steve Pacenka - Cornell
- Nora Catlin – Cornell Coop
- Jeremy Campbell - SSER
- Rosella O'Connor- EPA
- Jim Ammerman- LIS
- Daniel Fucci – Nassau
- Awarded Consultant Experts

Groundwater Model

- Chris Schubert – USGS
- Chris Gobler – SUNY SoMaS
- Lorraine Holdridge – NYSDEC
- Koon Tang – NYSDEC
- Susan Van Patton – NYSDEC
- Kristin Kraseski - NYSDEC
- Alison Branco – PEP
- Ken Zegel – SCDHS
- Julia Priolo - SCDHS
- Ron Paulsen – SCDHS
- Steve Colabufo - SCWA
- Ruth Izraeli - EPA
- Kristina Heinemann - EPA
- Jeremy Campbell – SSER
- Henry Bokeniewicz – SUNY SB
- Jim Ammerman – LIS
- Daniel Fucci – Nassau
- Stephen Lloyd – TNC
- Awarded Consultant Experts

Surface Water Model

- Chris Gobler – SUNY SoMaS
- Robert Wilson-SUNY SoMaS
- Charles Flagg – SUNY SoMaS
- Chris Schubert – USGS
- Lorraine Holdridge – NYSDEC
- Susan Van Patton – NYSDEC
- Koon Tang – NYSDEC
- Kristin Kraseski - NYSDEC
- Alison Branco – PEP
- Ken Zegel – SCDHS
- Julia Priolo - SCDHS
- Jim Ammerman - LIS
- Jeremy Campbell – SSER
- Rosella O'Connor– EPA
- Daniel Fucci – Nassau
- Stephen Lloyd – TNC
- Awarded Consultant Experts

Priority Areas/Endpoints

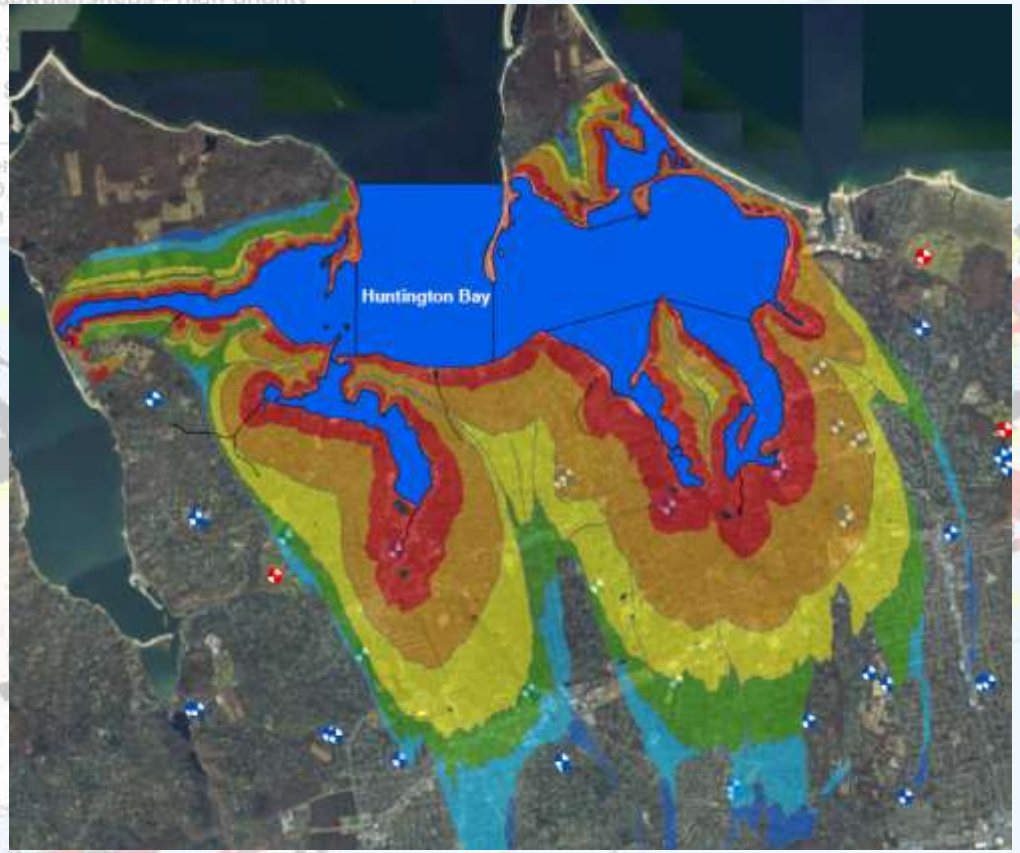
- Chris Gobler – SUNY SoMaS
- Larry Swanson – SUNY SoMaS
- Lorraine Holdridge – NYSDEC
- Koon Tang – NYSDEC
- Susan Van Patton – NYSDEC
- Kristin Kraseski - NYSDEC
- Alison Branco – PEP
- Mike Jensen - SCDHS
- Ken Zegel – SCDHS
- Julia Priolo - SCDHS
- Jason Hime – SCDHS
- Jim Latimer – EPA
- Brian Howes – UMASS
- Daniel Fucci – Nassau
- Marci Bortman – TNC
- Jeremy Campbell – SSER
- Mark Tedesco – LIS/EPA
- Soren Dahl – NYSDEC Region 1
- Awarded Consultant Experts

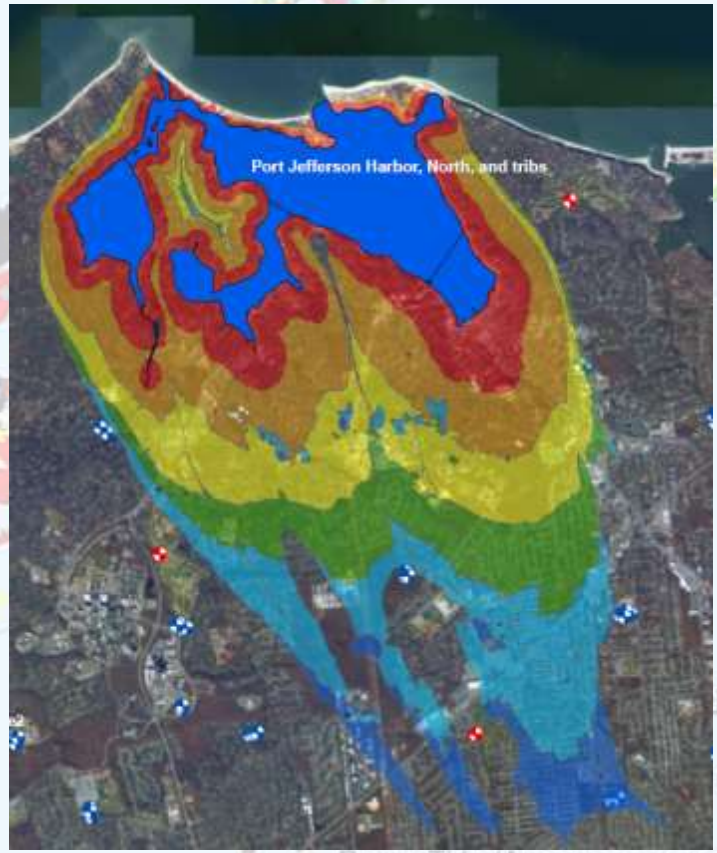
Wastewater Alternatives

- Sarah Lansdale – SCDEDP
- Dorian Dale - SCDEDP
- Lorraine Holdridge – NYSDEC
- Koon Tang – NYSDEC
- Susan Van Patton – NYSDEC
- Kristin Kraseski - NYSDEC
- Ken Zegel – SCDHS
- Julia Priolo - SCDHS
- Justin Jobin - SCDHS
- John Sohngen – SCDHS
- Jason Hime – SCDHS
- Boris Rukovets – SCDPW
- Jeremy Campbell - SSER
- Hal Walker - CCWT
- Daniel Fucci – Nassau
- Chris Clapp - TNC
- Tony Leung – NYSDEC Region 1
- Kristina Heinemann - EPA
- Awarded Consultant Experts

