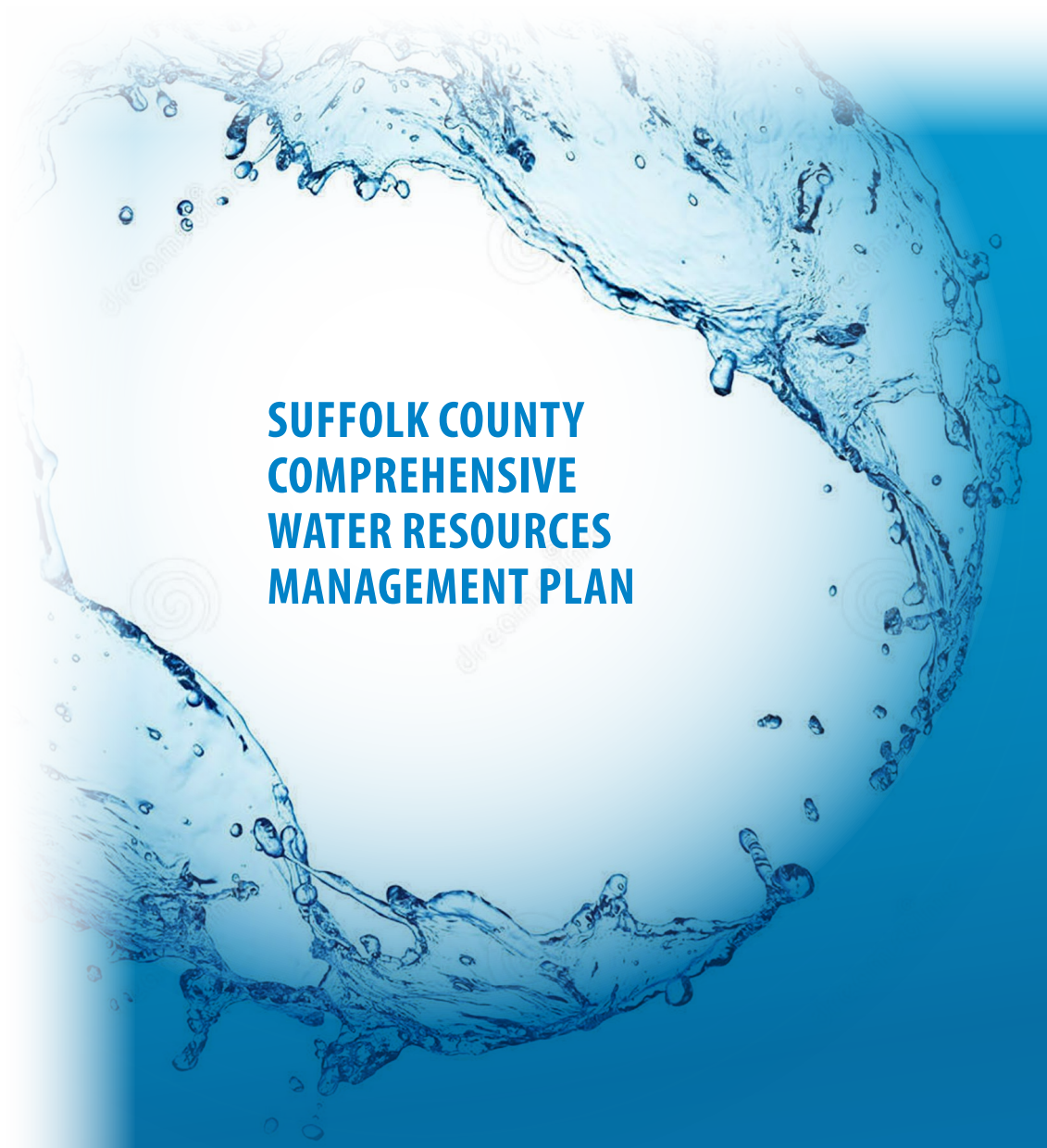

SUFFOLK COUNTY
COMPREHENSIVE
WATER RESOURCES
MANAGEMENT PLAN

Section 5
SURFACE WATER RESOURCES

Section 5
Surface Water Resources

Suffolk County's fresh and marine surface water resources are diverse and abundant; coastal waters form the County's boundaries to the north, east and south. In fact, the County's surface water features largely define the County's identity as a desirable location to live, work and play. Both the Long Island Sound and the Peconic Estuary have been designated as estuaries of national significance. The Long Island Sound (LIS) Comprehensive Conservation and Management Plan (CCMP) Summary reports that "Long Island Sound is a national treasure, to be prized for its beauty, abundant and diverse resources, and recreational and commercial opportunities." On the south shore, Coopers Beach in Southampton was named #1 in the nation by Dr. Stephen Leatherman (also known as Dr. Beach, Director of Florida International University's Laboratory for Coastal Research) on the 2010 list of the top ten beaches in the United States, and Main Beach in East Hampton was also identified as a National Winner. The County's harbors and estuaries also have great ecological value and significance; Great South Bay, part of the South Shore Estuary Reserve, is the largest shallow estuarine bay in New York State.

The 1987 Comp Plan enumerated and described the County's fresh surface waters and wetlands; that information is not reproduced here. The Long Island Sound, Peconic Estuary and South Shore Estuary Reserve have been the subjects of focused studies for years as documented extensively by the LIS and Peconic Estuary programs. The LIS CCMP, the Peconic Estuary CCMP and the South Shore Estuary Reserve (SSER) Comprehensive Management Plan (CMP) all identify a number of strategies and recommendations to improve water quality, reduce use impairments and protect/restore habitat and ecosystems in those marine systems, as well as the fresh surface waters that feed them. The surface water issues identified by the estuary programs, and the hundreds of recommendations incorporated into the estuary management plans are not repeated here, but are discussed in more detail in Section 6 of this document. Rather, this study evaluated the water quality of the County's fresh surface water features, particularly as it was impacted by the quality of groundwater baseflow, and reviewed trends in nitrogen levels in coastal water bodies. The status of implementation of the recommendations to protect and improve estuary water quality developed during previous studies was also assessed.

These reviews formed the basis for identification of recommendations that can reduce groundwater contamination; hence the quality of the groundwater

discharging to the surface waters will be improved, which will ultimately result in improved surface water quality.

In general, the recommendations for open space preservation, improved sanitary wastewater management, reduced fertilization, reduced stormwater impacts and enhanced public participation programs described in Section 3 of this Plan are all consistent with previous estuary program recommendations.

5.1 Problem Identification

5.1.1 Fresh Surface Water Resources

Suffolk County's fresh surface water resources are abundant and generally of sufficient quality to support multiple uses. Within the County, New York State has classified more than 200 freshwater streams and ponds and regulates over 1,050 freshwater wetlands covering nearly 24,000 acres (NYSDEC, 2006). The New York State Natural Heritage Program has identified over 50 coastal plain ponds in the County, distinguished by their rare ecological community type that supports rare and unusual plant species.

Many of the significant freshwater streams in the County are located along the County's south shore within the Southwest Sewer District (SWSD); however, some of the largest freshwater streams such as the Nissequogue, Connetquot, and Peconic Rivers are outside of the SWSD and the Flow Augmentation Needs (FANS) study area.

Suffolk County surface waters are regularly monitored, and their quality is assessed as part of other on-going programs, including New York State's identification of Impaired Waters under Section 303(d), the Long Island Sound Study (LISS), PEP and SSER programs (Task 6.1 - Freshwater Streams, Ponds and Wetlands, CDM, 2006; Task 6.2 - Coastal Marine Resources, CDM, 2007; and Task 6.3 - Estuary Study Recommendations, CDM 2008). Between 1966 and 2005, when staffing reductions forced a temporary reduction of the surface water monitoring program, SCDHS collected and compiled water quality data from over 113 streams. Thirteen streams were sampled by SCDHS in 2013/2014.

Table 5-1 lists the freshwater streams, segments and ponds identified in Suffolk County, along with their New York State use classification. The Suffolk County's water bodies on New York State 2014 303(d) list of impaired waters are highlighted on **Table 5-1,** along with the presumed cause(s) of the use impairments identified. NYSDEC has identified pathogens, metals, dissolved oxygen, phosphorus, ammonia, pesticides and silt/sediment as the primary contaminants causing impairment of the fresh surface waters, and storm water runoff as the source of these contaminants.

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
1	LIS-P 378	Great Pond		Q-30sw	A	A		
2	(MW6.1d) GB.GPB-P 495	Mattituck or Marratooka Pond (1701 - 0129)[4]		R-29ne	A	A	Oxygen Demand & Phosphorous	Urban/Storm Runoff
3	GPB-P 496	Laurel Pond		R-29ne	A	A(T)		
4	Fishers Island-P 1100	Middle Farm Pond	Pond on Fishers Island.	P-32sw	A	A		
5	Barlow Pond	Fishers Island-P 1108		P-32sw	A	A		
6	LIS-61 portion including P 274, P 275	Sunken Meadow Creek	From Fort Salonga Road to source.	R-26ne	B	B		
7	(MW7.7) AO-GSB-193..P304	Lake Ronkonkoma (1701-0020)		R-27sw R-27se	B	B	Pathogens & Phosphorus	Urban/Storm Runoff
8	(MW7.5) AO-GSB-185-P889	Caanan (1701-0018)			B	B(T)	Phosphorus, Silt/Sediment	Urban/Storm Runoff
9	GSB-189-P 896 to P 898	Sans Souci Lakes		S-27ne R-27se	B	B		
10	GSB-193 portion	Connetquot River	From Montauk Highway to north boundary of Connetquot State Park.	S-27nw R-27sw	B	B(TS)		
11	GSB-193-2 portion and P 902	Trib. of Connetquot River	From Montauk Highway to source.	S-27nw	B	B(T)		
12	GSB-193-3	Rattlesnake Brook		R-27sw S-27nw	B	B(TS)		
13	GSB-208-P 950	Geiger Memorial Park		R-26se	B	B		
14	LIS-P 362	Hollocks Pond	Camp Carey, Boys Club of New York camp.	R-29ne	B	B		
15	GB-137-P 726-1 and P 726a	Tribs. of Alewife Pond		Q-31sw	B	B		
16	GB-139	Tanbark Creek	Fresh water portion extends to approximately 1.0 mile south of Threemile Harbor.	R-31nw	B	B		
17	SIS-134 portion	Trib. of Shelter Island Sound	Fresh water portion.	R-30ne Q-30se	B	B		
18	SIS-134-1	Subtrib. of Shelter Island Sound		R-30ne Q-30se	B	B		
19	(MW6.3c) GB..LPB-123-1-P 661, P662	Big/Little Fresh Ponds (1701-0125)		R-30nw	B	B	Phosphorous	Urban/Storm Runoff
20	(MW7.1b) AO-P790-2-2P793, P794	Mill and Seven Ponds (1701-0113)			B	B	Phosphorous	Urban/Storm Runoff
21	BIS-141 portion	Trib. of Block Island Sound	Fresh water portion.	R-31ne R-31nw	B	B		
22	BIS-P 755	Fort Pond		Q-32sw	B	B		
23	BIS-P 763	Big Reed Pond		Q-32sw	B	B		
24	----	Spring Pond/Lake (1701-0157)			B		Chlordane	Contam. Sediment
25	CSH-50 portion	Trib. of Cold Spring Harbor	Mouth to trib. 1a within Suffolk County.	R-26sw	C	C(T)		
26	CSH-50 portion	Trib. of Cold Spring Harbor	From trib. 1a to source.	R-26sw	C	C		
27	CSH-50-P 158, P 159	Subtribs. of Cold Spring Harbor	Within Suffolk County.	R-26sw	C	C(T)		
28	CSH-P 200	Trib. of Cold Spring Harbor		R-26sw	C	C		
29	CSH-P 202, P 203, P 203a	Tribs. of Cold Spring Harbor		R-26nw	C	C		
30	CSH-52-1 including P 207	Subtrib. of Cold Spring Harbor		R-26nw	C	C		
31	HB-P 210	Trib. of Huntington Bay		R-26nw	C	C		
32	HB-HH-55	Trib. of Huntington Harbor		R-26nw	C	C		
33	HB-HH-55-P 221	Subtrib. of Huntington Harbor		R-26nw	C	C		
34	HB-HH-P 221a	Trib. of Huntington Harbor		R-26nw	C	C		

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
35	HB-P 220, P 226, P 227, P 238, P 238a, P 239, P 242, P 243, P 247, P 248, P 248a, P 249	Unnamed ponds		R-26nw R-26sw	C	C		
36	HB-NB-CH-56a-P 240a	Subtrib. of Centerport Harbor		R-26nw	C	C		
37	HB-NB-CH-P 240	Trib. of Centerport Harbor		R-26ne	C	C		
38	HB-NB-NH-57	Trib. of Northport Harbor		R-26ne	C	C		
39	HB-NB-NH-57-P 257, P 258	Subtribs. of Northport Harbor		R-26ne	C	C		
40	LIS-P 270	Unnamed pond		R-26ne	C	C		
41	LIS-P 270a, P 270b	Unnamed ponds		R-26ne	C	C		
42	From trib. 1 to source.	Crab Meadow Brook	LIS-59 portion and trib. 1	R-26ne	C	C		
43	LIS-P 271a	Unnamed pond		R-26ne	C	C		
44	LIS-P 271b	Unnamed pond		R-26ne	C	C		
45	LIS-61 portion	Sunken Meadow Creek	Freshwater portion to Fort Salonga Road.	R-26ne	C	C		
46	LIS-P 281	Unnamed pond		R-27nw	C	C		
47	LIS-62 portion	Nissequogue River	From P 288 to P 292.	R-27sw	C	C(TS)		
48	LIS-62 portion	Nissequogue River	From P 292 to source.	R-27sw	C	C(T)		
49	LIS-62-1 including P 282	Trib. of Nissequogue River		R-27nw	C	C		
50	LIS-62-2-P 283	Subtrib. of Nissequogue River		R-27nw	C	C		
51	LIS-62-2a	Trib. of Nissequogue River		R-27sw	C	C(T)		
52	LIS-62-2a-P 287b, P 287a	Subtribs. of Nissequogue River		R-27sw	C	C(T)		
53	LIS-62-P 288	Philips Mill Pond		R-27sw	C	C(T)		
54	LIS-62-P 290, P 291a, 4	Tribs. of Nissequogue River		R-27sw	C	C(T)		
55	LIS-62-4-P 291 and trib. 1	Webster Pond		R-27sw	C	C(T)		
56	LIS-62-4-P 289	Willow Pond		R-27sw	C	C(T)		
57	LIS-62-P 292	New Mill Pond		R-27sw	C	C(T)		
58	LIS-62-P 292-1 including P 296, P 296a, P 297, P 297a	Trib. of New Mill Pond (Millers Pond (1701-0013)		R-27sw	C	C	Oxygen Demand & Phosphorus	Urban/Storm Runoff
59	LIS-62-P 292-2 including P 326	Trib. of New Mill Pond		R-27sw	C	C(T)		
60	LIS-62-P 292-3 including P 329	Trib. of New Mill Pond		R-27sw	C	C(TS)		
61	LIS-62-P 292-4 including P 292a	Trib. of New Mill Pond		R-27sw	C	C		
62	LIS-P 304-1	Trib. of Lake Ronkonkoma		R-27sw	C	C		
63	LIS-P 304a, P 312, P 319, P 323, P 331, P 331a, P 331b, P 333, P 333a, P 334, P 335	Unnamed ponds		R-27se R-27ne R-27nw	C	C		
64	LIS-P 305, P 306, P 319a	Unnamed ponds		R-27sw R-27se	C	C		
65	SB-SBH-63	Trib. of Stony Brook Harbor		R-27nw	C	C		
66	SB-SBH-63-P 336	Mill Pond		R-27nw	C	C(T)		
67	SB-SBH-63-P 338	Unnamed pond		R-27nw	C	C(T)		
68	SB-SBH-64-1	Trib. of West Meadow Creek		R-27nw	C	C		
69	LIS-PJH-CB-66 portion	Trib. of Conscience Bay	From inlet of P 340a to source.	R-27ne	C	C		
70	LIS-PJH-CB-P 340a	Trib. of Conscience Bay		R-27ne	C	C		
71	LIS-P 343	Unnamed pond		R-27ne	C	C		
72	LIS-P 346, P 349	Unnamed ponds		R-27ne	C	C		