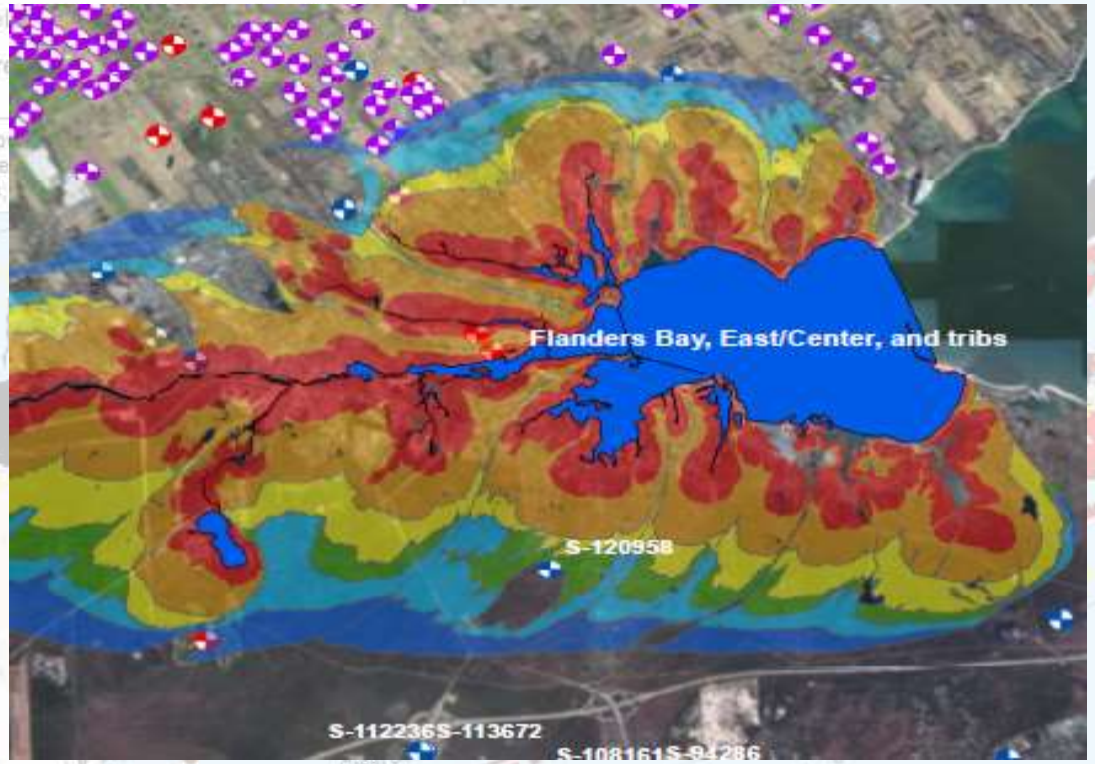
Modeling examples

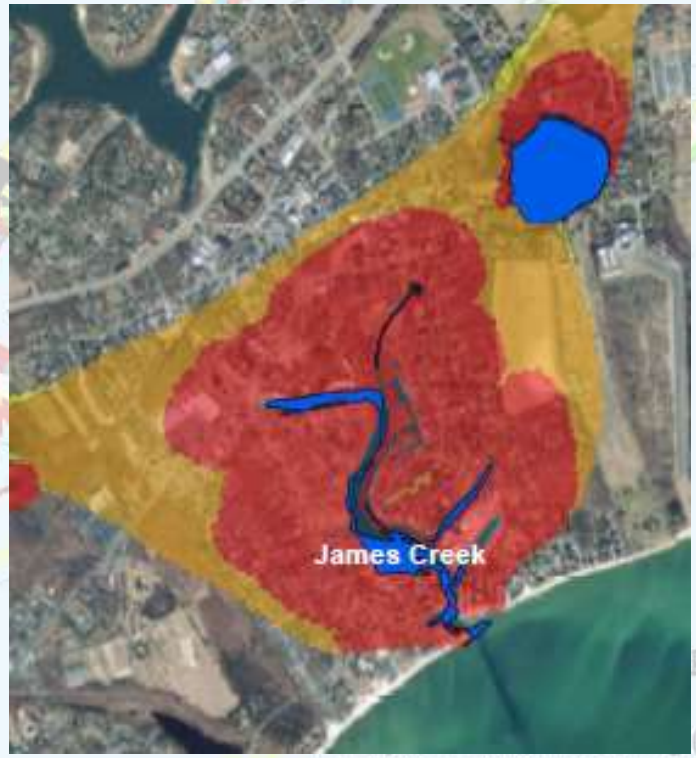
SUBWATERSHED DELINEATION



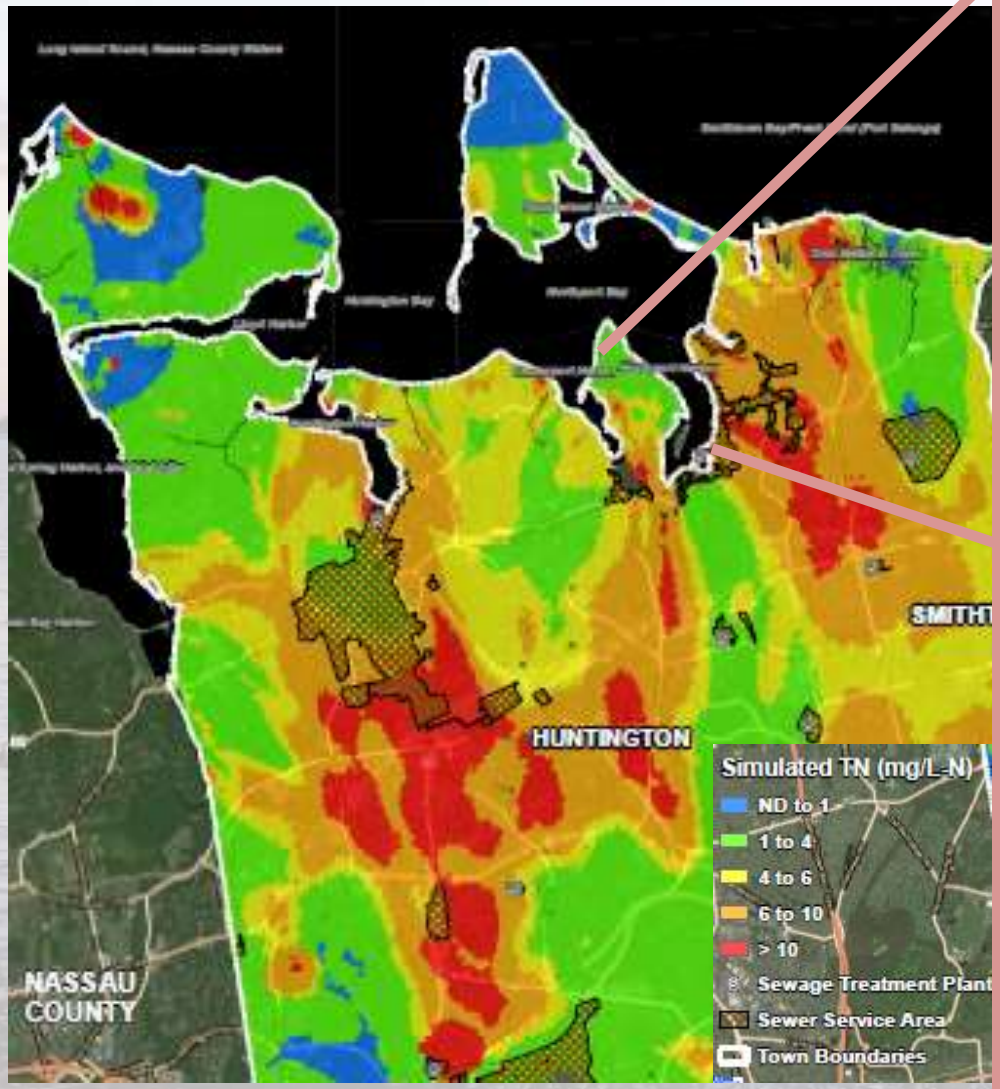


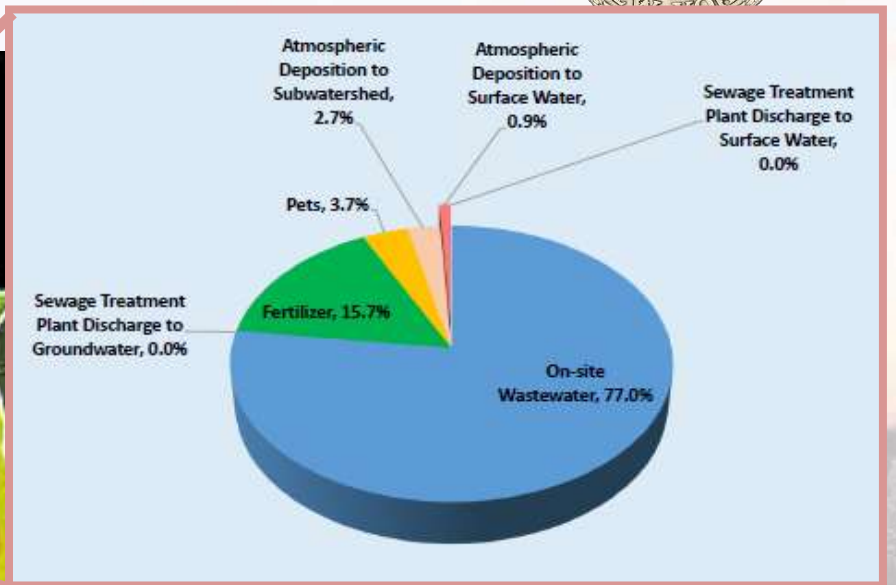
SUBWATERSHED DELINEATION

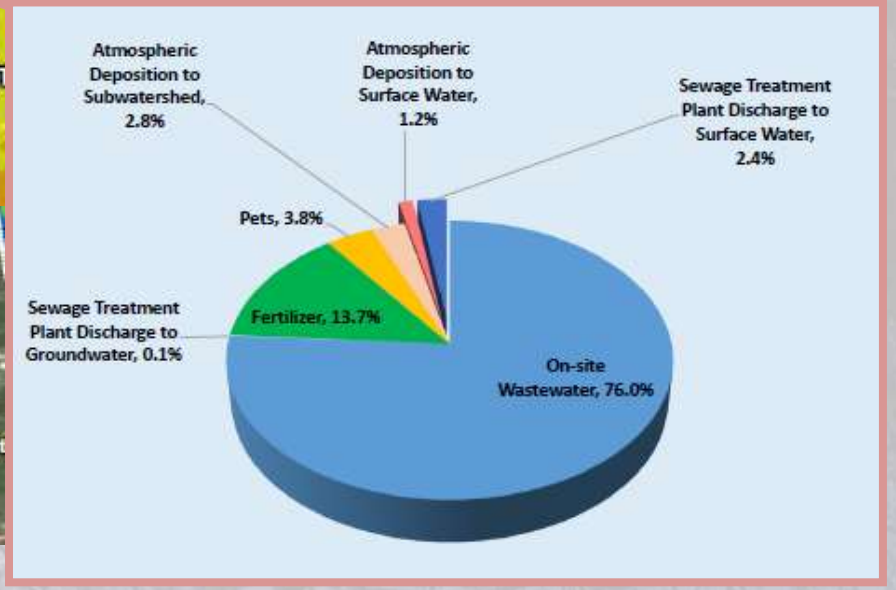


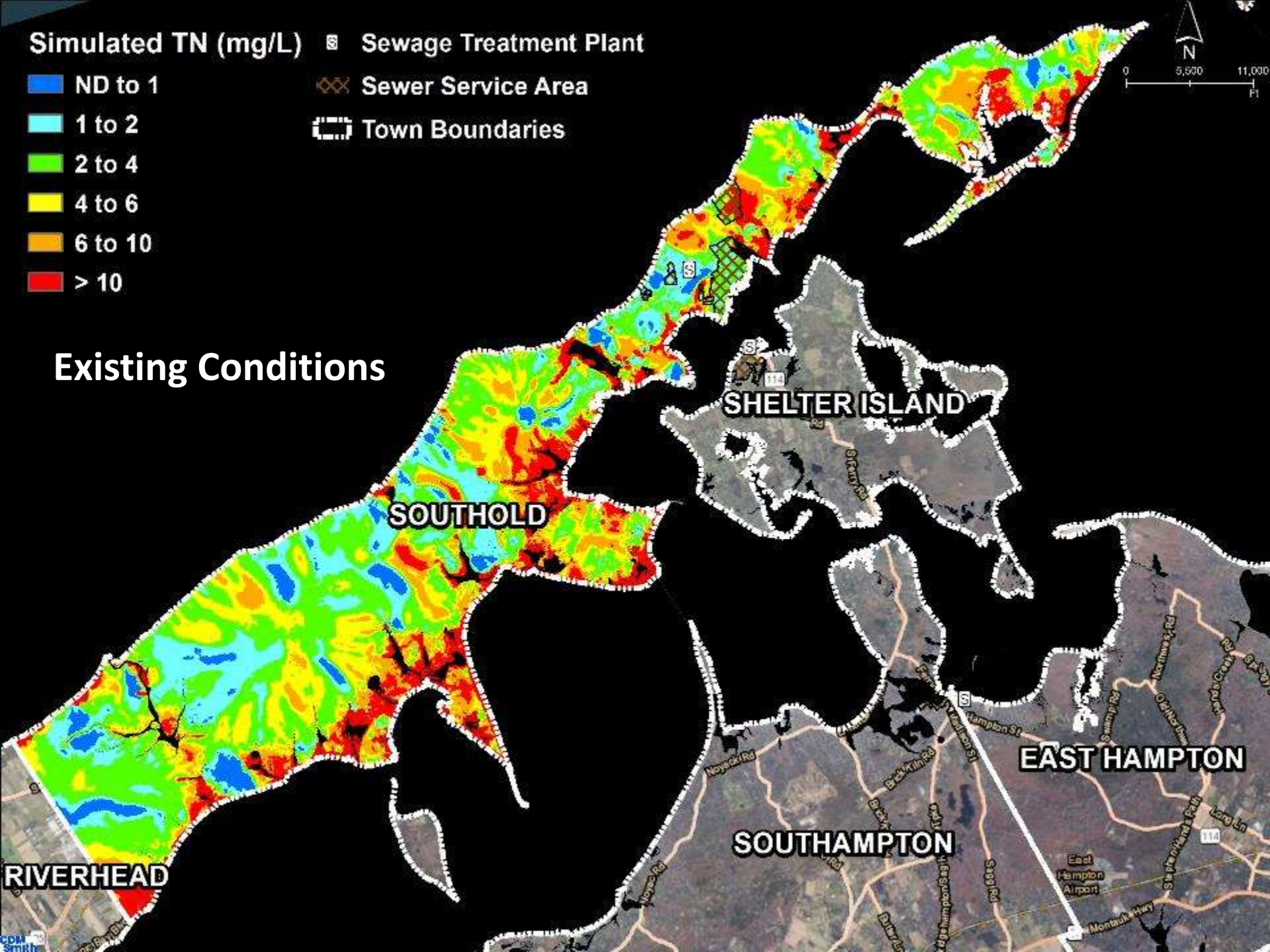


Nitrogen Load Model

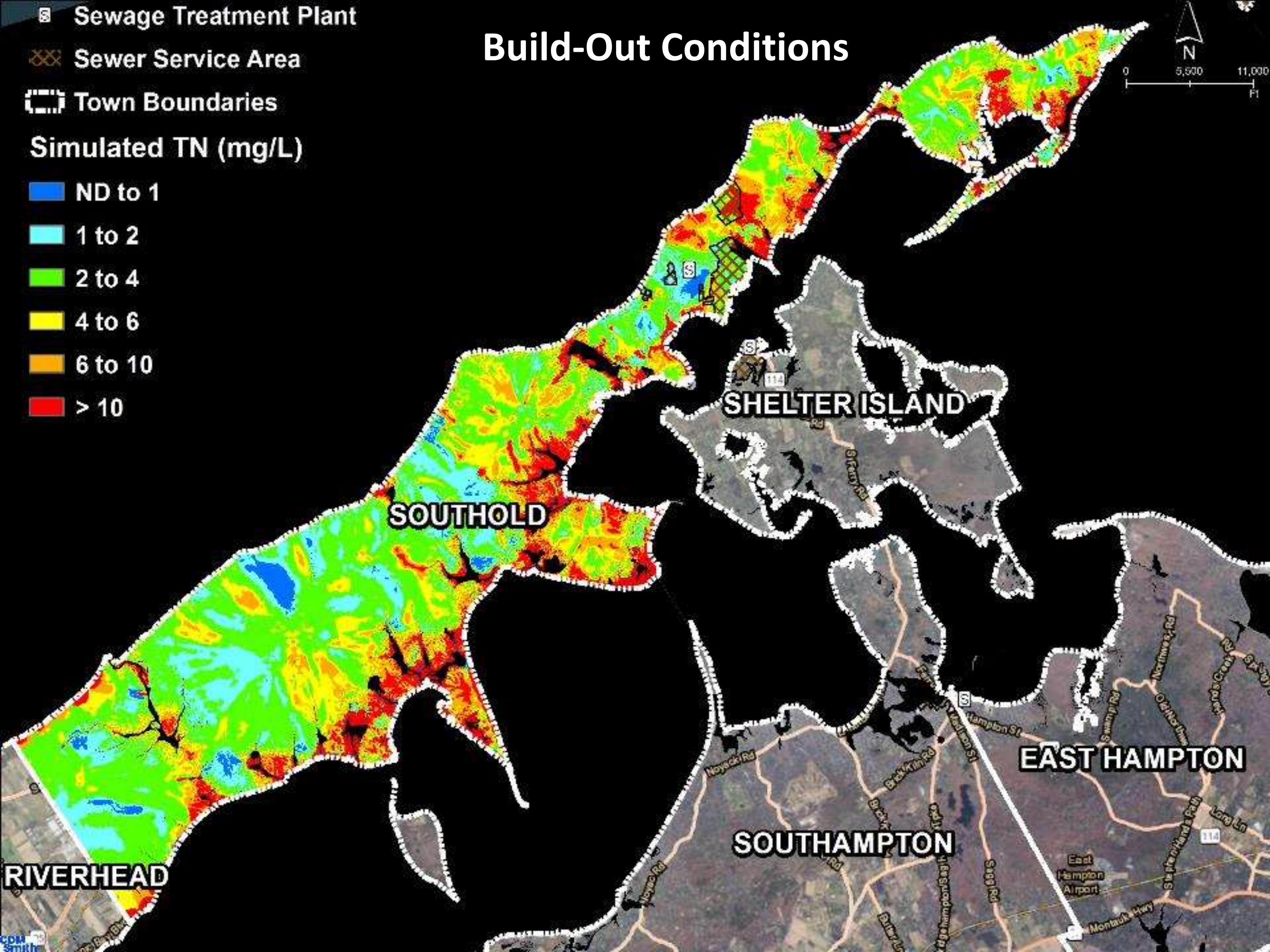






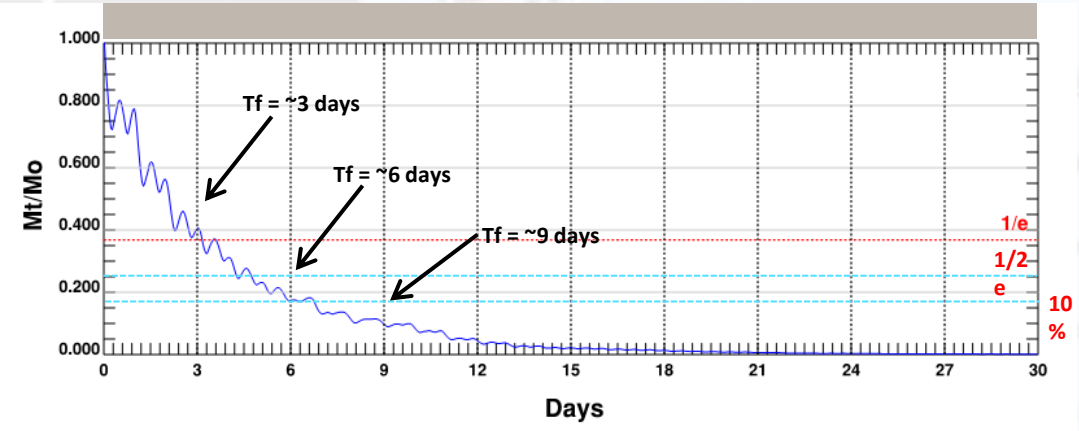

Simulated TN (mg/L)
ND to 1
1 to 2
2 to 4
4 to 6
6 to 10
> 10
Sewage Treatment Plant
Sewer Service Area
Town Boundaries
N
0
5,500
11,000
Ft
Existing Conditions
SHELTER ISLAND
SOUTHOLD
EAST HAMPTON
SOUTHAMPTON
RIVERHEAD

Build-Out Conditions



Hydrodynamic Modeling

- EFDC – (HDR, Inc.); with alternate method for select waterbodies
- Flushing times (Tf) calculated after models are developed & preliminary calibration completed
  - Fill model segments with initial “dye” concentration of 100 mg/L for PWL at time zero (complete individual PWL calculations separately)