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
73	LIS-MSH-67a	Trib. of Mount Sinai Harbor		R-27ne	C	C		
74	(MW7.5) AO-GSB-178	Beaverdam Creek and tribs (1701-0104)	River		C(TS)	NA	Ammonia	Urban/Storm Runoff
75	(MW7.5) AO-GSB-179	Motts Creek, Upper, and tribs (1701-0325)3			NA	C	Aquatic Toxicity	Urban/Storm Runoff
76	GSB-189 portion	Brown Creek	From inlet of Sayville Mill Pond to source.	S-27ne R-27se	C	C		
77	GSB-189-2 portion	West Branch Brown Creek	From mouth to Sayville Mill Pond (P 893).	S-27ne	C	C		
78	GSB-189-2 portion	West Branch Brown Creek	From Sayville Mill Pond to source.	S-27ne R-27se	C	C(TS)		
79	GSB-189-2-P 893	Sayville Mill Pond		S-27ne	C	C(T)		
80	GSB-189-P 895	Lotus Lake		S-27ne	C	C		
81	GSB-190 portion and P 899a	Green Creek	From Montauk Highway to source.	S-27ne	C	C(T)		
82	GSB-191-P 900	Trib. of Indian Creek		S-27ne	C	C		
83	GSB-193 portion	Connetquot River	From Connetquot State Park north boundary to source.	R-27sw	C	C(T)		
84	GSB-193-2-P 903	West Brook Pond		S-27nw R-27sw	C	C(T)		
85	GSB-193-3-1,2 including P 904, P 905, P 905a	Tribs. of Rattlesnake Brook		R-27sw S-27nw	C	C(TS)		
86	GSB-193-P 906	Main Pond		S-27nw R-27sw	C	C(T)		
87	GSB-193-P 907	Lower Pond		S-27nw R-27sw	C	C(T)		
88	GSB-193-P 908, P 909	Tribs. of Connetquot Brook		R-27sw	C	C(T)		
89	GSB-P 911a	Unnamed pond		S-27nw	C	C		
90	(MW7.8) AO-GSB-194	Champlin Creek, Upper and tribs (1701-0019)	From inlet of P 910 to source.	S-27nw	C	C(TS)	Thermal Changes	Urban/Storm Runoff
91	GSB-194-1GSB-194-1	Trib. of Champlin Creek		S-27nw	C	C		
92	GSB-194-P 910, P 911	Unnamed ponds		S-27nw	C	C		
93	GSB-194-P 912	Knapp's Lake		S-27nw	C	C(T)		
94	GSB-194-P 912-1	Trib. of Knapp's Lake	Enters from the east.	S-27nw	C	C		
95	GSB-P 910a	Unnamed pond		S-27nw	C	C		
96	(MW7.8) AO-GSB-196 portion	Orowoc Creek	From Montauk Highway to source.	S-27nw	C	C(T)	Aquatic Toxicity	Urban/Storm Runoff
97	(MW7.8) AO-GSB-196-1 including P 915, P 915b	Trib. of Orowoc Creek		S-27nw	C	C(T)		
98	(MW7.8) AOGSB-196-1-P 915a	Subtrib. of Orowoc Creek		S-27nw	C	C		
99	(MW7.8) AO-GSB-196-P 916	Trib. of Orowoc Creek		S-27nw	C	C(T)		
100	(MW7.8) AO-GSB-197	Awixa Creek, Upper, and tribs (1701-0093)		S-27nw	C	C	Aquatic Toxicity	Urban/Storm Runoff
101	(MW7.8) AO-GSB-198	Penataquit Creek, Upper, and tribs (1701-0090)[3]		S-27nw	C	C	Aquatic Toxicity	Urban/Storm Runoff
102	GSB-200-P 922, P 923, P 923a	Tribs. of Lawrence Creek		S-26ne	C	C		
103	GSB-201-P 924	Cascade Lake		S-26ne	C	C		
104	GSB-201-P 925	Mirror Lake		S-26ne	C	C		
105	GSB-201-P 925a	Nosreka Lake		S-26ne	C	C		
106	GSB-201-P 925b	Lagoon		S-26ne	C	C		
107	GSB-202-P 927, P 928, P 929	Tribs. of Thorn Canal		S-26ne	C	C		
108	GSB-203 portion	Thompsons Creek	From Montauk Highway to source.	S-26ne	C	C		

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
109	GSB-204 portion including P 930, P 931, P 932	Trues Creek	From Montauk Highway to source.	S-26ne	C	C		
110	GSB-P 933a	Unnamed pond		S-26ne	C	C		
111	GSB-205 portion	Willets Creek	From Montauk Highway to source.	S-26ne	C	C		
112	(MW7.8) AO-GSB-205-P 934	Lake Capri (1701-0175)		S-26ne	C	C	Cadmium/Chlordane	Cont. Sed, Land.Disp.
113	(MW7.8) AO-GSB-207	Sampawams Creek	From Montauk Highway to source.	S-26ne	C	C(T)	Aquatic Toxicity	Urban/Storm Runoff
114	(MW7.8) AO-GSB-207-P 936	Trib. of Sampawams Creek		S-26ne	C	C		
115	(MW7.8) AO-GSB-207-P 937, P 938, P 939	Tribs. of Sampawams Creek		S-26ne	C	C		
116	(MW7.8) AO-GSB-207-P 940	Trib. of Sampawams Creek		S-26ne	C	C(T)		
117	GSB-208 portion	Carlls River	From Montauk Highway to Railroad Avenue.	S-26ne	C	C		
118	GSB-208 portion	Carlls River	From Railroad Avenue to source.	S-26ne R-26se	C	C(T)		
119	GSB-208-1a- P 941, P 942, P 942a	Subtribs. of Carlls River		S-26ne	C	C		
120	GSB-208-P 943	Memorial Pond		S-26ne	C	C		
121	GSB-208-P 946	Southards Pond		S-26ne	C	C(T)		
122	GSB-208-3	Trib. of Carlls River		S-26ne	C	C(T)		
123	GSB-208-3-P 946a	Subtrib. of Carlls River		S-26ne	C	C		
124	GSB-208-3-P 947	Elda Lake		S-26ne	C	C		
125	GSB-208-3-P 947-1, 2	Tribs. of Elda Lake		S-26ne	C	C(T)		
126	GSB-208-P 949	Belmont Lake		S-26ne	C	C	*Delisted in 2006*	
127	GSB-208-P 950-1	Trib. of Geiger Memorial Park		R-26se	C	C		
128	GSB-208-4	Trib. of Carlls River		S-26ne	C	C(T)		
129	GSB-209-P 954	Unnamed pond		S-26ne	C	C		
130	GSB-210 portion and trib. 1	Santapogue Creek	From Montauk Highway to source.	S-26ne	C	C(T)		
131	GSB-210-P 959a	Trib. of Santapogue Creek		S-26ne	C	C		
132	GSB-211 portion including P 959c, P 959h	Neguntatogue Creek	From Montauk Highway to source.	S-26ne	C	C		
133	GSB-212 portion and trib. 1	Trib. of Great South Bay	From Montauk Highway to source.	S-26nw S-26ne	C	C		
134	GSB-213 portion including P 959d	Trib. of Great South Bay	From Montauk Highway to source.	S-26nw	C	C(T)		
135	GSB-215 portion	Woods Creek	From Merrick Road to source.	S-26nw	C	C		
136	GSB-216 portion including P 960, P 961a	Amityville Creek	From Merrick Road to source.	S-26nw	C	C(T)		
137	GSB-216-P 961	Avon Lake		S-26nw	C	C(T)		
138	GSB-P 969a, P 969b	Unnamed ponds		S-26nw	C	C		
139	LIS-P 362a, P 363, P 364, P 365	Tribs. of Long Island Sound		R-29ne	C	C		
140	LIS-71-1 portion	Trib. of Mattituck Creek	Fresh water portion.	Q-29se R-29ne	C	C		
141	LIS-71-2,4,5	Tribs. of Mattituck Creek		Q-29se R-29ne	C	C		
142	LIS-P 367	Wolf Pit Pond		Q-29se	C	C		
143	LIS-P 375	Trib. of Long Island Sound	Isolated pond located just south of Goldsmith Inlet.	Q-30sw	C	C		
144	LIS-P 379, P 380	Tribs. of Long Island Sound	Lily Pond (P 379).	Q-30sw	C	C		
145	GB-P 393	Trib. of Gardiners Bay		Q-30ne	C	C		

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
146	GB-P 440, P 441, P 441b, P 443, P 443a, P 444, P 445, P 446, P 448, P 449	Tribs. of Gardiners Bay		Q-30se	C	C		
147	GB-137	Trib. of Gardiners Bay	Fresh water portion.	Q-31sw	C	C		
148	BG-P 726b	Trib. of Gardiners Bay		Q-31sw	C	C		
149	SIS-SI-P 432	Unnamed pond		Q-30se	C	C		
150	SIS-SI-P 433	Wecks Pond		Q-30se	C	C		
151	SIS-SI-2a-P 435	Subtrib. of Shelter Island Sound		Q-30se	C	C		
152	SIS-SI-P 437 P 438	Tribs. of Shelter Island Sound		Q-30se	C	C		
153	(MW7.2a) GS-SIS-SI-WNH-P 458	Fresh Pond (1701-0241)		Q-30se	C	C	Phosphorous	Urban/Storm Runoff
154	SIS-SI-P 461a, P 465	Tribs. of Shelter Island Sound	On Westmoreland Farms property.	Q-30se	C	C		
155	SIS-79-1 portion	Trib. of Shelter Island Sound	Fresh water portion.	Q-30sw	C	C		
156	SIS-79-1-P 409	Subtrib. of Shelter Island Sound		Q-30sw	C	C		
157	SIS-79-2 portion	Moores Drain	Fresh water portion.	Q-30sw	C	C		
158	SIS-79-2-P 402	Silver Lake		Q-30se	C	C		
159	SIS-P 417	Trib. of Shelter Island Sound		Q-30sw	C	C		
160	SIS-P 420a	Trib. of Shelter Island Sound		Q-30sw	C	C		
161	SIS-P 427	Trib. of Shelter Island Sound		Q-30sw	C	C		
162	SIS-P 675	Trib. of Shelter Island Sound		R-30ne	C	C		
163	SIS-P 674a	Trib. of Shelter Island Sound		R-30ne	C	C		
164	SIS-127 including P 676	Mill Creek		R-30ne	C	C		
165	SIS-127-P 677 and tribs. 1, 2	Trout Pond		R-30ne	C	C(T)		
166	SIS-128-2 including P 681, P 682	Subtrib. of Shelter Island Sound		Q-30se	C	C		
167	SIS-P 690, P 691, P 692	Tribs. of Shelter Island Sound		Q-30se	C	C		
168	SIS-P 697a	Mouth to Brick Kiln Road.	Trib. of Shelter Island Sound	R-30ne	C	C		
169	SIS-132 portion	Ligonee Brook	From Brick Kiln Road to source.	R-30ne	C	C		
170	SIS-132-P 698	Round Pond		R-30ne	C	C		
171	SIS-132-P 698a	Subtrib. of Shelter Island Sound		R-30ne	C	C		
172	SIS-132-P 699	Subtrib. of Shelter Island Sound		R-30ne	C	C		
173	SIS-132-P 701	Lily Pond		R-30ne	C	C		
174	SIS-132-P 702	Long Pond		R-30ne	C	C		
175	SIS-132-P 702-P 703, P 704, P 705, P 706	Unnamed ponds		R-30ne	C	C		
176	SIS-132-P 702-P 708	Little Long Pond		R-30ne	C	C		
177	LPB-P 471	Trib. of Little Peconic Bay		Q-30sw	C	C		
178	LPB-P 487, P 488	Tribs. of Little Peconic Bay		R-30nw	C	C		
179	LPB-P 654, P 655	Tribs. of Little Peconic Bay		R-30nw	C	C		
180	LPB-123-1 portion	Trib. of North Sea Harbor	Fresh water portion.	R-30nw	C	C		
181	LPB-124-P 665a	Subtrib. of Little Peconic Bay		R-30nw	C	C		
182	LPB-P 669	Trib. of Little Peconic Bay		R-30ne	C	C		
183	GPB-96-1 portion	Trib. of West Creek	Fresh water portion.	Q-30sw	C	C		
184	GPB-96-1-P 485	Subtrib. of West Creek		Q-30sw	C	C		
185	GPB-97 portion	Downs Creek	Fresh water portion.	Q-30sw R-30nw	C	C		
186	GPB-98 portion	Halls Creek	Fresh water portion.	R-29ne	C	C		

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source
187	GPB-P 489	Trib. of Great Peconic Bay		Q-29se	C	C		
188	GPB-99-P 493	Trib. of Deep Hole Creek		R-29ne	C	C		
189	GPB-100 portion	Trib. of Great Peconic Bay	Fresh water portion.	R-29ne	C	C		
190	GPB-100-P 495a	Subtrib. of Great Peconic Bay		R-29ne	C	C		
191	GPB-101 portion	Trib. of Great Peconic Bay	Fresh water portion.	R-29ne	C	C		
192	GPB-102 portion	Brush Creek	Fresh water portion.	R-29ne	C	C		
193	GPB-104 portion	Trib. of Great Peconic Bay	Fresh water portion.	R-29ne	C	C		
194	GPB-P 507	Trib. of Great Peconic Bay		R-29ne	C	C		
195	GPB-118-1, P 644a	Tribs. of Red Creek Pond		R-29ne	C	C		
196	GPB-P 650, P 650a	Tribs. of Great Peconic Bay		R-30nw	C	C		
197	BIS-P 753	Fresh Pond		Q-31se	C	C		
198	BIS-P 756	Trib. of Block Island Sound		Q-32sw	C	C		
199	BIS-P 761-1, 2 P 761a	Tribs. of Montauk Harbor	Enter Montauk Harbor from southwest and south. Osborne Brook (trib. 1). Dutch Plains Creek (trib. 2).	Q-32sw	C	C		
200	BIS-P 764-1,2	Tribs. of Oyster Pond	Enter Oyster Pond from east and west, respectively.	Q-32sw	C	C		
201	(MW7.2a) AO-MB-170	Terrell River, Upper, and tribs (1701-0103)[3]	River	NA	C(TS)	NA	Aquatic Toxicity	Urban/Storm Runoff
202	AO-P 776	Hook Pond		R-31nw	C	C		
203	AO-P 776-1	Trib. of Hook Pond		R-31nw	C	C		
204	AO-P 778	Town Pond		R-31nw	C	C		
205	AO-P 779	Lily Pond		R-31nw	C	C		
206	AO-P 780-2	Trib. of Georgica Pond	Enters from northwest.	R-31nw	C	C		
207	AO-P 782, P 784	Tribs. of Atlantic Ocean	Wainscott Pond (P 782). Fairfield Pond (P 784).	R-30ne R-31nw	C	C		
208	AO-P 786-1	Trib. of Sagaponack Pond		R-30ne	C	C		
209	AO-P 787	Poxabogue Pond		R-30ne	C	C		
210	AO-P 787, P 787a	Little Poxabogue Pond		R-30ne	C	C		
211	AO-P 786-2	Trib. of Sagaponack Pond		R-30ne	C	C		
212	AO-P 788, P 789	Unnamed ponds		R-30ne	C	C		
213	Gardiners Island-P 732, P 731, P 736, P 737, P 737a, P 738, P 739, 5 including P 741, P 743, P 744, 6 including P 745, P 746, P 746a, 7 including P 747	Tribs. of Gardiners Island	Fresh water portions.	Q-31sw Q-31se	C	C		
214	Fishers Island-P 1089, P 1091, P 1092, P 1093, P 1093a, P 1099, P 1103, P1103a, P 1105, P 1106	Tribs. of Fishers Island	Ponds on Fishers Island.	P-32sw P-31se	C	C		
215	----	Saint James Pond		----	C	C	Chlordane/DDT	Contam. Sediment
216	AO-P 780-1	Trib. of Georgica Pond	Enters from northeast.	R-31nw	D	D		
217	Gardiners Island-1	Trib. of Gardiners Island		Q-31sw	D	D		

Notes from 2014 303d list:

[1] Includes Upper Forge River, which is the trib of primary concern. The Lower Forge River is included in Part 2c - Shellfishing Waters portion of the list.