  - Run model and calculate normalized “dye” concentration distribution over time
  - Calculate avg. flushing time to 10% of C/Co



PRIORITY AREA RANKING

Purpose:

- Rank and group waterbodies scientifically with respect to current ecological condition and vulnerability to nitrogen loads from wastewater (nitrogen load vs flushing time and existing water quality) to assist in funding resource allocation.
- Maximize cost-benefit on ultimate reduction needs/goals.
- Currently does not include “preservation priorities” and other subsequent policy evaluations.

PRIORITY SCORING CRITERIA

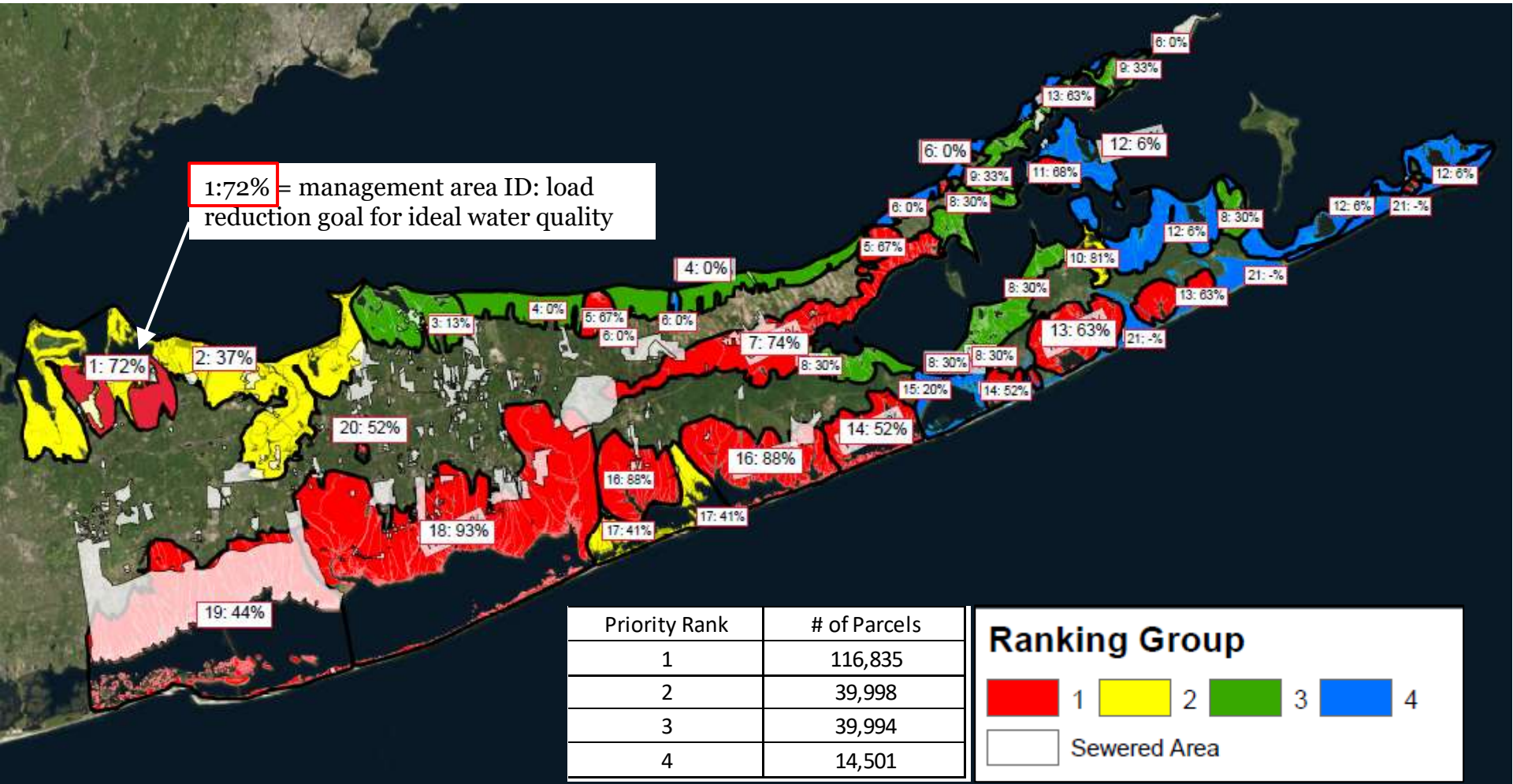
Marine Matrix

Criteria	Predicted N Load (1) (#/volume/yr)	Residence Time (2) (days)	Total Nitrogen Concentration (3) 90th Percentile for Last 10 Years (mg/L)	Total Phosphorus Concentration (3) 90th Percentile for Last 10 Years (mg/L)	Dissolved Oxygen (4) 10% percentile for last ten years	HAB - Environmental # of Blooms in Last 10 Years	HAB - Human Health # of Blooms in Last 10 Years	Chl-a (6) 90th Percentile for Last 10 Years (ug/L) or for poorly characterized subwatersheds, 90% percentile	Clarity (7) Secchi depth (ft)
Q,+N,-N	-N	-N	-N	-N	+N	-N	-N	-N	+N
Weight	15%	25%	10%	2%	15%	10%	13%	5%	5%

Fresh Matrix

Criteria	Predicted N Load (1) (#/volume/yr)	Residence Time (2) (days)	Total Nitrogen Concentration (3) 90th Percentile for Last 10 Years (mg/L)	Total Phosphorus Concentration (3) 90th Percentile for Last 10 Years (mg/L)	Dissolved Oxygen (4) 10% percentile for last ten years	HAB - Environmental # of Blooms in Last 10 Years	HAB - Human Health # of Blooms in Last 10 Years	Plant and/or Macroalgae Overgrowth	Chl-a (6) 90th Percentile for Last 10 Years (ug/L) or for poorly characterized subwatersheds, 90% percentile	Clarity (7) Secchi depth (ft)/Depth x 100
Q,+N,-N	-N	-N	-N	-N	+N	-N	-N	Q	-N	+N
Weight	20%	20%	5%	15%	10%	5%	10%	5%	5%	5%