[2] These listings are a result of impairmaents due to extensive algal blooms (Brown Tide) that are thought to be the result of multiple factors, including elevated nitrogen levels. Further study is necessary to determine the relative contribution of these multiple factors, the role of nitrogen in the Bay, whether a TMDL is the more appropriate management response (and if so, what is the appropriate TMDL target/endpoint). Until these issues regarding causes and pollutants are clarified, Part 3b is the appropriate place to list the waters of the Bay. Other tributary embayments to these waters were also considered for listing, however decisions regarding these additional lists have been deferred pending further study regarding Brown Tide algal blooms.

[3] Although this water is considered to be impaired, poor sampling also influences the biological sampling results that indicate moderate impacted conditions.

Table 5-1
Suffolk County Fresh Surface Water Classifications and Impairments

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards	New York State Final 2014 Section 303(d) List Water	
							Cause / Pollutant	Source

[4] This segment had previously been listed in Part 1 of the list (for pathogens), but it has been moved to Part 3c pending the development of the appropriate strategy to address wildlife sources of pathogens.

Key:		
Waters Index Number	**Name of Waters**	**Explanation**
LIS	Long Island Sound	Primary waters identified by abbreviation.
GB	Gardiners Bay	
SIS	Shelter Island Sound	
LPB	Little Peconic Bay	
GPB	Great Peconic Bay	
BIS	Block Island Sound	
AO	Atlantic Ocean	
GPB-96	West Creek	The 96th stream encountered on Long Island proceeding in a clockwise direction around the island from Fort Hamilton (The Narrows).
GPB-96-1	Trib. of West Creek	The first tributary entering West Creek above the mouth.
GPB-P 496	Laurel Pond	The 496th pond or lake encountered in the Conservation Department's report, A Biological Survey of the Fresh Waters of Long Island.
The symbol (T) appearing after any class designation indiactes that the designated waters are trout waters and that the dissolved oxygen specification for trout waters shall apply thereto.		
Shading indicates the water body is included on the Final 2014 New York State 303(d) List of Impaired Waters.		

Source:
www.dec.ny.gov/docs/water_pdf/303dlistfinal2014.pdf

FRESH SURFACE WATERS

§701.6 Class A fresh surface waters

(a) The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b)This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug 2,1991 eff. 30 days after filing.

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§701.7 Class B fresh surface waters

The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2,1991 eff. 30 days after filing.

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§701.8 Class C fresh surface waters

The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug 2,1991 eff. 30 days after filing.

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§701.9 Class D fresh surface waters

The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

SALINE SURFACE WATERS

§701.10 Class SA saline surface waters

The best usages of Class SA waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

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§701.11 Class SB saline surface waters

The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

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§701.12 Class SC saline surface waters

The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

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§701.13 Class I saline surface waters

The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

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§701.14 Class SD saline surface waters

The best usage of Class SD waters is fishing. These waters shall be suitable for fish survival. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation and fish propagation.

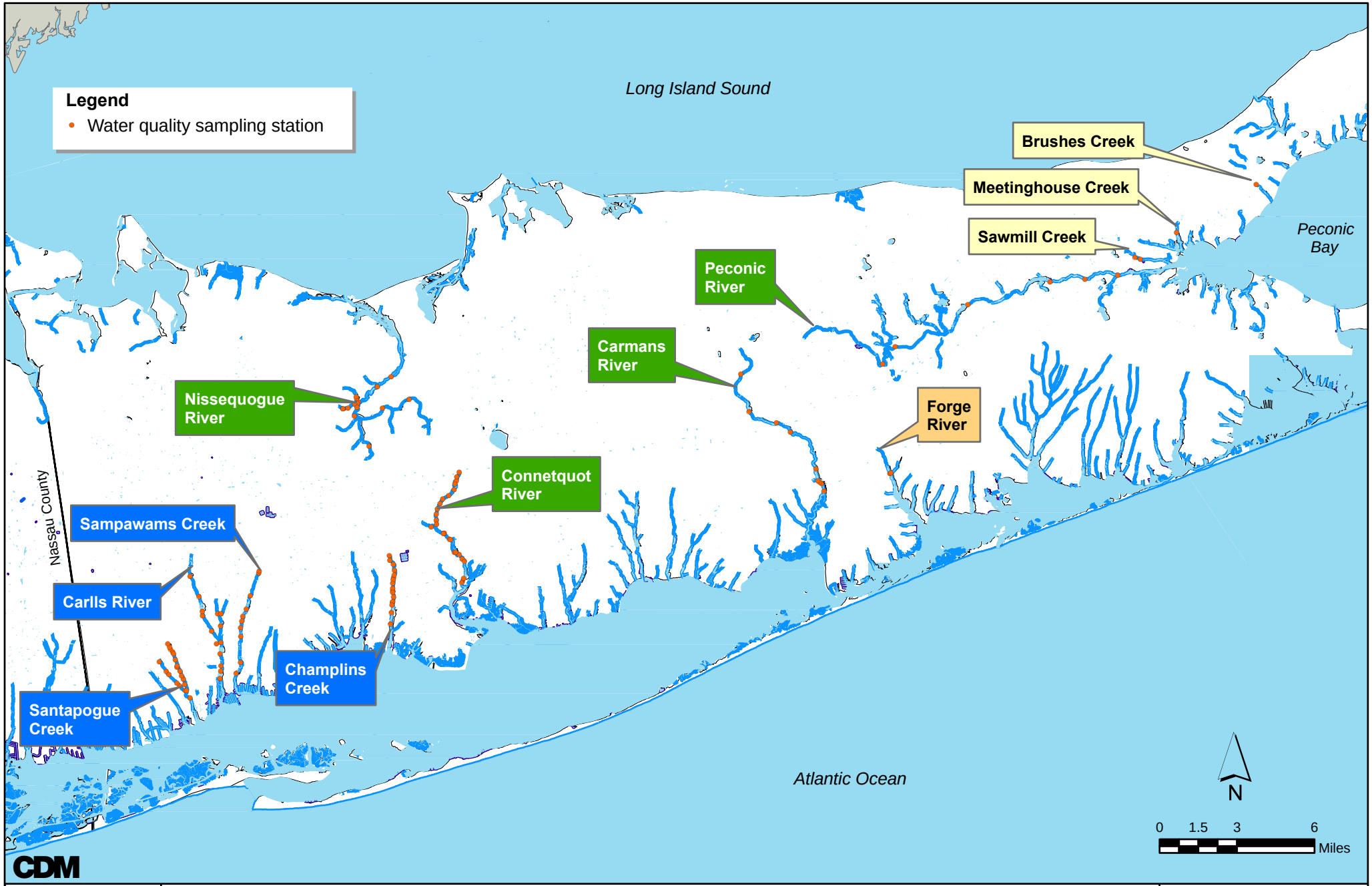
Part 1 of the list identifies individual water body segments with impairments requiring total maximum daily load (TMDL) development. The water bodies identified include lakes (with oxygen demand or phosphorus from urban and stormwater runoff identified as the causes of impairment) and pathogens from urban/stormwater runoff and nitrogen from agricultural lands and onsite wastewater treatment for the estuary segments.

Part 2 of the list identifies multiple water body segments and categorical water body impairments requiring TMDL development. Sediment contaminated with chlordane and cadmium is identified as the issue of concern for the south shore lakes identified in this category. Water bodies with uses impaired by fish consumption advisories (category 2c) are identified in the Long Island Sound, Peconic and south shore estuaries. Pathogens attributed to urban and stormwater runoff have been identified as the water quality concern.

Part 3 of the 303(d) list identifies water bodies for which TMDLs may be deferred pending verification of the impairment, verification of the cause of the impairment or contaminant source, and water bodies awaiting development or evaluation of other restoration measures. Phosphorus from urban/stormwater runoff is identified as the presumed source of impairments to be documented in two lakes.

A review of water quality data characterizing twelve of the larger fresh streams in the County (shown on **Figure 5-1** and described more completely in the Task 6.1 memorandum) revealed that higher levels of Volatile Organic Compounds (VOCs) were detected in streams in the more densely developed western part of the County than in streams located further to the east, and pesticides were primarily detected in streams in the agricultural eastern areas of the County. Both of these observations are consistent with the assessment relating groundwater quality to land use; higher levels of VOCs were detected in wells with industrial, commercial or institutional land uses within the contributing area, while pesticides (except for DEET) were only found in wells with agriculture in the contributing area. The VOCs that were most frequently detected in Suffolk County streams are summarized on **Table 5-2**. MTBE was the most frequently detected VOC, but levels have been declining, probably because sale of gasoline containing MTBE as an additive has been prohibited in New York State since 2004.

The solvents (and breakdown products) detected in groundwater are also the most common group of VOCs detected in surface water. VOCs are found in low concentrations in Suffolk County's surface waters; the percent of samples with solvent detections has declined significantly since the last assessment in 2005. Found in the Nissequogue River at 13 µg/L, tetrachloroethene (PCE) was



FANS Streams

Major Streams

Streams Impacted by Agriculture, Duck Farms, or Golf Courses

Streams with Multiple Causes of Eutrophication

Map of the 12 Selected Streams

Figure 5-1

the VOC detected at the highest concentration in SCDHS sampling conducted from 2013-2014.

Table 5-2 VOCs Most Frequently Detected in Suffolk County Streams, 2013-2014

Compound	Percent of Samples with Detections		
	1981-2005	2005-2014	2013-2014
Methyl-tertiary-butyl-ether	34%	19%	20%
Tetrachloroethene (PCE)	23%	13%	11%
1,1,1-Trichloroethane	21%	2%	2%
Trichloroethene	18%	6%	4%
Carbon disulfide	17%	0%	0%
1,1-Dichloroethene	15%	3%	3%
1,1-Dichloroethane	12%	1%	0%
Methyl sulfide	8%	7%	10%
Freon 113	3%	6%	8%
cis-1,2-Dichloroethene	3%	5%	3%

Numerous pesticides have also been detected in Suffolk County streams in 2013 and the first half of 2014, with 2,6-Dichlorobenzamide being detected most frequently (**Table 5-3**). Brush's Creek in Laurel had the most detections of the streams sampled during this time period.

Table 5-3 Pesticides Detected in Suffolk County Streams, 2013-2014

Compound	Maximum Concentration	Percent of Samples with Detections	
	µg/L	2010-2014	2013-2014
2,6-Dichlorobenzamide	7.4	12.09%	13.08%
Alachlor ESA	0.4	8.79%	10.28%
Metalaxyl	2	2.93%	2.80%
Alachlor OA	Trace (0.1)	2.56%	4.67%
Imidacloprid	0.5	1.83%	3.74%
Dichlobenil	1.3	1.47%	1.87%
Trichlorfon	Trace (0.1)	0.37%	0.93%
Germanium	0.9	0.37%	0.93%
Picaridin	Trace (0.1)	0.37%	0.93%

As shown by **Figure 5-2**, nitrate levels were highest in streams affected by agriculture and duck farming; the installation of sanitary sewers in the southwestern part of the County has resulted in significant reduction in nitrate levels in most streams within the SWSD. Sewering has also resulted in reduced baseflow in those streams located within the SWSD.

Water quality data collected by the SCDHS shows that the sanitary sewering program has helped to reduce nitrate levels in SWSD streams, as summarized on **Table 5-4**, and illustrated for Sampawams Creek by **Figure 5-3**. The observed increase in nitrate levels in Sampawams Creek in recent years is driven by a single 45.5 mg/L sample collected in September 2013; the remainder of the samples were all significantly lower.

Because groundwater continues to provide the majority of County stream baseflow, and as the link between groundwater and surface water quality becomes more established, the County's groundwater models were used to delineate the land surface area contributing groundwater recharge to the County's surface water features. Understanding the land use types within the groundwater contributing areas to a stream can help to identify the sources of any observed contamination, and to help guide identification and evaluation of management options developed to improve water quality. Existing discretization was added to the model grid in the area of the stream corridors, and the models were used to delineate groundwater contributing areas to each stream at time of travel intervals ranging from less than one year to fifty years. These travel time estimates consider advective movement only, and do not consider retardation, decay or other factors that could affect the migration of a specific contaminant.

Figure 5-4 shows the model-predicted groundwater contributing areas to the Carlls River and Sampawams Creek, superimposed on a mapping of current land use types provided by the Suffolk County Planning Department. **Figure 5-5** provides a similar representation superimposed upon a composite orthophotograph of the area.