Priority Areas
Surface Waters



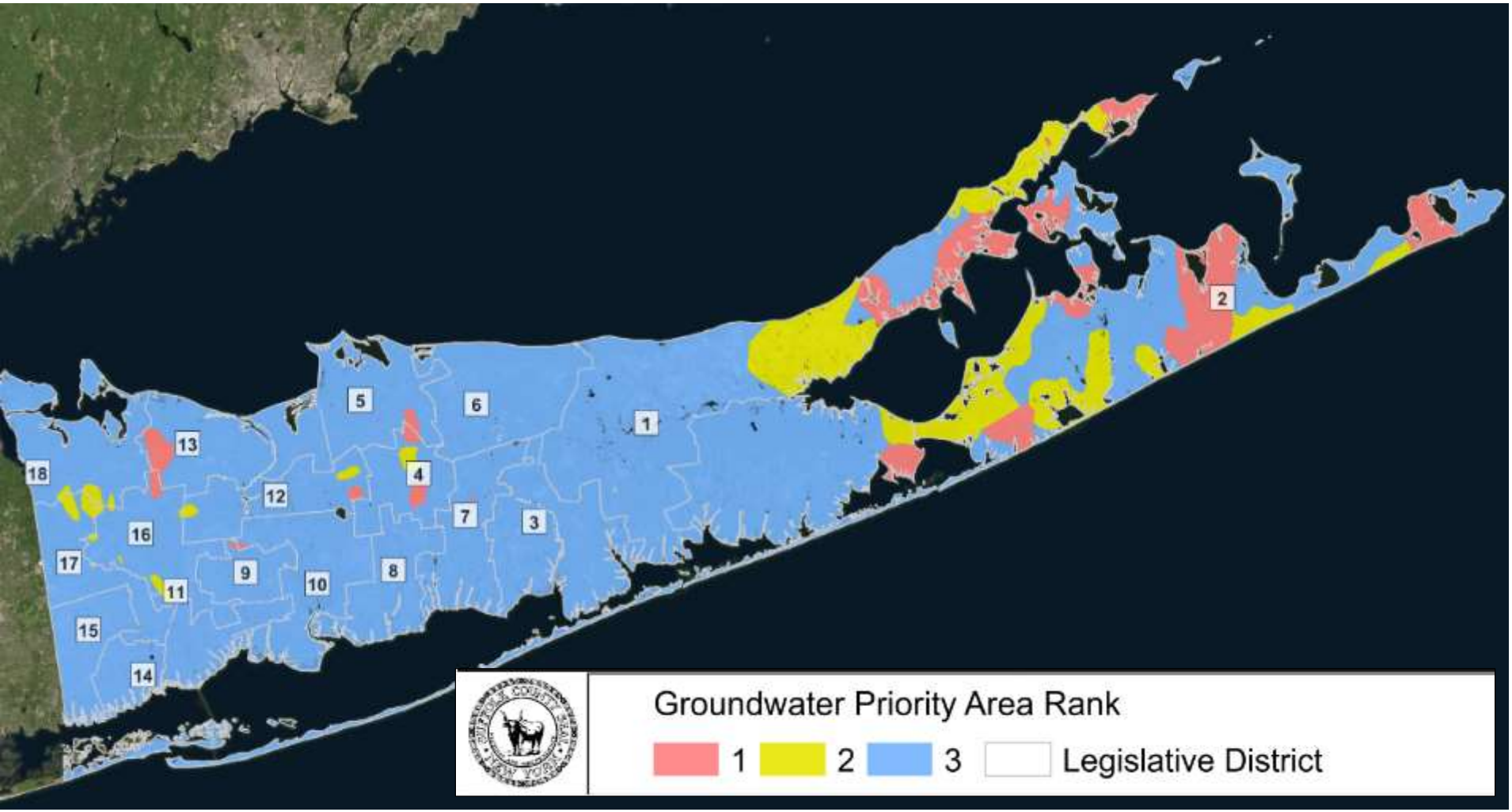
Priority Rank	# of Parcels
1	116,835
2	39,998
3	39,994
4	14,501

Ranking Group

1 2 3 4

Sewered Area

Priority Areas
Groundwater/Drinking Water



Load Reduction Goals

Purpose:

- Identify load reduction goals to improve water quality
- Support prioritization of wastewater upgrades
- Support identification of wastewater technology (I/A, sewering/clustering)
- Identification of waterbodies where other interventions may be necessary
- NOT intended to be a TMDL

LOAD REDUCTION GOALS (TASK 7 REPORT)

Wastewater Management Area Number	Management Area Name	Ecological Priority Area Rank	Management Area HAB/DO Improvement Goal*	Overall Water Quality Improvement Goal**	Achievable Reduction through On-Site Wastewater Management***
1	Western Long Island Sound Harbors Restoration Area	1	44%	72%	46%
2	Long Island Sound Harbors and Bays Restoration and Protection Area I	2	23%	37%	44%
3	Long Island Sound Harbors and Bays Restoration and Protection Area II	3	5%	13%	45%
4	Central and Western Long Island Sound Open Waters Protection Area	3	0%	0%	16%
5	Long Island Sound Inlets and Creeks Restoration Area	1	34%	67%	39%
6	Eastern Long Island Sound Open Waters and Long Island Sound Fresh Waters Protection Area	4	0%	0%	5%
7	Peconic Estuary Restoration and Protection Area I	1	49%	74%	23%
8	Peconic Estuary Restoration and Protection Area II	3	14%	30%	34%
9	Peconic Estuary Restoration and Protection Area III	3	15%	33%	30%
10	Sag Harbor Cove and Connected Creeks	2	62%	81%	45%

Management area can achieve significant water quality improvement through wastewater management alone.

Working DRAFT Subject to Revision

LOAD REDUCTION GOALS (CON'T)

11	West Neck Bay and Creek and Menantic Creek	1	37%	68%	42%
12	Peconic Estuary Restoration and Protection Area IV	4	0%	6%	11%
13	Coastal Ponds Restoration and Protection Waterbodies	1	N/A	63%	36%
14	Shinnecock Bay Restoration and Protection Area I	1	28%	52%	44%
15	Shinnecock Bay Restoration and Protection Area II	4	0%	20%	42%
16	Moriches Bay Restoration Area I	1	76%	88%	48%
17	Moriches Bay Restoration Area II	2	18%	41%	48%
18	Great South Bay Restoration Area I	1	87%	93%	48%
19	Great South Bay Restoration Area II	1	2%	44%	27%
20	Lake Ronkonkama	1	N/A	52%	48%
21	Atlantic Ocean	4	N/A	N/A	N/A

Management area can achieve significant water quality improvement through wastewater management alone.

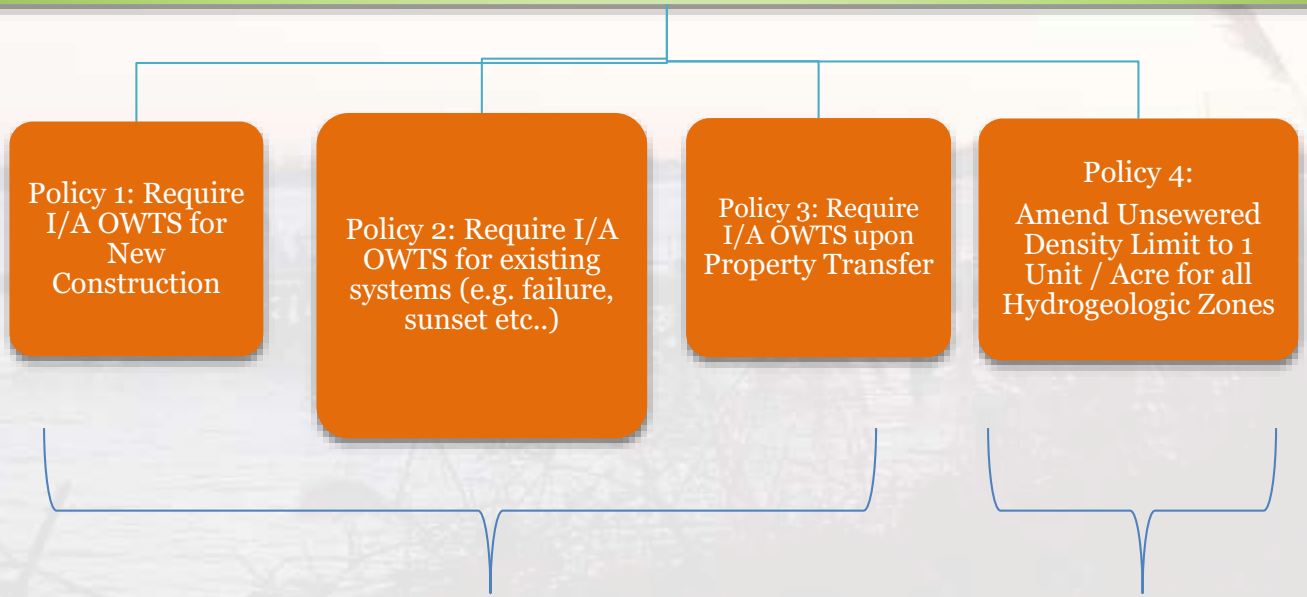
<u>The good news:</u> estimated that >75% of waterbodies can achieve significant water quality improvement through wastewater alone.