In decades past, VOCs have been detected in Sampawams Creek twice as often as in the Carlls River; however the most recent data (2013-2014) identifies similar low levels of PCE and MTBE in each. A statistical analysis of the acreage and percentage of land use types within the contributing area for each creek provides some insight into the differences in observed water quality. For Sampawams Creek, medium density residential land (35 percent), transportation (23 percent) and high density residential land (18 percent) comprise three quarters of the land surface area within the contributing area. Less than five percent of the contributing area within a one year travel time to the creek is open space. In the adjacent Carlls River, 25 percent of the land

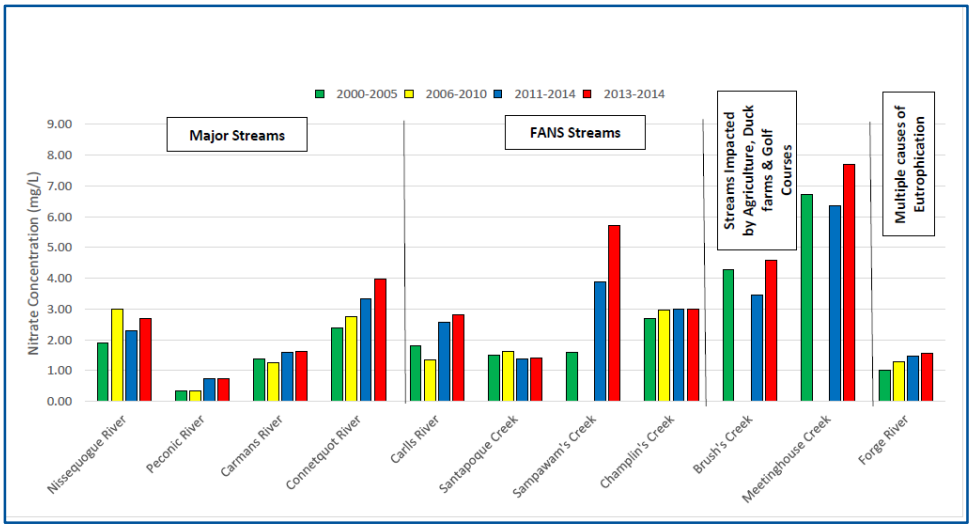


Figure 5-2 Average Nitrate Concentrations in Streams (2000 -2005 and 2013-2014, SCDHS)

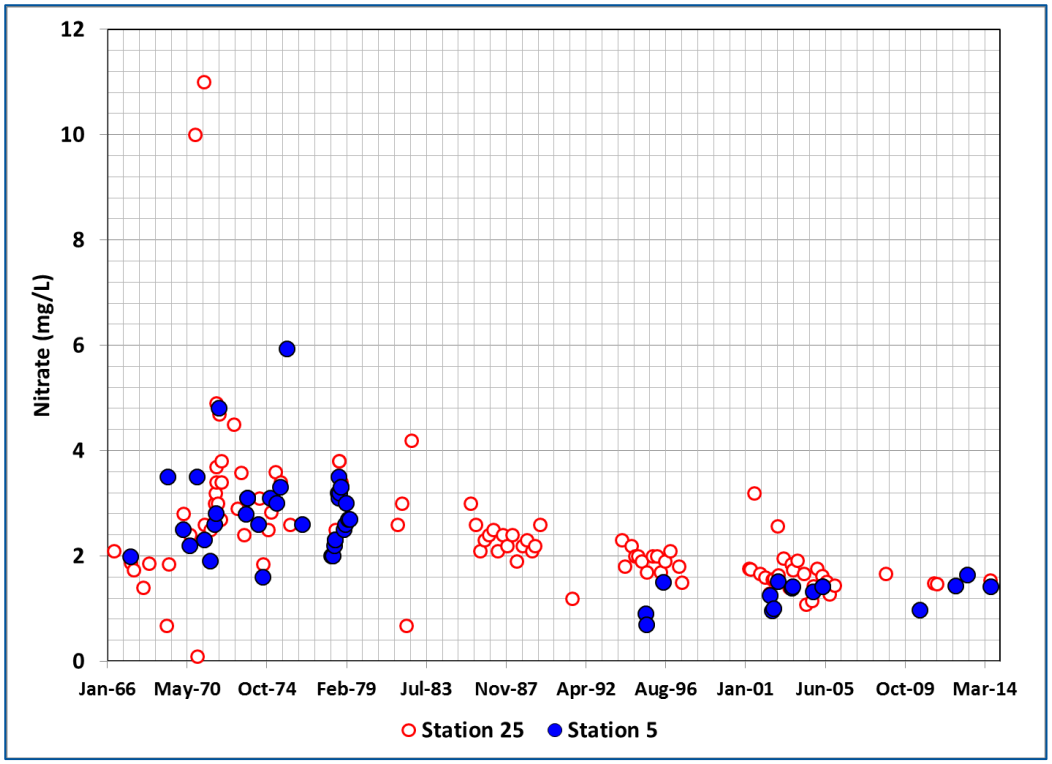


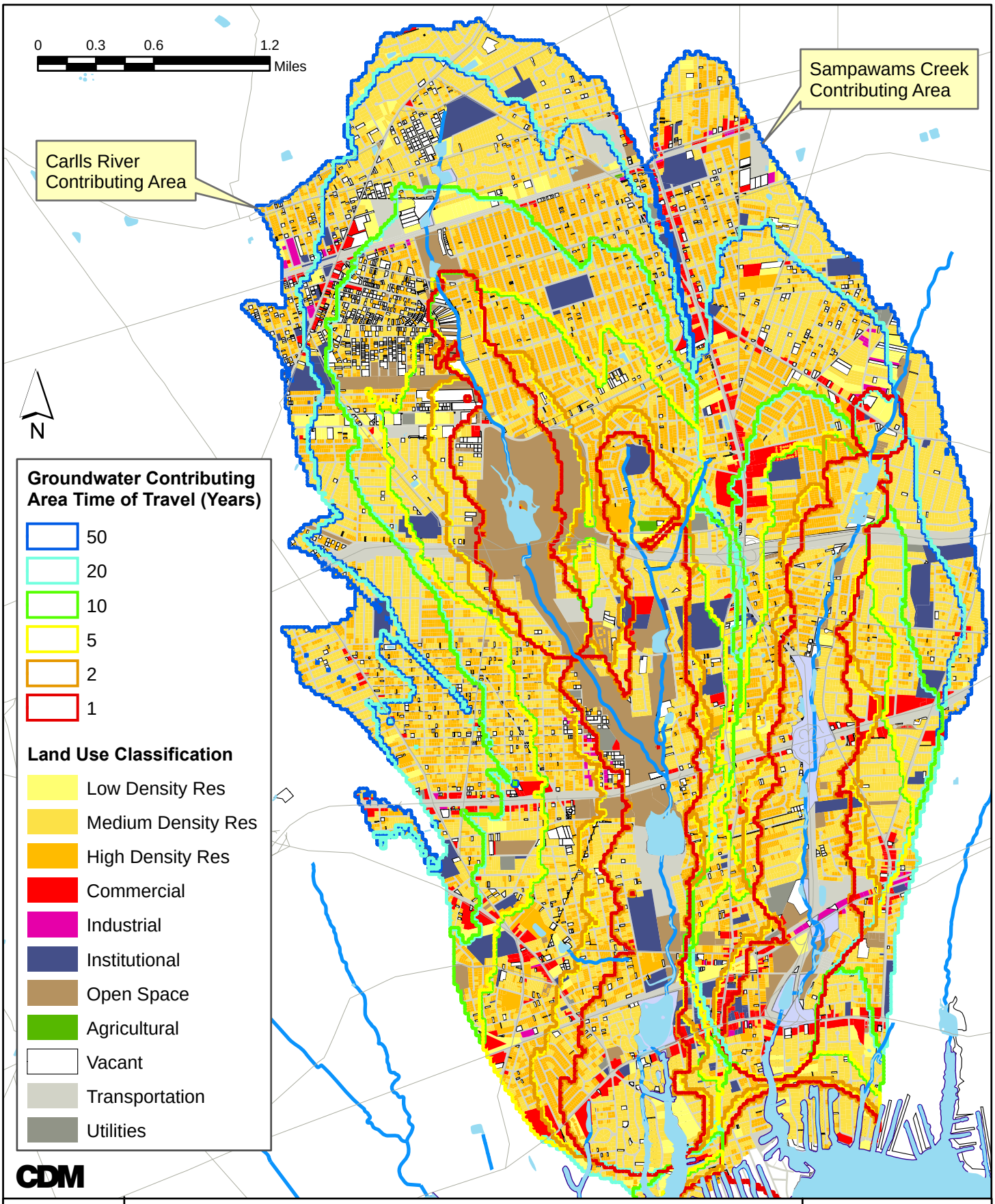
Figure 5-3 Nitrate Concentrations in Sampawams Creek

Table 5-4 Nitrate Concentrations in Streams in the Southwest Sewer District

Santapogue Creek	1960s	1970s	1980s	1990s	2000s	2013	2014
Number of Samples	10	126	22	16	40	4	2
Average (mg/L)	2.0	2.3	1.0	0.9	1.5	1.3	1.5
Maximum (mg/L)	2.8	15.0	1.4	1.4	4.0	1.6	1.7
Minimum (mg/L)	1.3	0.1	0.1	0.5	0.1	1.0	1.4
10th Percentile (mg/L)	1.4	1.2	0.7	0.5	0.9	1.1	1.4
50th Percentile (median) (mg/L)	1.9	2.0	0.9	0.9	1.3	1.3	1.5

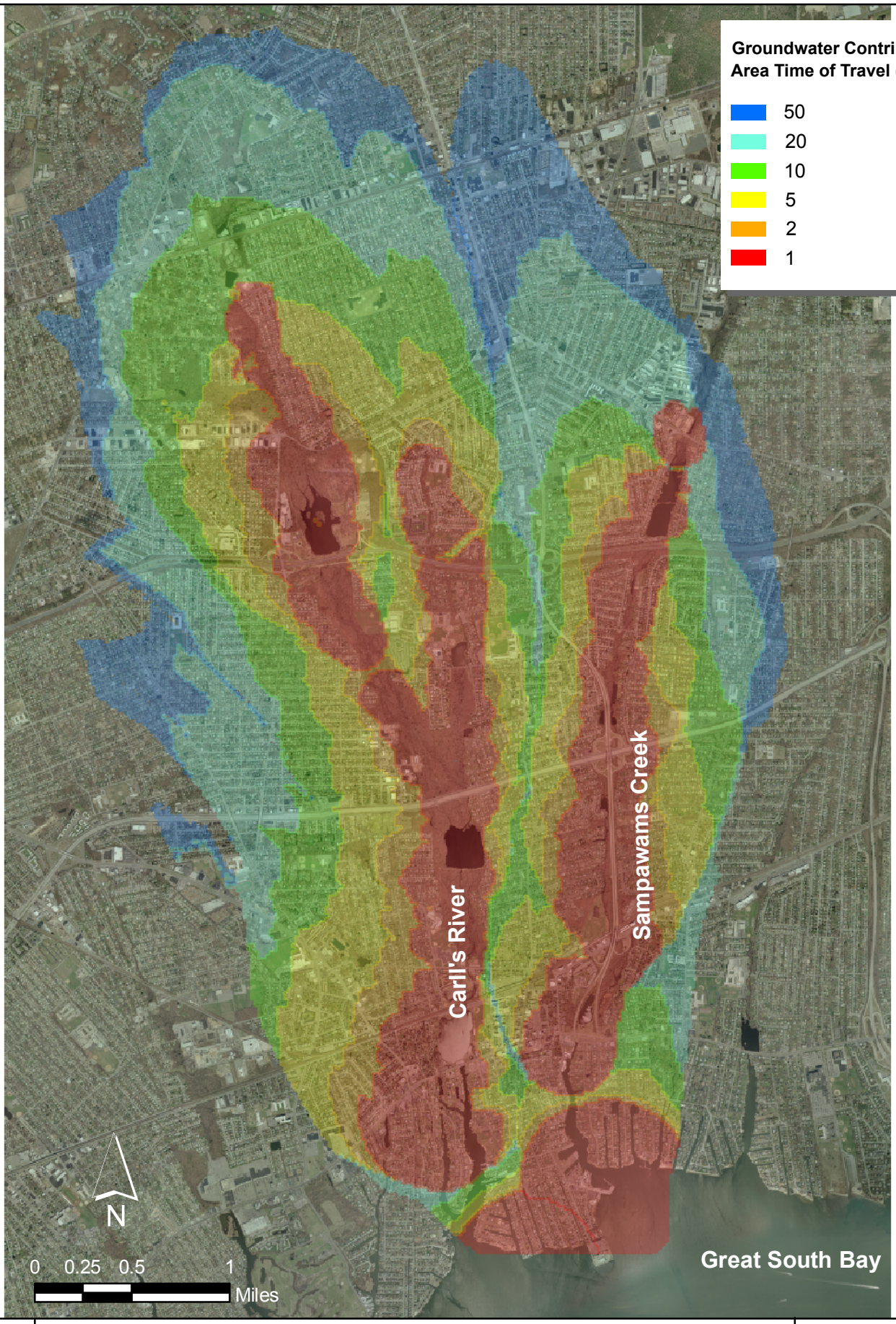
Carlls River	1960s	1970s	1980s	1990s	2000s	2013	2014
Number of Samples	-	63	20	22	65	6	3
Average (mg/L)	-	3.2	2.3	2.1	1.8	3.0	2.4
Maximum (mg/L)	-	6.1	3.5	4.8	3.4	8.5	2.7
Minimum (mg/L)	-	1.2	1.3	0.3	0.2	0.8	2.2
10th Percentile (mg/L)	-	2.2	1.6	1.1	1.0	0.8	2.3
50th Percentile (median) (mg/L)	-	3.1	2.2	2.2	1.9	2.3	2.5
90th Percentile (mg/L)	-	4.5	2.8	2.6	2.6	5.8	2.6

Sampawams Creek	1960s	1970s	1980s	1990s	2000s	2013	2014
Number of Samples	12	136	20	18	50	5	6
Average (mg/L)	2.2	3.2	2.4	1.7	1.6	10.4	1.9
Maximum (mg/L)	3.5	11.0	4.2	2.3	3.2	45.5	3.3
Minimum (mg/L)	0.7	0.1	0.7	0.7	0.1	1.4	0.7
10th Percentile (mg/L)	1.4	2.0	2.0	0.9	1.0	1.4	1.1
50th Percentile (median) (mg/L)	1.9	3.0	2.4	1.9	1.6	1.6	1.6
90th Percentile (mg/L)	3.1	4.6	3.0	2.2	2.2	28.0	2.9



Land Use Classifications within the Groundwater Contributing Areas to Carlls River and Sampawams Creek

Figure 5-4



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Groundwater Contributing Areas to Carlls River and Sampawams Creek