PHASED WASTEWATER UPGRADE PROGRAM

OBJECTIVES AND GUIDING PRINCIPLES

- Upgrade all existing onsite sanitary systems in the highest priority areas within a single generation (30 years*)
- Upgrade all existing onsite sanitary systems in ALL priority areas within 50 years
- Identify:
  - Policy Triggers Requiring WWT Upgrades
  - Estimated upgrade rates for policy triggers
  - Potential Funding Options
  - Locations with Highest Cost-Benefit
  - Locations that May Benefit for Sewer Expansions
  - RME and Market Ramp Up Strategy

Suffolk County Department of Health Services
Possible Sanitary Code Changes



Currently included in Subwatersheds Wastewater Plan Recommendations and Evaluated in GEIS

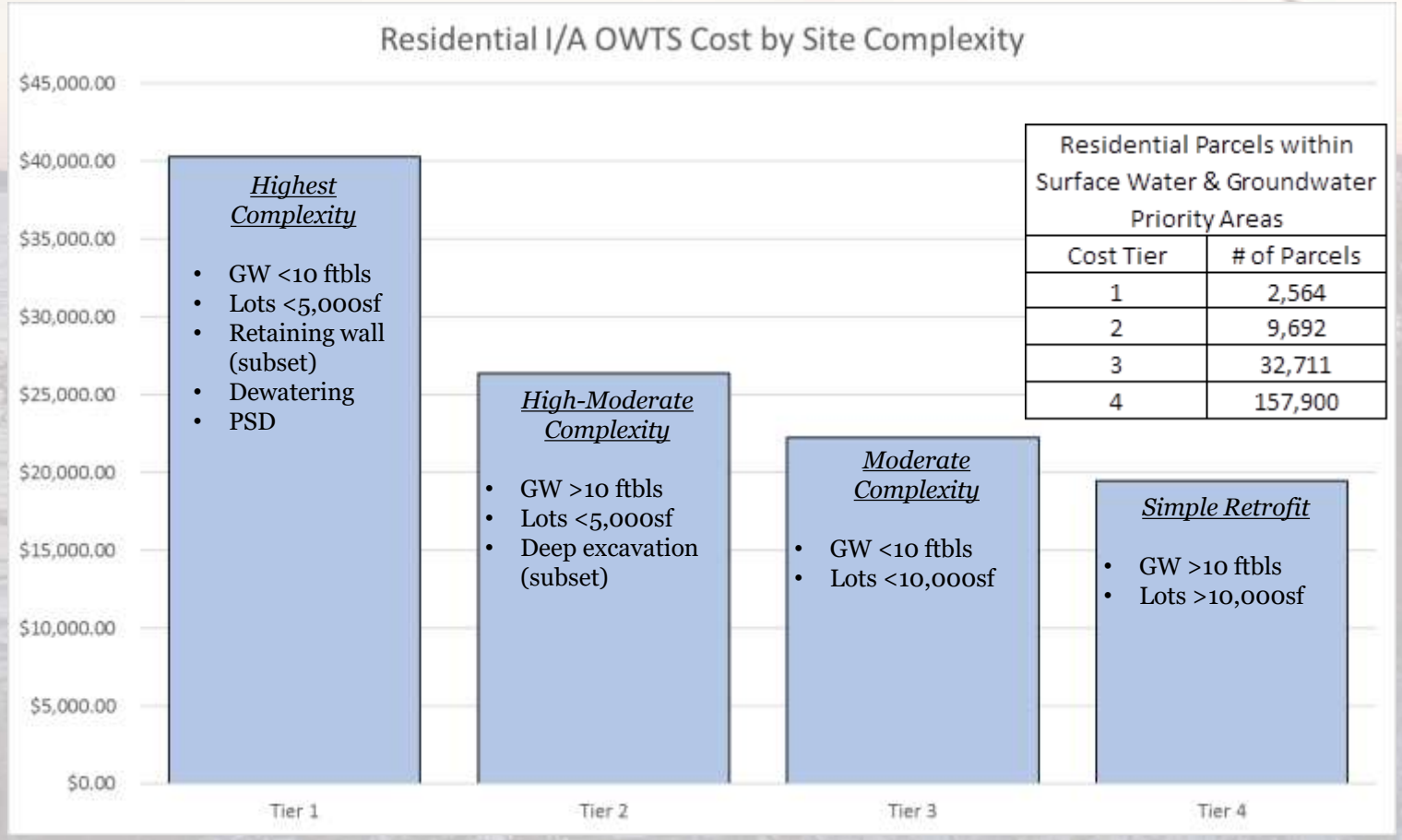
To be Evaluated as Alternative in GEIS – results pending

Wastewater Management District and Stable Recurring Revenue Source

- Purpose: to provide a central entity to provide a revenue means to offset the cost of wastewater management upgrades and to provide overall program administration (e.g. unify existing Districts, provide mechanism for administering and management revenue source, etc.)
- Examples of revenue sources: Chesapeake Bay Restoration Fee, Water Quality Protection Fee

COST DATABASE DEVELOPMENT

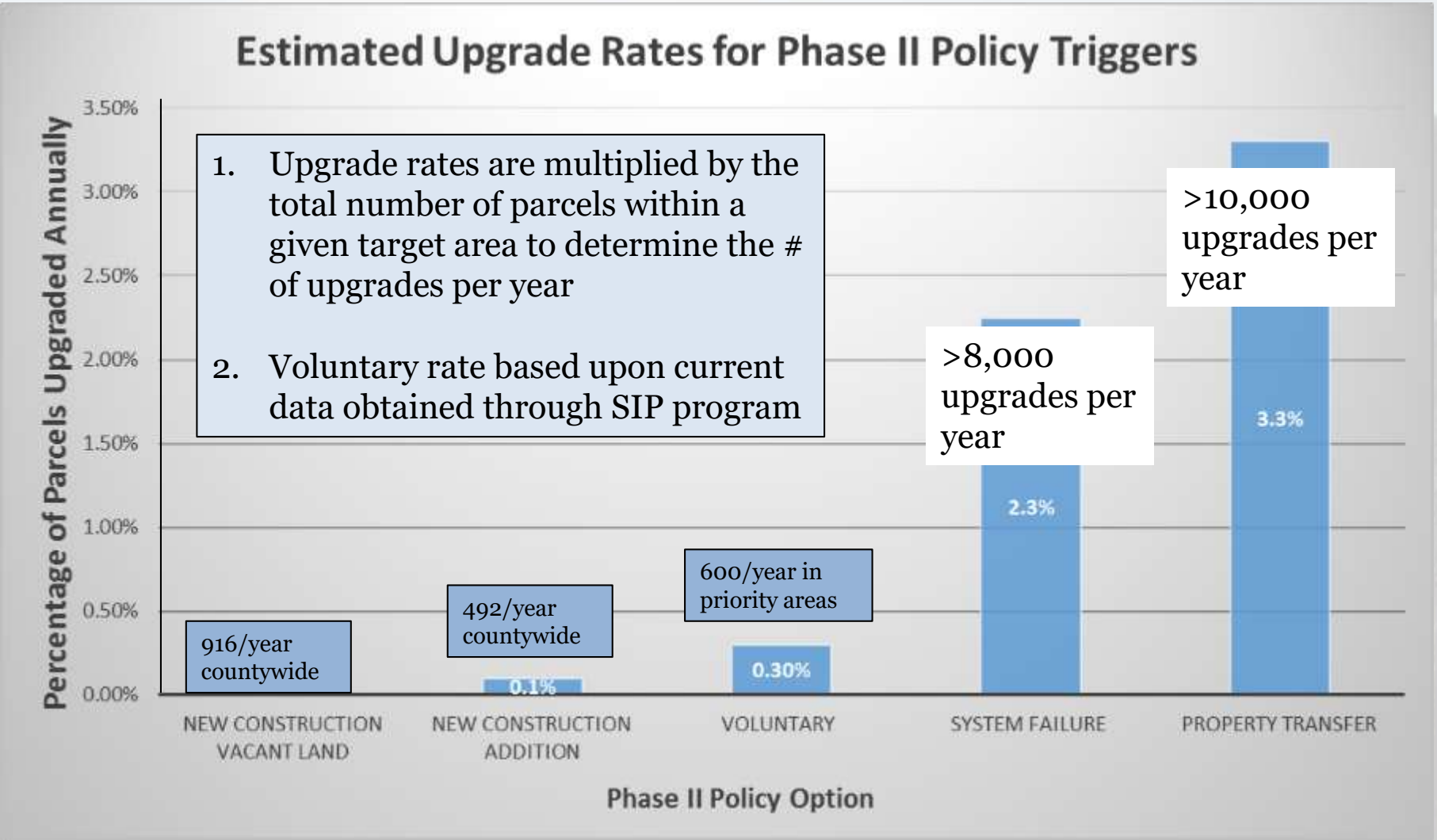
- Parcel-specific database that estimates cost to upgrade to I/A OWTS based upon four (4) tiers of site complexity.
- Includes estimates for residential and commercial***



Residential Parcels within Surface Water & Groundwater Priority Areas	
Cost Tier	# of Parcels
1	2,564
2	9,692
3	32,711
4	157,900

***All estimates based on current pricing from SC SIP. Pricing anticipated to decrease as market demand increases.

Wastewater Upgrade Rates and Program Ramp up



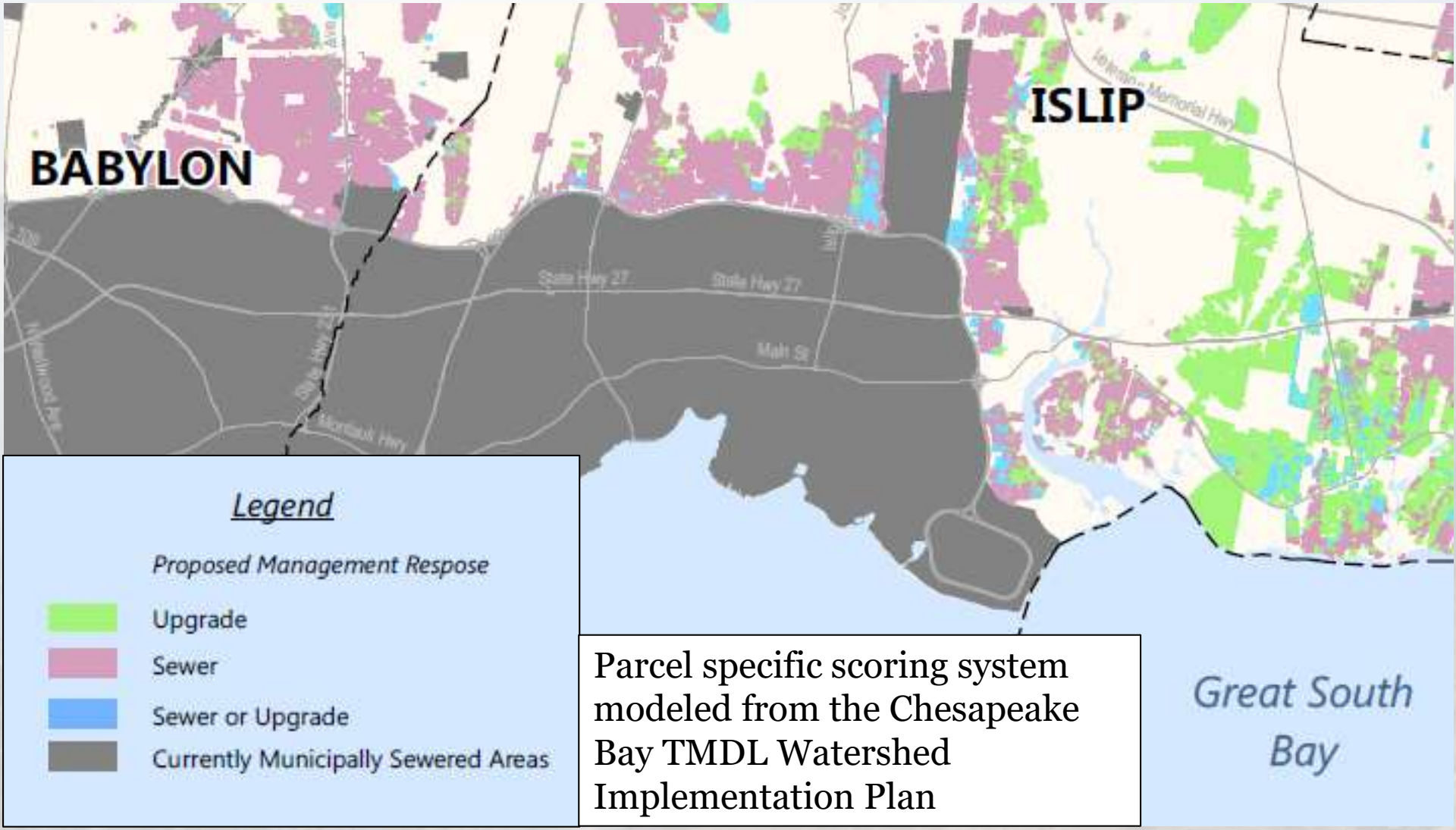
Sewer Assumptions

= Existing Sanitary Sewer Districts

= Proposed Sanitary Sewer Districts with Construction Funding

= Proposed Sanitary Sewer Districts without Construction Funding

SEWER ASSUMPTIONS – PARCEL SCORING



Parcel specific scoring system modeled from the Chesapeake Bay TMDL Watershed Implementation Plan

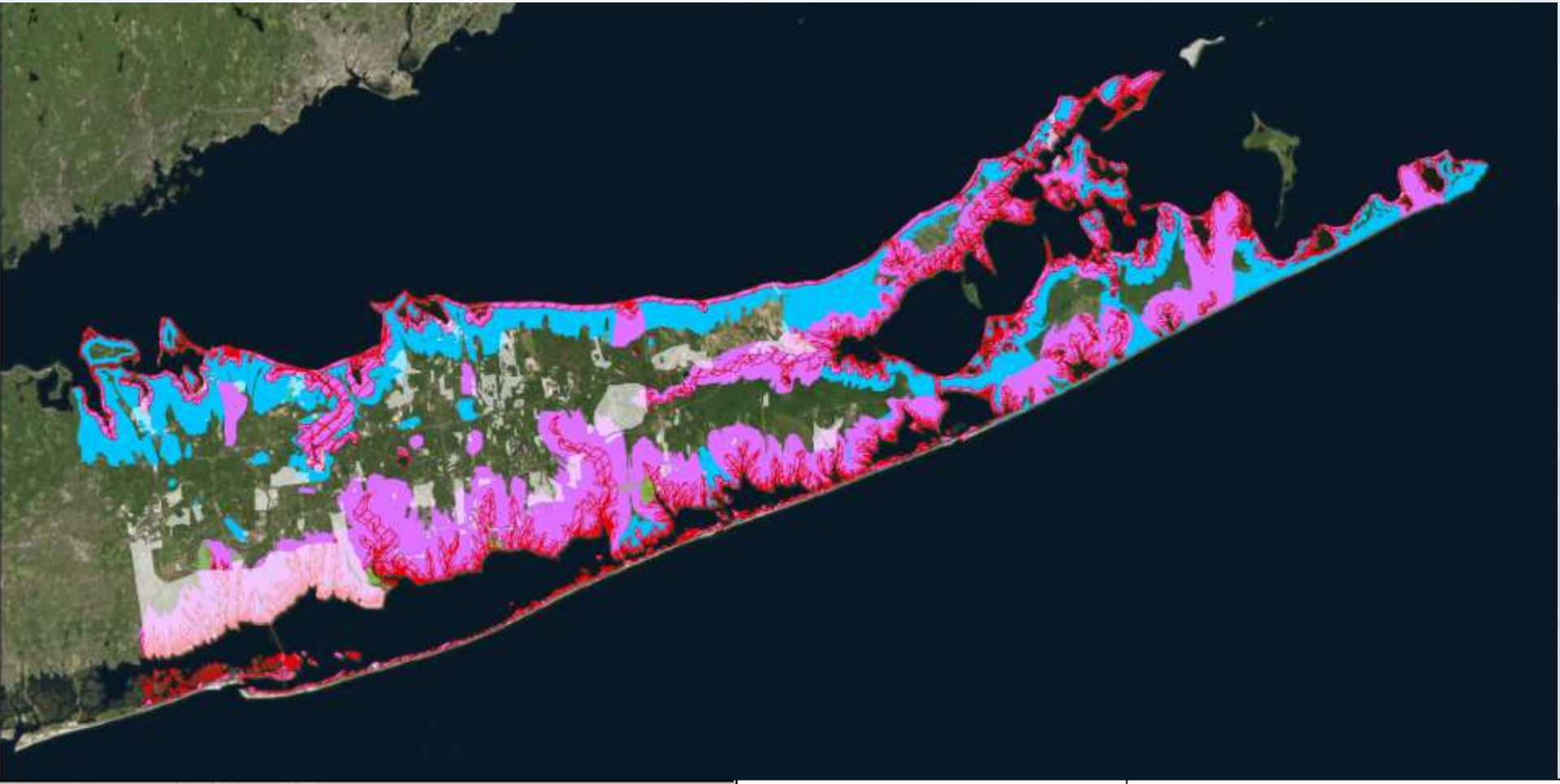
RECOMMENDED PHASED UPGRADE PROGRAM

Program Phase	Program Phase Objectives	Approximate Cost/Timeframe
1 **Program Ramp Up**[1]	- Article 6 for mandatory I/A OWTS on all new construction	$12M/year 5 Years
2 **Mandated Upgrades in Near Shore and Highest Priority Areas**	-Address all highest priority areas including: *All near shore 0-2 year contributing areas. *All priority area rank 1 areas. - Phase in mandatory upgrades at failure and property transfer	$50M-$65M/year 30 years
3 **Mandated Upgrades in All Other Priority Areas**	-Mandatory upgrades in all remaining high priority areas. *Remaining parcels in surface water priority area ranks 2, 3, and 4. *Groundwater/Drinking water priority area rank 2 (6-10 mg/l TN). - Phase in mandatory upgrades at failure and property transfer	$50M-$65M/year 15 Years
4 **Mandated Upgrades in Remaining Areas (Central Suffolk)**	-Mandatory upgrades in all remaining priority areas (GW priority rank 3)	Annual Cost Target $50M-$65M/year Timeframe = TBD