Figure 5-5

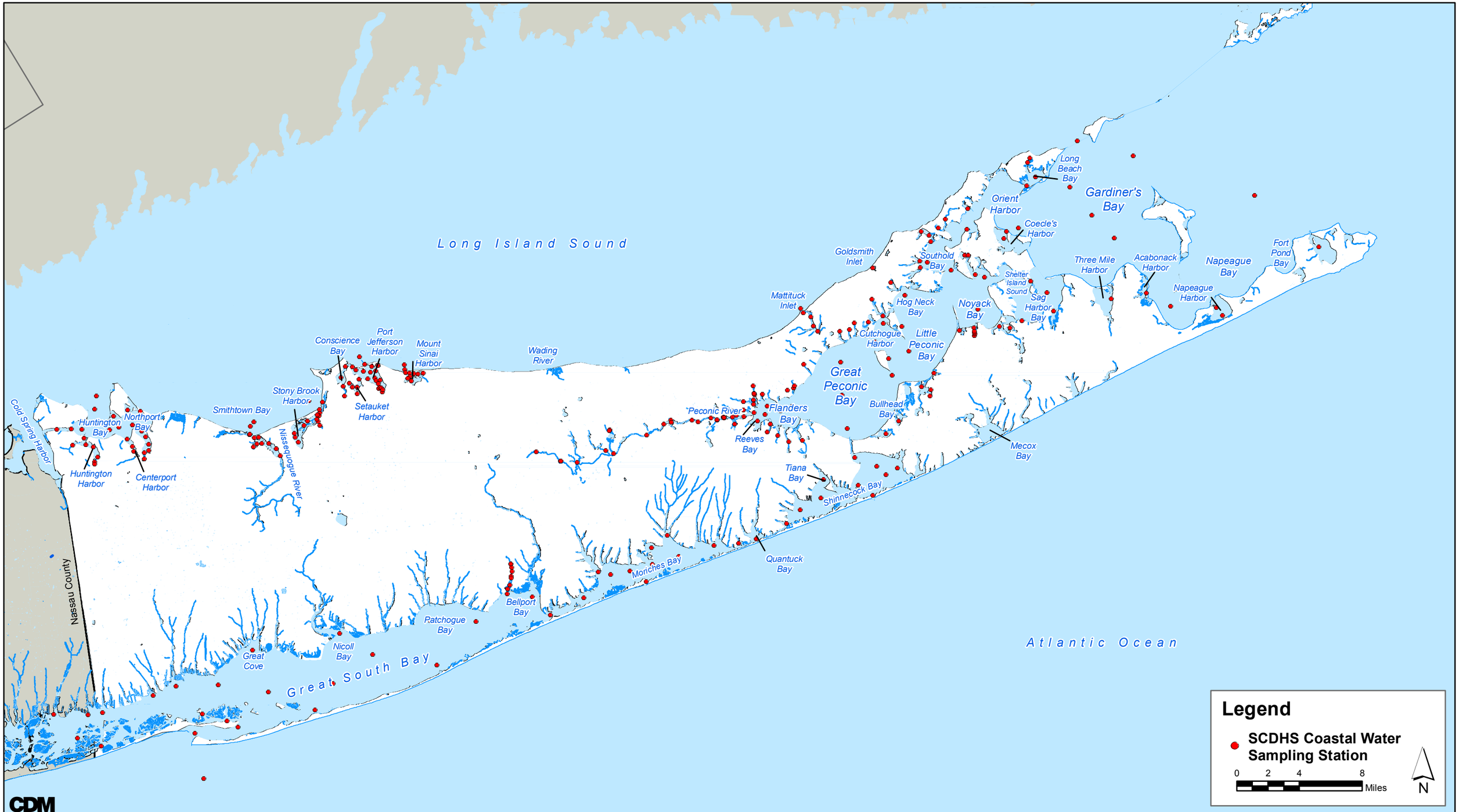
within a one year travel time is open space. VOCs were detected in stream samples collected from Sampawams Creek more than twice as often as in samples collected from the Carmans River. A review of land use types within the Carmans River watershed reveals that almost two thirds of the area that contributes groundwater baseflow to the Carmans River within a two year travel time remains open space, and over fifty percent of the entire groundwater contributing area is currently either open space or vacant land, as shown on **Table 5-5.** Not only does the open space reduce contaminant loading to groundwater, it provides a riparian buffer to protect the stream from contamination due to runoff.

Non-point source pollution controls and Total Maximum Daily Loads (TMDLs) are managed and implemented in New York State by the New York State Department of Environmental Conservation's (NYSDEC) Bureau of Water Assessment and Management. The Non-point Source Management Section works with federal, state, and local agencies and groups to develop TMDLs and address polluted runoff through the Non-point Source Coordinating Committee.

5.1.2 Coastal and Marine Resources

The quality of the County's coastal waters has been characterized using data collected by SCDHS from over 200 monitoring stations, shown on **Figure 5-6**. Coastal marine water body classifications and impairments identified by NYSDEC are summarized on **Table 5-6**. Nitrogen or aquatic toxicity concerns prompted the inclusion of fourteen water bodies, including portions of Great South Bay, Moriches Bay and five creeks on the 3c list, as shown. The presumed sources of the impairments included onsite wastewater treatment or urban runoff.

The coastal waters bordering Suffolk County are impacted to varying degrees by contaminants introduced by point and nonpoint sources. The estuary programs have demonstrated that nutrients (particularly nitrogen) and pathogens are primarily responsible for use impairments and for stressing the living marine resources. As of 2014, almost 30,000 acres are closed to shellfishing year-round, and approximately 9,000 acres are closed on a seasonal basis (NYSDEC, personal communication). Toxic contaminants also play a role in imparting stress on the living resources of Suffolk County's coastal waters. The cumulative impacts of these stresses on the overall health of the aquatic ecosystem are not well understood. Little is also known about the impact of emerging contaminants such as pharmaceuticals and personal care products (PPCPs) on the marine resources. The relative contribution of the sources of each of these contaminants of concern varies for each of the major coastal water bodies.



Suffolk County's Coastal Waters

Figure 5-6

Table 5-5
Analysis of Land Use within Carmans River Groundwater Contributing Areas

Land Use	Total Acres by Land Use within Contributing Areas					Total (Acres)
	0 to 2 Years	2 to 5 Years	5 to 10 Years	10 to 25 Years	25 to 50 Years	
Open Space	2,782	848	729	1,109	449	5,917
Medium Density Residential	530	487	565	652	376	2,608
Vacant	220	341	431	641	536	2,168
Institutional	110	85	66	770	487	1,519
Low Density Residential	343	131	156	203	127	960
Agricultural	108	63	235	147	164	717
Transportation	50	33	69	200	105	457
Industrial	33	58	41	95	65	291
Commercial	14	18	72	65	37	205
Waste Disposal	0	11	63	116	1	190
Utilities	18	12	11	19	62	122
High Density Residential	8	15	15	15	11	64
Total (Acres)	4,216	2,101	2,452	4,030	2,421	15,219

Land Use	Percentage of Land Use (by area) within Contributing Areas					Total (Percent)
	0 to 2 Years	2 to 5 Years	5 to 10 Years	10 to 25 Years	25 to 50 Years	
Open Space	66%	40%	30%	28%	19%	39%
Medium Density Residential	13%	23%	23%	16%	16%	17%
Vacant	5%	16%	18%	16%	22%	14%
Institutional	3%	4%	3%	19%	20%	10%
Low Density Residential	8%	6%	6%	5%	5%	6%
Agricultural	3%	3%	10%	4%	7%	5%
Transportation	1%	2%	3%	5%	4%	3%
Industrial	<1%	3%	2%	2%	3%	2%
Commercial	<1%	<1%	3%	2%	2%	1%
Waste Disposal	0%	<1%	3%	3%	<1%	1%
Utilities	<1%	<1%	<1%	<1%	2.6%	<1%
High Density Residential	<1%	<1%	<1%	<1%	<1%	<1%

Table 5-5
Coastal Marine Water Classification and Impairments

Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
Part 1 - Segments with Impairments Requiring TMDL Development							
LIS1	(MW5.4c)LIS (portion 5)	Long Island Sound	East from Nassau-Suffolk county line to a line running north from Miller Place Beach and north to the New York-Connecticut boundary.	1	SA	Pathogens	Urban/Storm Runoff
SS17	(MW7.2a) AO-MB-168a thru 175	Tidal Tribs to West Moriches Bay (1701-0312) [1]	Estuary	1		D.O./Oxygen Demand	Urb/Storm,Ag,OWTS
SS17	(MW7.2a) AO-MB-168a thru 175	Tidal Tribs to West Moriches Bay (1701-0312) [1]	Estuary	1		Nitrogen	Urb/Storm,Ag,OWTS
SS17	(MW7.2a) AO-MB-168a thru 175	Tidal Tribs to West Moriches Bay (1701-0312) [1]	Estuary	1		Pathogens	Urb/Storm,Ag,OWTS
Part 2c - TMDL Required for Waters Impaired by Shellfishing Restrictions							
LIS17	(MW5.4b) LIS-P 339	Flax Pond		2c	SA	Pathogens	Urban/Storm Runoff
PEC9	GB-P 397	Spring Pond		2c	SA	Pathogens	Urban/Storm Runoff
PEC39	(MW6.1c) GB..LPB-CH-93, P420.	Mud/East Creeks and tribs (1701-0377		2c	SA	Pathogens	Urban/Storm Runoff
PEC40	(MW6.1c) GB..LPB-CH-94	Wickam Creek and tribs (1701-0378)		2c	SA	Pathogens	Urban/Storm Runoff
PEC46	(MW6.1d) GB.GPB-96	West Creek and tidal tribs (1701-0246)		2c	SA	Pathogens	Urban/Storm Runoff
PEC60	(MW6.3b)GB..GPB-122a-P 652	Scallop Pond (1701-0354)		2c	SA	Pathogens	Urban/Storm Runoff
PEC65	(MW6.3g) BIS..P 764	Oyster Pond/Lake Munchogue (1701-0169)		2c	SA	Pathogens	Urban/Storm Runoff
PEC67	(MW5.4g) LIS-FI-P1 1101	Beach Pond	Fishers Island	2c	SA	Pathogens	Urban/Storm Runoff
PEC68	(MW5.4g) LIS-FI-P1 P 1102	Island Pond	Fishers Island	2c	SA	Pathogens	Urban/Storm Runoff
SS6	(MW6.3i) AO-SB-155	Phillips Creek, Lower, and tidal tribs (1701-0299)		2c	SA	Pathogens	Urban/Storm Runoff
SS8	(MW6.3i) AO-SB-QgC	Quogue Canal (1701-0301)		2c	SA	Pathogens	Urban/Storm Runoff
SS16	(MW7.2a) AO-MB (portion 4)	Forge River, Lower and Cove (1701-0316)		2c	SA	Pathogens	Urban/Storm, Agric
SS23	(MW7.6) AO-GSB (portion 6)	Nicoll Bay (1701-0375)	Estuary	2c	SA	Pathogens	Urban/Storm Runoff
SS24	(MW7.8) AO-GSB (portion 7)	Great Cove (1701-0376)	Estuary	2c	SA	Pathogens	Urban/Storm Runoff
Part 3b - TMDL May be Deferred, Pending Verification of Cause/Pollutant/Source							
SS13	(MW7.2a) AO-MB (portion 1)	Moriches Bay, East (1701-0305)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS14	(MW7.2a) AO-MB (portion 2)	Moriches Bay, West (1701-0038)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS18	(MW7.3) AO-GSB (portion 1)-	Great South Bay, East (1701-0039)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS19	(MW7.3) AO-GSB (portion 2)-	Great South Bay, Middle (1701-0040)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS20	(MW7.3) AO-GSB (portion 3)-	Great South Bay, West (1701-0173)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS25	(MW7.1b) AO-SB	Shinnecock Bay and Inlet (1701-0033)	Estuary	3b	NA	Nitrogen	Onsite WTS, Urban
SS10	(MW7.1c) AO-QB	Quantuck Bay (1701-0042)		3b	SA	Nitrogen	Onsite WTS, Urban
Part 4a - TMDL Has Already Been Established							
LIS6	HB-HH portion	Huntington Harbor	South of a line running from Wendower Road to Elbertsons Point.	4a	SA	Pathogens	Municipl,Urb/Storm
LIS7	HB-HH portion	Huntington Harbor	Remainder.	4a	SA	Pathogens	Municipl,Urb/Storm
LIS9	HB-NB-CH including P 240b	Centerport Harbor	Southeast of a line running west from land spit, including Mill Pond (P 240b).	4a	SA	Pathogens	Municipl,Urb/Storm
LIS10	HB-NB-NH	Northport Harbor	Waters south of a line running west from Bluff Point.	4a	A	Pathogens	Municipl,Urb/Storm
LIS14	SB-SBH	Stony Brook Harbor		4a	SA	Pathogens	Urban/Storm Runoff
LIS15	SB-SBH-64	West Meadow Creek		4a	SA	Pathogens	Urban/Storm Runoff
LIS18	LIS-PJH	Port Jefferson Harbor	From harbor entrance portion south to a line running between LILCO bulkhead and beach house at end of Beach Road, Belle Terre; excluding Setauket Harbor and Conscience Bay.	4a	SA	Pathogens	Municipl,Urb/Storm
LIS19	LIS-PJH-SH	Setauket Harbor		4a	SA	Pathogens	Municipl,Urb/Storm
LIS20	LIS-PJH-CB	Conscience Bay		4a	SA	Pathogens	Municipl,Urb/Storm
LIS21	LIS-MSH	Mount Sinai Harbor		4a	SA	Pathogens	Urban/Storm Runoff
LIS23	LIS-71 including P 366	Mattituck Creek		4a	SA	Pathogens	Urban/Storm Runoff
LIS24	LIS-71-1 portion	Trib. of Mattituck Creek	From mouth to Reeve Avenue bridge.	4a	SA	Pathogens	Municipl,Urb/Storm
LIS25	LIS-72 including P 376	Goldsmith Inlet		4a	SA	Pathogens	Urban/Storm Runoff
LIS26	(MW5.4g) LIS-FI-WH	West Harbor, Fishers Island		4a	SA	Pathogens	Urban/Storm Runoff
PEC1	FB	Flanders Bay, East/Center, and tribs	East/center, and tribs.	4a	SA	Pathogens	Municipl,Urb/Storm
	(MW6.1e) GB..FB,FB-111	Flanders Bay, West/Lower Sawmill Creek		4a	SC	D.O./Oxygen Demand/Nitrogen/Pathogens	Urban/Storm Runoff

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Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
	(MW6.1e) GB..FB-110	Meetinghouse/Terrys Creeks and tribs		4a	SC	D.O./Oxygen Demand/Pathogens	Agricult/Urb/Storm
	(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs		4a	SC	D.O./Oxygen Demand/Nitrogen/Pathogens	Urban/Storm Runoff
PEC2	FB-RB	Reeves Bay	And tidal tribs.	4a	SA	Pathogens	Municipl,Urb/Storm
PEC12	GB-136 including P 713	Northwest Creek	And tidal tribs.	4a	SA	Pathogens	Urban/Storm Runoff
PEC15	GB-AH	Acabonack Harbor		4a	SA	Pathogens	Urban/Storm Runoff
PEC17	SIS-DH	Dering Harbor	South of a line running from Dering Point to Shelter Island Ferry.	4a	SA	Pathogens	Urban/Storm Runoff
PEC22	SIS-78	Stirling Creek and Basin		4a	SA	Pathogens	Urban/Storm Runoff
PEC24	SIS-80c including P 418b	Budds Pond		4a	SA	Pathogens	Urban/Storm Runoff
PEC25	SIS-P 420	Hashamomuck Pond		4a	SA	Pathogens	Urban/Storm Runoff
PEC26	SIS-83a	Town Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC27	SIS-83b portion	Jockey Creek	Below Oaklawn Avenue bridge.	4a	SA	Pathogens	Urban/Storm Runoff
PEC28	SIS-84 including P 423	Goose Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC29	SIS-126 including P 674	Noyack Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC30	SIS-SH	Sag Harbor	Harbor, northeast of Sag Harbor-North Haven bridge to breakwater and a line extending from breakwater to trib. 130.	4a	SA	Pathogens	Urban/Storm Runoff
PEC31	SIS-SHC	Sag Harbor Cove	All of cove southwest of Sag Harbor-North Haven bridge.	4a	SA	Pathogens	Urban/Storm Runoff
PEC35	LPB-90 including P 473	Richmond Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC41	LPB-123 including P 659	North Sea Harbor		4a	SA	Pathogens	Urban/Storm Runoff
PEC45	LPB-124 including P 665	Wooley Pond (P 665).	Trib. of Little Peconic Bay	4a	SA	Pathogens	Urban/Storm Runoff
PEC48	GPB-97 portion	Downs Creek	Tidal portion.	4a	SA	Pathogens	Urban/Storm Runoff
PEC49	GPB-98 portion	Halls Creek	Tidal portion.	4a	SA	Pathogens	Urban/Storm Runoff
PEC50	GPB-99	Deep Hole Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC51	GPB-99-P 492	Trib. of Deep Hole Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC52	GPB-100 portion	Trib. of Great Peconic Bay	Tidal portion.	4a	SA	Pathogens	Urban/Storm Runoff
PEC57	GPB-122	Sebonac Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC58	GPB-122-P 648	Bullhead Bay		4a	SA	Pathogens	Urban/Storm Runoff
PEC59	GPB-122a including P 651 and tribs.	Little Sebonac Creek		4a	SA	Pathogens	Urban/Storm Runoff
PEC64	BIS-P 761	Montauk Harbor		4a	SA	Pathogens	Urban/Storm Runoff
PEC91	SIS-83b portion	Jockey Creek	Above Oaklawn Avenue bridge.	4a	SC	Pathogens	Urban/Storm Runoff
PEC110	GPB-100-2	Subtrib. of Great Peconic Bay		4a	SC	Pathogens	Urban/Storm Runoff
PEC111	GPB-101 portion	Trib. of Great Peconic Bay	Tidal portion.	4a	SC	Pathogens	Urban/Storm Runoff
PEC112	GPB-102 portion	Brush Creek	Tidal portion.	4a	SC	Pathogens	Urban/Storm Runoff
PEC113	GPB-103	Trib. of Great Peconic Bay		4a	SC	Pathogens	Urban/Storm Runoff
PEC114	GPB-104 portion	Trib. of Great Peconic Bay	Tidal portion.	4a	SC	Pathogens	Urban/Storm Runoff
SS2	AO-P790	Mecox Bay	And tribs.	4a	SA	Pathogens	Agriculture
SS3	AO-SB-143, 144	Heady and Taylor Creeks	And tribs.	4a	SA	Pathogens	Urban/Storm Runoff
SS4	AO-SB-148, 150	Penny Pond and Smith Creek		4a	SA	Pathogens	Urban/Storm Runoff
SS5	AO-SB-153	Weesuck Creek	And tidal tribs.	4a	SA	Pathogens	Urban/Storm Runoff
SS7	AO-SB-156	Penniman Creek	And tidal tribs.	4a	SA	Pathogens	Urban/Storm Runoff
SS9	AO-SB-QgC-P834	Ogden Pond		4a	SA	Pathogens	Urban/Storm Runoff
SS11	AO-SB-QB-QtC	Quantuck Canal/Moneybogue Bay		4a	SA	Pathogens	Urban/Storm Runoff
SS12	AO-MB-NB	Narrow Bay		4a	SA	Pathogens	Urban/Storm, Agric
SS15	AO-MB (portion 3)	Tuthill, Harts, Seatuck Coves		4a	SA	Pathogens	Urban/Storm, Agric
SS21	AO-GSB (portion 4)	Bellport Bay		4a	SA	Pathogens	Urban/Storm Runoff
SS22	AO-GSB (portion 5)	Patchogue Bay		4a	SA	Pathogens	Urban/Storm Runoff
SS27	AO-P 780	Georgica Pond		4a	SA	Pathogens	Agriculture
SS28	AO-P 786	Sagaponack Pond		4a	SA	Pathogens	Agriculture

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Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
Part 4c - TMDL Not Appropriate to Address Impairment							
LIS32	LIS-62 portion	Nissequogue River, Lower		4c	SC	Restricted Passage	Hab/Hyd Mod
	(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs		4c	Sc	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.1b) AO-SB	Shinnecock Bay (and Inlet)		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.1c) AO-QB	Quantuck Bay		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.2a) AO-MB (portion 1)	Moriches Bay, East		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.2a) AO-MB (portion 2)	Moriches Bay, West		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.3) AO-GSB (portion 1)	Great South Bay, East		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.3) AO-GSB (portion 2)	Great South Bay, Middle		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
	(MW7.3) AO-GSB (portion 3)	Great South Bay, West		4c	SA	Algal/Weed Growth	Hab/Hyd Mod
Waters NOT Included on the NYS 2014 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy							
LIS4	HB	Huntington Bay	Area bounded on west by a line running south from East Beach, on the east by a line running south from West Beach and on the north by a line running east from East Fort Point.		SA		
LIS5	HB-LH	Lloyd Harbor	Waters east of a line running south from East Beach.		SA		
LIS8	HB-NB	Northport Bay	East of a line running south from West Beach excluding Centerport Harbor and Northport Harbor.		SA		
LIS11	LIS-58 including P 269	Trib. of Long Island Sound			SA		
LIS12	LIS-59 portion	Crab Meadow Brook	From mouth to trib. 1.		SA		
LIS13	SB	Smithtown Bay	Waters south of a line running between mouth of Crab Meadow Brook and Crane Point.		SA		
LIS16	LIS-65		Trib. of Long Island Sound		SA		
LIS22	LIS portion	Long Island Sound	All waters of Long Island Sound in New York State, east of a line running north from Luce Landing to the New York-Connecticut boundary and north of a line extending from Orient Point, through Plum Island, to Great Gull Island.		SA		
LIS27	CSH-51	Trib. of Cold Spring Harbor	Tidal portion.		SC		
LIS28	CSH-P 204	Trib. of Cold Spring Harbor			SC		
LIS29	LIS-P 209	Unnamed pond			SC		
LIS30	HB-NB-CH-56a	Trib. of Centerport Harbor			SC		
LIS31	LIS-61 portion	Sunken Meadow Creek	Tidal portion.		SC		
LIS33	LIS-62-2	Trib. of Nissequogue River	Tidal portion.		SC		
LIS34	LIS-PJH portion	Port Jefferson Harbor	Remainder.		SC		
LIS35	LIS-PJH-CB-66 portion	Trib. of Conscience Bay	Mouth to outlet of P 340a.		SC		
LIS36	LIS-70 including P 361	Trib. of Long Island Sound			SC		
LIS37	LIS-71-1 portion	Trib. of Mattituck Creek	Tidal portion.		SC		
LIS38	LIS-P 386, P 388	Tribs. of Long Island Sound			SC		
PEC3	GB	Gardiners Bay	East of a line extending from Cleaves Point to Hay Beach Point on North Fork and east of a line extending from Mashomack Point to Barcelona Point on South Fork, to a line running south from Plum Island through Gardiners Island to Alberts Landing, including Orient Harbor, Long Beach Bay, Northwest Harbor.		SA		
PEC4	GB-LBB	Long Beach Bay	North of a line extending from Browns Point to Orient State Park. Includes Little Bay and Narrow River. (Part of Gardiners Bay.)		SA		
PEC5	GB-OH	Orient Harbor	North of a line running from Cleaves Point to Long Beach Point. (Part of Gardiners Bay.)		SA		
PEC6	GB-75	Trib. of Gardiners Bay			SA		
PEC7	GB-76 including P 395	Dam Pond			SA		
PEC8	GB-77a including P 396 portion	Marion Lake	Northeast of bridge.		SA		
PEC10	GB-CI	Coecles Inlet	Northwest of a line running between Reel Point and Sungic Point.		SA		
PEC11	GB-NWH	Northwest Harbor	East of a line running from Cedar Point to Barcelona Point.		SA		
PEC13	GB-TMH	Threemile Harbor			SA		

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Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
PEC14	GB-140 including P 729	Hog Creek			SA		
PEC16	SIS	Shelter Island Sound	All waters east from a line extending south from Cedar Beach Point to Jessup Neck, to a line extending from Cleaves Point to Hay Beach Point on the North Fork and from Mashomack Point to Barcelona Point on the South Fork, including Noyack Bay, Sag Harbor Bay.		SA		
PEC18	SIS-WNH	West Neck Harbor	North of a line running from West Neck Point to Wards Point.		SA		
PEC19	SIS-SI-8 including P 457	Dickerson Creek			SA		
PEC20	SIS-SI-8a	Menantic Creek			SA		
PEC21	SIS-SI-9 including P 461	West Neck Creek and Bay			SA		
PEC23	SIS-80	Trib. of Shelter Island Sound			SA		
PEC32	LPB	Little Peconic Bay	From a line extending southerly from New Suffolk through Robins Island to Cow Neck Point and east to a line running from Cedar Beach Point to Jessup Neck and including Cutchogue Harbor.		SA		
PEC33	LPB-88 including P 467	Cedar Beach Creek			SA		
PEC34	LPB-89 including P 472	Corey Creek			SA		
PEC36	LPB-91	Little Creek			SA		
PEC37	LPB-CH	Cutchogue Harbor	Part of Little Peconic Bay - north of a line running from New Suffolk to Nassau Point.		SA		
PEC38	LPB-92 including P 477, 92a including P 478	Tribs. of Little Peconic Bay			SA		
PEC42	LPB-123-P 659a	Davis Creek			SA		
PEC43	LPB-123-P 659a-P 664	Turtle Cove			SA		
PEC44	LPB-123-P 660	Fish Cove			SA		
PEC47	GPB	Great Peconic Bay	From a line extending southerly from Miamogue Point to Red Cedar Point, east to a line extending southerly from New Suffolk through Robins Island to Cow Neck Point.		SA		
PEC53	GPB-118 including P 644	Red Creek Pond			SA		
PEC54	GPB-119 including P 645	Trib. of Great Peconic Bay			SA		
PEC55	GPB-121	Trib. of Great Peconic Bay			SA		
PEC56	GPB-121-P 647	Cold Spring Pond			SA		
PEC61	BIS	Block Island Sound	All waters within New York State, east of a line running from Plum Island through Gardiners Island to Alberts Landing, including Napeague Bay, Napeague Harbor and Fort Pond Bay.		SA		
PEC62	BIS-NH	Napeague Harbor	Part of Block Island Sound, southeast of a line running from Goff Point to Hicks Island.		SA		
PEC63	BIS-142 including P 752	Napeague Pond			SA		
PEC66	Gardiners Island-P 732, 5 including P 741, 7 including P 747, 739	Tribs. of Gardiners Island	Tidal portions.		SA		
PEC69	GB-73,74,75a,75b, 75c	Tidal portion.	Tribs. of Gardiners Bay		SC		
PEC70	GB-77a including P 396 portion	Marion Lake	Southwest of bridge.		SC		
PEC71	GB-P 399	Trib. of Gardiners Bay			SC		
PEC72	Trib. of Gardiners Bay	GB-P 439a			SC		
PEC73	GB-P 450a	Trib. of Gardiners Bay			SC		
PEC74	GB-137 portion	Trib. of Gardiners Bay	Tidal portion.		SC		
PEC75	GB-137-P 726	Alewife Pond			SC		
PEC76	GB-138	Hands Creek			SC		
PEC77	SIS-SI-1 including P 431	Crab Creek			SC		
PEC78	SIS-SI-2a including P 434	Chase Creek			SC		
PEC79	SIS-SI-2b and P 436	Gardiners Creek			SC		
PEC80	SIS-SI-3 and P 451b	Trib. of Shelter Island Sound			SC		
PEC81	SIS-SI-4	Trib. of Shelter Island Sound			SC		
PEC82	SIS-SI-4a including P 451a, 5 including P 452, 6 including P 455, 6a including P 456a, 6b including P 456,7	Tribs. of Shelter Island Sound			SC		
PEC83	SIS-77 including P 400	Gull Pond			SC		
PEC84	SIS-79	Trib. of Shelter Island Sound			SC		
PEC85	SIS-79-1 portion including P 408	Trib. of Shelter Island Sound	Tidal portion.		SC		
PEC86	SIS-79-2 portion	Moores Drain	Tidal portion.		SC		
PEC87	SIS-P 414, P 415	Tribs. of Shelter Island Sound			SC		

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Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
PEC88	SIS-80a	Trib. of Shelter Island Sound			SC		
PEC89	SIS-80b including P 418	Trib. of Shelter Island Sound			SC		
PEC90	SIS-82 including P 421, 83 including P 422	Tribs. of Shelter Island Sound			SC		
PEC92	SIS-85 including P 428, 86 including P 429, 87 including P 430, P 672	Tribs. of Shelter Island Sound			SC		
PEC93	SIS-128	Trib. of Shelter Island Sound			SC		
PEC94	SIS-128-1 including P 678	Subtrib. of Shelter Island Sound			SC		
PEC95	SIS-129 including P 686, P 685, P 685a	Tribs. of Shelter Island Sound			SC		
PEC96	SIS-129a including P 689	Trib. of Shelter Island Sound			SC		
PEC97	SIS-130 including P 696	Trib. of Shelter Island Sound	P 696 is fresh pond.		SC		
PEC98	SIS-131 including P 697	Trib. of Shelter Island Sound			SC		
PEC99	SIS-132 portion	Ligonee Brook			SC		
PEC100	SIS-133	Trib. of Shelter Island Sound			SC		
PEC101	SIS-133-P 709	Subtrib. of Shelter Island Sound			SC		
PEC102	SIS-134 portion	Trib. of Shelter Island Sound	Tidal portion.		SC		
PEC103	SIS-135 including P 712	Trib. of Shelter Island Sound			SC		
PEC104	LPB-88a, 88b including P 470	Tribs. of Little Peconic Bay			SC		
PEC105	LPB-95	Trib. of Little Peconic Bay			SC		
PEC106	LPB-P 653	Trib. of Little Peconic Bay			SC		
PEC107	LPB-123-1 portion	Trib. of North Sea Harbor	Tidal portion.		SC		
PEC108	LPB-125 including P 667	Trib. of Little Peconic Bay	Fresh Pond (P 667).		SC		
PEC115	GPB-120	Shinnecock Canal	From Shinnecock Light to locks.		SC		
PEC116	BIS-141 portion including P 749	Trib. of Block Island Sound	From mouth to inlet of P 749.		SC		
PEC117	BIS-P 761-P 762	Little Reed Pond			SC		
PEC118	BIS-P 766, P 766a, P 767, P 767a	Tribs. of Block Island Sound			SC		
PEC119	Gardiners Island-P 731, P 736, P 737, P 737a, P 738, P 743, P 744, 6 including P 745, P 746, P 746a	Ponds and streams on Gardiners Island	Tidal portions.		SC		
PEC120	GPB-121-P 647-1	Trib. of Cold Spring Pond	Tidal portion. Freshwater portion.		SC C		
SS1	AO	Atlantic Ocean	To three miles out, Nassau county line east to line running south of Blue Point and Water Island.		SA		
SS26	AO portion	Atlantic Ocean	From a line running southerly from Mecox Coast Guard Station, east to Montauk Point and extending three miles from shore.		SA		
SS30	GSB-188a	Namkee Creek			SC		
SS31	GSB-188b	Herman's Creek			SC		
SS32	GSB-189 portion	Brown Creek	From mouth to outlet of Sayville Mill Pond (P 893).		SC		
SS33	GSB-190 portion	Green Creek	Mouth to Montauk Highway.		SC		
SS34	GSB-190-P 899	Trib. of Green Creek			SC		
SS35	GSB-191	Indian Creek			SC		
SS36	GSB-192, 192a	Tribs. of Great South Bay			SC		
SS37	GSB-193 portion	Connetquot River	Mouth to Montauk Highway.		SC		
SS38	GSB-193-1, 1a	Tribs. of Connetquot River			SC		
SS39	GSB-193-2 portion	Trib. of Connetquot River	Mouth to Montauk Highway.		SC		
SS40	GSB-193-2-P 901	Subtrib. of Connetquot River			SC		
SS41	GSB-193a	Heckscher Canal			SC		
SS42	GSB-194a	Quintuck Creek			SC		
SS43	GSB-194 portion	Champlin Creek	Mouth to outlet of P 910.		SC		
SS44	GSB-194b, 194c, 195	Tribs. of Great South Bay	Tidal portion.		SC		
SS45	GSB-196 portion	Orowoc Creek	From mouth to Montauk Highway.		SC		
SS46	GSB-197 portion	Awixa Creek	From mouth to Montauk Highway.		SC		
SS47	GSB-198 portion	Penataquit Creek	From mouth to Montauk Highway.		SC		
SS48	GSB-199	Watchogue Creek			SC		
SS49	GSB-199a	Trib. of Great South Bay			SC		
SS50	GSB-200	Lawrence Creek	Tidal portion.		SC		
SS51	GSB-201	Brightwaters Canal	Tidal portion.		SC		