Notes:

1. Also includes the following:
   -Revise Appendix A Construction Standards
   -Establish Countywide Wastewater Management District
   -Establish Stable Recurring Revenue Source

PHASED UPGRADE PROGRAM (SURFACE WATERS ONLY)



Phase II

SW Priority Area 1
GW Priority Area 1
0-2 Year Contributing Area

Phase III

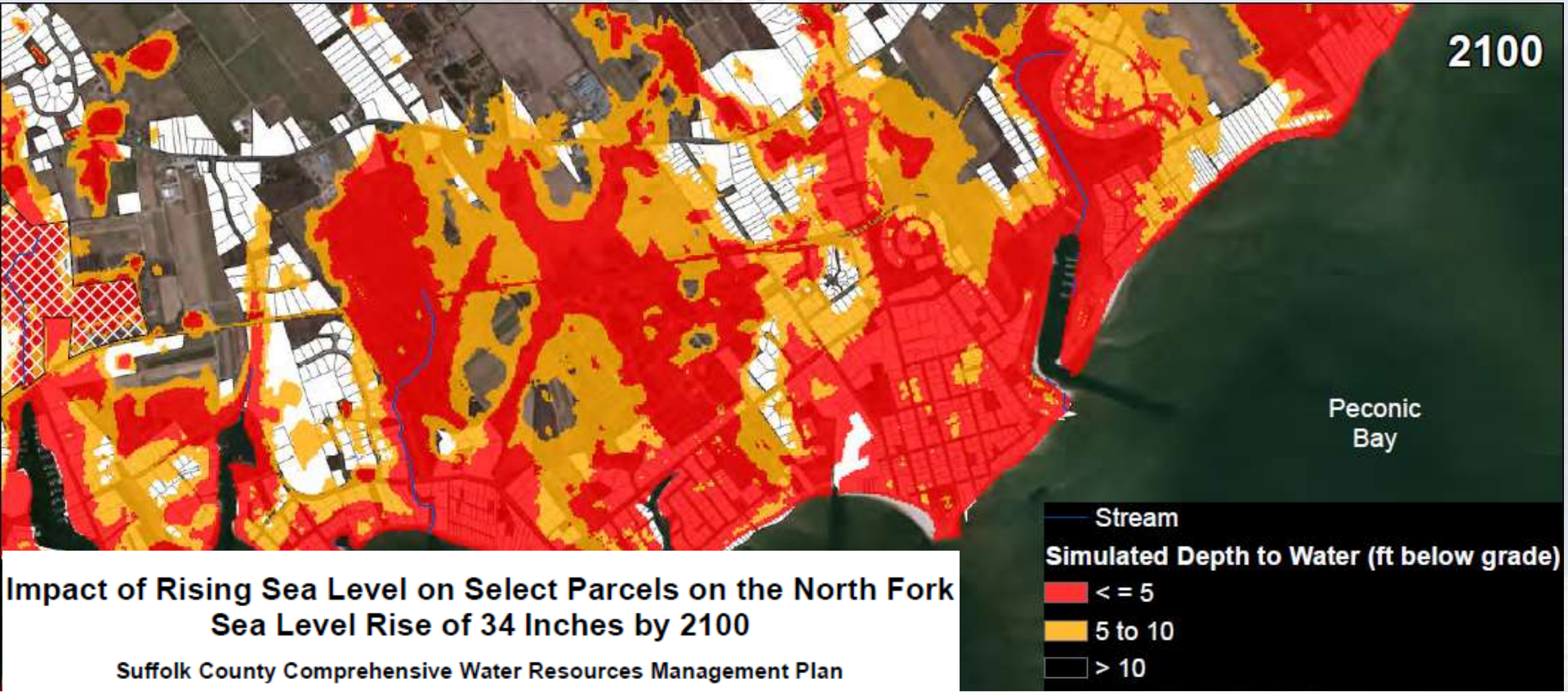
SW Priority Area 2-4
GW Priority Area 2
2-25/50 Year Contributing Area

OTHER RECOMMENDATIONS

Sea Level Rise

Initial recommendations:

- Increase minimum separation distance
- Consider relocating wastewater discharge
- Follow up study through LINAP or other initiative



Impact of Rising Sea Level on Select Parcels on the North Fork
Sea Level Rise of 34 Inches by 2100

Suffolk County Comprehensive Water Resources Management Plan

EMERGING CONTAMINANTS

Initial recommendations:

- Continue to monitor performance (SBU CCWT, SCDHS)
- Identify recalcitrant compounds
- Evaluate alternate designs to enhance removal (SBU CCWT)
- Follow up study through CCWT, LINAP, or other initiative

	LINED NRB Influent (ng/L)	LINED NRB Effluent (ng/L)	Removal LINED NRB (%)	WOODCHIP BOX Influent (ng/L)	WOODCHIP BOX Effluent (ng/L)	Removal WOODCHIP BOX (%)	UNLINED Influent (ng/L)	UNLINED Effluent (ng/L)	Removal UNLINED NRB (%)
Acetaminophen	98,000	<MDL (61)	>99	67,000 ± 6,000	<MDL (64)	>99	99,000	<MDL (55)	>99
Atenolol	480	19	96	480 ± 10	45 ± 0.8	90	450	<MDL (17)	96
Caffeine	40,000	<MDL (56)	>99	36,000 ± 2,000	<MDL (58)	>99	40,000	<MDL (50)	>99
Cotinine	1,800	<MDL (39)	98	1,800 ± 70	<MDL (40)	98	1,700	<MDL (35)	98
DEET	22,000	70	>99	22,000 ± 1,000	35 ± 2	>99	20,000	14	>99
Diphenhydramine	400	<MDL (19)	95	360 ± 30	<MDL (20)	95	340	<MDL (17)	95
Metoprolol	420	76	82	440 ± 7	160 ± 1	63	390	<MDL (8.2)	98
Nicotine	1,100	<MDL (20)	98	1,400 ± 70	<MDL (20)	99	1,200	<MDL (18)	98
Paraxanthine	17,000	<MDL (51)	>99	12,000 ± 700	<MDL (53)	>99	11,000	<MDL (46)	>99
Sulfamethoxazole	1,400	120	92	1,500 ± 60	22 ± 1	99	1,400	35	97
Trimethoprim	300	<MDL (17)	94	340 ± 9	<MDL (18)	95	330	<MDL (15)	95

Other Program Recommendations

- Revisions to Appendix A of the Commercial
  - ✓ Reduced setbacks in commercial areas
  - ✓ Increase allowable flow to 30,000 gpd
- Implement mechanisms to increase County I/A design capacity
- Recommendations for Commercial Properties
- Evaluate and provide initial recommendations for clustering
- Cost/benefit of additional wastewater management tools
  - ✓ CCWT, zeolite, NRBs, polishing filters
- Cost/benefit of other nitrogen mitigation options
  - ✓ Support of ROW, LINAP, and other initiatives
  - ✓ PRBs, aquaculture, hydro modifications, fertilizer BMPs

Program Benefits

- **Within 30 years*:**
  - ✓Annual cost ~$60M/year; total cost $1.8B;
  - ✓214,000 upgrades
    - All near shore areas and highest priority areas
  - ✓Benefits:
    - Arrest and reverse decline within 10 years
    - Meet HABs/DO goal >50 percent of waterbodies
- **Within 45 years***:
  - ✓Total aggregate cost $2.5B
  - ✓295,000 upgrades
    - All priority areas addressed
  - ✓Benefits
    - Meet HAB/DO problem goal within >75 percent of waterbodies

May 31, 2017 Suffolk County Executive Steve Bellone signs SIP into Law

*from establishment of revenue stream

Are there any questions about what we covered today?

Ken Zegel, PE
Associate Public Health Engineer
Department of Health Services
Office of Ecology
631-852-5809
Ken.Zegel@suffolkcountyny.gov