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Item No.	Waters Index Number	Name	Description	Section 303(d) Part No.	Standards	New York State 2014 Section 303(d) List Water	
						Cause/Pollutant	Source
SS52	GSB-202	Thorn Canal	Tidal portion.		SC		
SS53	GSB-202a		Isbrandsen Canal		SC		
SS54	GSB-203 portion	Thompsons Creek	From mouth to Montauk Highway.		SC		
SS55	GSB-204 portion	Trues Creek	From mouth to Montauk Highway.		SC		
SS56	GSB-204a	Trib. of Great South Bay			SC		
SS57	GSB-205 portion	Willets Creek	From mouth to Montauk Highway.		SC		
SS58	GSB-206	Skookwams Creek			SC		
SS59	GSB-207 portion	Sampawams Creek	From mouth to Montauk Highway.		SC		
SS60	GSB-208 portion and tribs. 1, 1a	Carlls River	From mouth to Montauk Highway.		SC		
SS61	GSB-209 and trib. 1	West Babylon Creek	Tidal portions.		SC		
SS62	GSB-210 portion including P 958	Santapogue Creek	From mouth to Montauk Highway.		SC		
SS63	GSB-211 portion	Neguntatogue Creek	From mouth to Montauk Highway.		SC		
SS64	GSB-212 portion	Trib. of Great South Bay	From mouth to Montauk Highway.		SC		
SS65	GSB-212a, 212b		Tribs. of Great South Bay		SC		
SS66	GSB-213 portion	Great Neck Creek	From mouth to Montauk Highway.		SC		
SS67	GSB-213a, 213b	Tribs. of Great South Bay			SC		
SS68	GSB-214	Howell Creek			SC		
SS69	GSB-214a	Trib. of Great South Bay			SC		
SS70	GSB-215 portion	Woods Creek (Ketchams Creek)	From mouth to Merrick Road.		SC		
SS71	GSB-216 portion	Amityville Creek	From mouth to Merrick Road.		SC		
SS72	GSB-217	Narraskatuck Creek	Tidal portion within Suffolk County.		SC		
SS73	AO-P 786-2-P 789a	Subtrib. of Sagaponack Pond			SC		
SS74	Gardiners Island-P 731, P 736, P 737, P 737a, P 738, P 743, P 744, 6 including P 745, P 746, P 746a	Ponds and streams on Gardiners Island	Tidal portions.		SC		

Key:		
Waters Index Number	Name of Waters	Explanation
LIS	Long Island Sound	Primary waters identified by abbreviation.
CSH	Cold Spring Harbor	
SB	Smithtown Bay	
HB	Huntington Bay	
GB	Gardiners Bay	Primary waters identified by abbreviation.
SIS	Shelter Island Sound	
LPB	Little Peconic Bay	
GPB	Great Peconic Bay	
BIS	Block Island Sound	
GSB	Great South Bay	Primary waters identified by abbreviation.
AO	Atlantic Ocean	

Source for 2014 NYS 303(d) List of Impaired Waters:

http://www.dec.ny.gov/docs/water_pdf/303dlistfinal2014.pdf

The management plans that are in place for the coastal waters bordering the County share many common issues and management strategies. Nitrogen and pathogens were identified as the parameters with the greatest impacts in terms of limiting uses and stressing the living marine resources. Within the Suffolk County watershed area, nonpoint sources are the major contributors of nutrients and pathogens, and recommendations identified within each of the estuary programs focus on reducing nitrogen loading from sanitary wastewater and fertilization, implementation of best management practices (BMPs) to improve stormwater quality, and open space preservation. The cumulative impacts of pesticides and PPCPs on the aquatic ecosystems have not yet been well defined, and are currently under study.

Not all impaired waters of the state are listed on the Section 303(d) list. By definition, the 303(d) list is limited to impaired waters that require the development of a TMDL. However New York State maintains a list of Other Impaired Waterbody Segments Not Listed on the 303(d) list to provide a more comprehensive inventory of waters that do not fully support designated uses. Waterbodies on this list are considered to be impaired, however a TMDL is not necessary. In some cases, this is because a TMDL has already been established for the segment/pollutant, or because urban stormwater runoff is identified as a source of impairment. **Table 5-7**, the All Impaired Waters List is a complete listing of all impaired water bodies (contains the Section 303(d) List waters as well as the Other Impaired Waterbody Segments Not Listed) as shown on the figure below.

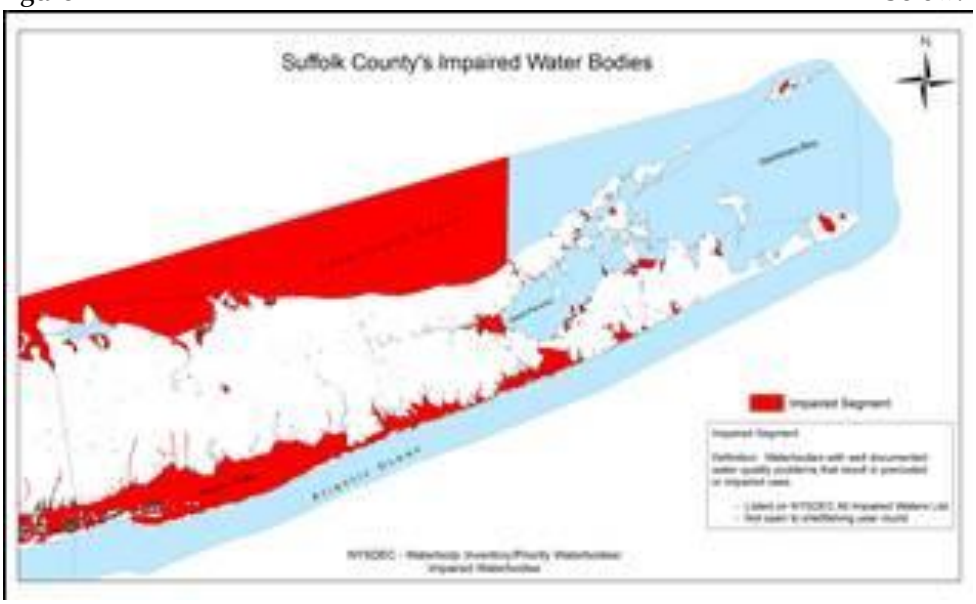


Table 5-7 Suffolk County Impaired Waters

Waters Index Number	Water Body Name	CAUSE/POLLUTANT	SOURCE
(MW5.4c) LIS (portion 5)	Long Island Sound, Suffolk Co, Central	Pathogens	Urban/Storm Runoff
(MW7.2a) AO-MB-168a thru 175 (sel.)	Tidal tribs to West Moriches Bay	D.O./Oxygen Demand	Urb/Storm,Ag,OWTS
(MW7.2a) AO-MB-168a thru 175 (sel.)	Tidal tribs to West Moriches Bay	Nitrogen	Urb/Storm,Ag,OWTS
(MW7.2a) AO-MB-168a thru 175 (sel.)	Tidal tribs to West Moriches Bay	Pathogens	Urb/Storm,Ag,OWTS
Part 2c TMDL Required for Waters Impaired by Shellfishing Restrictions			
(MW5.4b) LIS-P339	Flax Pond	Pathogens	Urban/Storm Runoff
(MW5.4g) LIS-FI-P1101,P1102	Beach/Island Ponds, Fishers Island	Pathogens	Urban/Storm Runoff
(MW6.1a) GB-P397	Spring Pond	Pathogens	Urban/Storm Runoff
(MW6.1c) GB..LPB-CH-93, P420	Mud/East Creeks and tribs	Pathogens	Urban/Storm Runoff
(MW6.1c) GB..LPB-CH-94	Wickham Creek and tribs	Pathogens	Urban/Storm Runoff
(MW6.1d) GB..GPB- 96	West Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.3b) GB..GPB-122a-P652	Scallop Pond	Pathogens	Urban/Storm Runoff
(MW6.3h) BIS..P764	Oyster Pond/Lake Munchogue	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-155	Phillips Creek, Lower, and tidal tribs	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-QgC	Quogue Canal	Pathogens	Urban/Storm Runoff
(MW7.2a) AO-MB (portion 4)	Forge River, Lower and Cove	Pathogens	Urban/Storm, Agric
(MW7.6) AO-GSB (portion 6)	Nicoll Bay	Pathogens	Urban/Storm Runoff
(MW7.8) AO-GSB (portion 7)	Great Cove	Pathogens	Urban/Storm Runoff
Part 3b - TMDL May be Deferred, Pending Verification of Cause/Pollutant/Source			
(MW7.1b) AO-SB	Shinnecock Bay (and Inlet)	Nitrogen	Onsite WTS, Urban
(MW7.1c) AO-QB	Quantuck Bay	Nitrogen	Onsite WTS, Urban
(MW7.2a) AO-MB (portion 1)	Moriches Bay, East	Nitrogen	Onsite WTS, Urban
(MW7.2a) AO-MB (portion 2)	Moriches Bay, West	Nitrogen	Onsite WTS, Urban
(MW7.3) AO-GSB (portion 1)	Great South Bay, East	Nitrogen	Onsite WTS, Urban
(MW7.3) AO-GSB (portion 2)	Great South Bay, Middle	Nitrogen	Onsite WTS, Urban
(MW7.3) AO-GSB (portion 3)	Great South Bay, West	Nitrogen	Onsite WTS, Urban
Part 4a - TMDL Has Already Been Established			
(MW5.2a) LIS-HB-HH	Huntington Harbor	Pathogens	Municipl,Urb/Storm
(MW5.2a) LIS-HB-NB-CH	Centerport Harbor	Pathogens	Municipl,Urb/Storm
(MW5.2a) LIS-HB-NB-NH	Northport Harbor	Pathogens	Municipl,Urb/Storm
(MW5.4a) LIS-SB-SBH	Stony Brook Harbor and West Meadow Creek	Pathogens	Urban/Storm Runoff
(MW5.4c) LIS-PJH (portion 1)	Port Jefferson Harbor, North, and tribs	Pathogens	Municipl,Urb/Storm
(MW5.4c) LIS-PJH-CB	Conscience Bay and tidal tribs	Pathogens	Municipl,Urb/Storm
(MW5.4c) LIS-PJH-SH	Setauket Harbor	Pathogens	Municipl,Urb/Storm
(MW5.4d) LIS- MSH	Mt Sinai Harbor and tidal tribs	Pathogens	Urban/Storm Runoff
(MW5.4e) LIS- 71	Mattituck Inlet/Cr, Low, and tidal tribs	Pathogens	Urban/Storm Runoff
(MW5.4e) LIS- 72	Goldsmith Inlet	Pathogens	Urban/Storm Runoff
(MW5.4g) LIS-FI-WH	West Harbor, Fishers Island	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS- 78	Stirling Creek and Basin	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS- 80c-P418a	Budds Pond	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS- 83a,83b	Town/Jockey Creeks and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS- 84-P423	Goose Creek	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS(-DH)	Dering Harbor	Pathogens	Urban/Storm Runoff
(MW6.1b) GB-SIS-P420	Hashamomuck Pond	Pathogens	Urban/Storm Runoff
(MW6.1c) GB..LPB- 90	Richmond Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.1d) GB..GPB- 97 thru 104	Tidal Tribs to Gr Peconic Bay, Northshr	Pathogens	Urban/Storm Runoff
(MW6.1e) FB	Flanders Bay, East/Center, and tribs	Pathogens	Municipl,Urb/Storm
(MW6.1e) GB..FB,FB-111	Flanders Bay, West/Lower Sawmill Creek	D.O./Oxygen Demand	Urban/Storm Runoff
(MW6.1e) GB..FB,FB-111	Flanders Bay, West/Lower Sawmill Creek	Nitrogen	Urban/Storm Runoff
(MW6.1e) GB..FB,FB-111	Flanders Bay, West/Lower Sawmill Creek	Pathogens	Urban/Storm Runoff
(MW6.1e) GB..FB-110	Meetinghouse/Terrys Creeks and tribs	D.O./Oxygen Demand	Agriculture
(MW6.1e) GB..FB-110	Meetinghouse/Terrys Creeks and tribs	Nutrients	Agriculture
(MW6.1e) GB..FB-110	Meetinghouse/Terrys Creeks and tribs	Pathogens	Urban/Storm Runoff
(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs	D.O./Oxygen Demand	Urban/Storm Runoff
(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs	Nutrients	Urban/Storm Runoff
(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs	Pathogens	Urban/Storm Runof
(MW6.3a) GB..FB-RB	Reeves Bay and tidal tribs	Pathogens	Municipl,Urb/Storm
(MW6.3b) GB..GPB-122a-P651	Little Sebonac Creek	Pathogens	Urban/Storm Runoff
(MW6.3b) GB..GPB-122-P648	Sebonac Cr/Bullhead Bay and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.3c) GB..LPB-123-P659	North Sea Harbor and tribs	Pathogens	Urban/Storm Runoff
(MW6.3c) GB..LPB-124-P665	Wooley Pond	Pathogens	Urban/Storm Runoff

Table 5-7 Suffolk County Impaired Waters

(MW6.3d) GB-SIS-126	Noyack Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.3e) GB-SIS-SHB,SHC	Sag Harbor and Sag Harbor Cove	Pathogens	Urban/Storm Runoff
(MW6.3f) GB-AH	Acabonack Harbor	Pathogens	Urban/Storm Runoff
(MW6.3f) GB-SIS-NH-136	Northwest Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW6.3h) BIS..P761	Lake Montauk	Pathogens	Urban/Storm Runoff
(MW7.1a) AO-P780	Georgica Pond	Pathogens	Agriculture
(MW7.1a) AO-P786	Sagaponack Pond	Pathogens	Agriculture
(MW7.1b) AO-P790	Mecox Bay and tribs	Pathogens	Agriculture
(MW7.1b) AO-SB-143,144	Heady and Taylor Creeks and tribs	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-148 thru 150	Penny Pond, Wells and Smith Creeks	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-153	Weesuck Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-156	Penniman Creek and tidal tribs	Pathogens	Urban/Storm Runoff
(MW7.1b) AO-SB-QgC-P834	Ogden Pond	Pathogens	Urban/Storm Runoff
(MW7.1c) AO-QB	Quantuck Bay	Pathogens	Urban/Storm Runoff
(MW7.1c) AO-SB-QB-QtC	Quantuck Canal/Moneybogue Bay	Pathogens	Urban/Storm Runoff
(MW7.2a) AO-MB (portion 3)	Tuthill, Harts, Seatuck Coves	Pathogens	Urban/Storm, Agric
(MW7.2b) AO-MB-NB	Narrow Bay	Pathogens	Urban/Storm, Agric
(MW7.3) AO-GSB (portion 4)	Bellport Bay	Pathogens	Urban/Storm Runoff
(MW7.3) AO-GSB (portion 5)	Patchogue Bay	Pathogens	Urban/Storm Runoff
Part 4c -TMDL Not Appropriate to Address Impairment			
(MW5.3) LIS- 62	Nissequogue River, Lower	Restricted Passage	Hab/Hyd Mod
(MW6.2) GB..FB-112 (portion 1)	Peconic River, Lower, and tidal tribs	Algal/Weed Growth	Hab/Hyd Mod
(MW7.1b) AO-SB	Shinnecock Bay (and Inlet)	Algal/Weed Growth	Hab/Hyd Mod
(MW7.1c) AO-QB	Quantuck Bay	Algal/Weed Growth	Hab/Hyd Mod
(MW7.2a) AO-MB (portion 1)	Moriches Bay, East	Algal/Weed Growth	Hab/Hyd Mod
(MW7.2a) AO-MB (portion 2)	Moriches Bay, West	Algal/Weed Growth	Hab/Hyd Mod
(MW7.3) AO-GSB (portion 1)	Great South Bay, East	Algal/Weed Growth	Hab/Hyd Mod
(MW7.3) AO-GSB (portion 2)	Great South Bay, Middle	Algal/Weed Growth	Hab/Hyd Mod
(MW7.3) AO-GSB (portion 3)	Great South Bay, West	Algal/Weed Growth	Hab/Hyd Mod
(MW5.0) - - -	Spring Pond/Lake	Chlordane	Contaminated Sed.
(MW5.3) LIS- 62-P288	Philips Mill Pond	Restricted Passage	Hab/Hyd Mod
(MW5.3) LIS- 62-P292	New Mill Pond	Restricted Passage	Hab/Hyd Mod
(MW5.3) LIS-62-P296	Millers Pond	Algal/Weed Growth	Hab/Hyd Mod
(MW5.3) LIS-62-P296	Millers Pond	D.O./Oxygen Demand	Urban/Storm Runoff
(MW5.3) LIS-62-P296	Millers Pond	Phosphorus	Urban/Storm Runoff
(MW6.1d) GB..GPB-P495	Mattituck (Marratooka) Pond	D.O./Oxygen Demand	Urban/Storm Runoff
(MW6.1d) GB..GPB-P495	Mattituck (Marratooka) Pond	Pathogens	Urban/Storm Runoff
(MW6.1d) GB..GPB-P495	Mattituck (Marratooka) Pond	Phosphorus	Urban/Storm Runoff
(MW6.1d) GB..GPB-P496	Laurel Pond	D.O./Oxygen Demand	
(MW6.2) GB..FB-112-2-P536	Wildwood Lake (Great Pond)	Restricted Passage	Hab/Hyd Mod
(MW6.2) GB..FB-112-P555/P556	Peconic Lake/Swans Pond	Restricted Passage	Hab/Hyd Mod
(MW6.3c) GB..LPB-123..P661,P662	Big/Little Fresh Ponds	Nutrients	Urb/Storm/CSO,Muni
(MW6.3d) GB-SIS-SI-WNH-P458	Fresh Pond	Phosphorus	Urban/Storm Runoff
(MW6.3h) BIS..P753	Fresh Pond	Mercury	Atmospheric Dep.
(MW6.3h) BIS..P755	Fort Pond	D.O./Oxygen Demand	
(MW7.1a) AO-P782/P784	Wainscott Pond/Fairfield Pond	D.O./Oxygen Demand	
(MW7.1b) AO-P790- 2-2-P793,P794	Mill and Seven Ponds	Phosphorus	Urb/Storm/CSO,Muni
(MW7.1b) AO-P814	Old Town Pond	D.O./Oxygen Demand	
(MW7.1b) AO-P815	Agawam Lake	D.O./Oxygen Demand	
(MW7.2a) AO-MB-174-P850/P851	West and East Mill Ponds	D.O./Oxygen Demand	
(MW7.5) AO-GSB-185-P889	Canaan Lake	Phosphorus	Urban/Storm Runoff
(MW7.5) AO-GSB-185-P889	Canaan Lake	Silt/Sediment	Urban/Storm Runoff
(MW7.7) AO-GSB-193..P304	Lake Ronkonkoma	Algal/Weed Growth	Hab/Hyd Mod
(MW7.7) AO-GSB-193..P304	Lake Ronkonkoma	Pathogens	Urban/Storm Runoff
(MW7.7) AO-GSB-193..P304	Lake Ronkonkoma	Phosphorus	Urban/Storm Runoff
(MW7.8) AO-GSB-205-P934	Lake Capri	Cadmium	Cont.Sed,Land Disp
(MW7.8) AO-GSB-205-P934	Lake Capri	Chlordane	Cont.Sed,Land Disp
(MW5.3) LIS- 62	Nissequogue River, Upper, and tribs	Restricted Passage	Hab/Hyd Mod
(MW6.2) GB..FB-112 (portion 2)	Peconic River, Middle, and tribs	Restricted Passage	Hab/Hyd Mod
(MW6.2) GB..FB-112 (portion 3)	Peconic River, Middle, and tribs	Restricted Passage	Hab/Hyd Mod
(MW6.2) GB..FB-112-3a thru 9 (sel)	Tribs to Peconic River	Restricted Passage	Hab/Hyd Mod
(MW7.2a) AO-MB-170	Terrell River, Upper, and tribs	Unknown Toxicity	Urb/Storm Runoff
(MW7.5) AO-GSB-178	Beaverdam Creek and tribs	Ammonia	Urb/Storm Runoff
(MW7.5) AO-GSB-179	Motts Creek, Upper, and tribs	Unknown Toxicity	Urb/Storm Runoff
(MW7.8) AO-GSB-194	Champlin Creek, Upper, and tribs	Thermal Changes	Urban/Storm Runoff
(MW7.8) AO-GSB-196	Orowoc Creek, Upper, and tribs	Unknown Toxicity	Urban/Storm Runoff

Table 5-7 Suffolk County Impaired Waters

(MW7.8)	AO-GSB-197	Awixa Creek, Upper, and tribs	Unknown Toxicity	Urb/Storm Runoff
(MW7.8)	AO-GSB-198	Penataquit Creek, Upper, and tribs	Unknown Toxicity	Urb/Storm Runoff
(MW7.8)	AO-GSB-207	Sampawams Creek, Upper, and tribs	Unknown Toxicity	Urban/Storm Runoff

5.1.2.1 Long Island Sound

As described in the Task 6.2 Memorandum, the Long Island Sound Study (LISS) was initiated in 1985 as a partnership between the United States Environmental Protection Agency (USEPA) and the states of New York and Connecticut. In 1987, the Long Island Sound was designated as an "Estuary of National Significance" under the National Estuary Program (NEP), which is implemented according to Section 320 of the Clean Water Act to protect nationally significant estuaries from pollution, development and overuse.

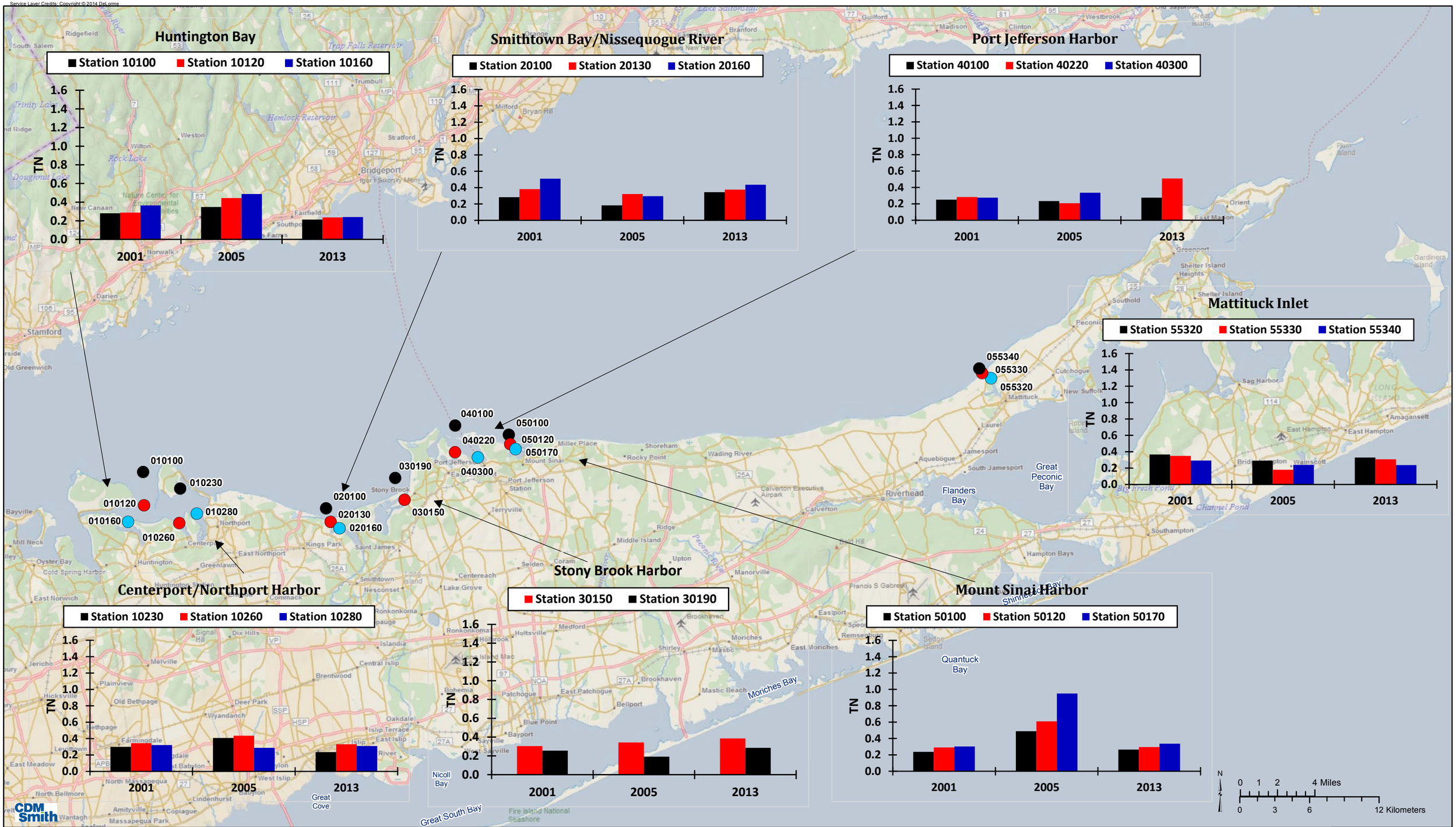
The LISS CCMP identified strategies to address:

- Low dissolved oxygen (DO);
- Toxic Contamination;
- Pathogen Contamination;
- Floatable debris;
- The impact of these water quality problems and habitat degradation and loss on the health of the living resource, and
- Land use and development resulting in habitat loss and degradation of water quality.

Nitrogen has been identified as the primary pollutant contributing to low dissolved oxygen levels and hypoxia in the Sound, which results in the subsequent loss of designated uses. Total nitrogen concentrations from 2001 to 2013 at select north shore embayment sampling stations are shown on **Figure 5-7**. In general, it appears that higher total nitrogen concentrations were observed closer to shore, and that nitrogen levels decreased moving northward towards the Long Island Sound. It is interesting to note that based on the limited set of sampling stations evaluated, average annual total nitrogen levels were generally lower at the Port Jefferson Harbor Complex stations than at the other sample points; it is hypothesized that these lower values may result from the fact that much of the drainage area is served by a sanitary sewer system.

Low levels of oxygen threaten many forms of aquatic life in portions of the Sound's bottom waters, typically between July and September when water temperatures are high. Because of the numerous and significant impacts, management efforts have focused on reducing major nitrogen inputs to the Sound.

The LISS adopted a TMDL for nitrogen to improve dissolved oxygen levels. However, the TMDL did not consider the nitrogen contribution from



Average Annual Total Nitrogen Concentrations (mg/L) by Year at Selected Sampling Locations within North Shore Embayments

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-7

groundwater discharges. Working in partnership with NYSDEC, Suffolk County Department of Health Services (SCDHS) Office of Ecology developed the North Shore Embayments Watershed Management Plan

(Nelson, Pope and Vorhees, 2007) to reduce nitrogen loading to the LIS. The evaluation concluded that groundwater discharge is the most significant source of nitrogen to the Sound along the Suffolk County coastline; and the Plan identified a number of recommendations to reduce nitrogen loading.

5.1.2.2 Peconic Estuary

The Peconic Estuary includes 120 classified bays, harbors, embayments, and tributaries encompassing 158,000 acres of surface waters. New York State and the Peconic Estuary Program (PEP) established a nitrogen Total Maximum Daily Load (TMDL) in 2007 to identify the nitrogen loading reductions needed to comply with dissolved oxygen criteria, and pathogen TMDLs were established for 20 water bodies within the Estuary to address coliform levels. Nitrogen trends at SCDHS sampling stations in the Peconic Estuary are shown on **Figure 5-8.**

The brown tide blooms in the mid-1980s and 1990s have caused significant reductions in the once abundant bay scallop population and have reduced the number of eelgrass beds, an important estuarine nursery habitat for finfish and shellfish. Eelgrass beds are now limited to waters near Shelter Island and to the east. Eelgrass beds, at about 1,550 acres as of 2010, are not expanding, despite generally good water quality. Because of the decline in bay scallops, commercial shellfishing operations have turned to the hard clams; however, there is some evidence of a decline in the hard clam population as well.

Some of the declines in the finfish population of the Peconic Estuary are attributed to over-harvesting and habitat degradation. Habitat degradation (feeding and spawning areas) has resulted from shoreline hardening, fertilizer and pesticide use, commercial trawling, recreational boating, historic oyster harvesting, and dredging.

Low dissolved oxygen conditions are evident in the western estuary's tidal creeks including Meetinghouse Creek, Sawmill Creek and at the mouth of the Peconic River. Nevertheless, recent trend analyses completed for SCDHS indicate that dissolved oxygen levels are increasing at many locations throughout the Estuary.

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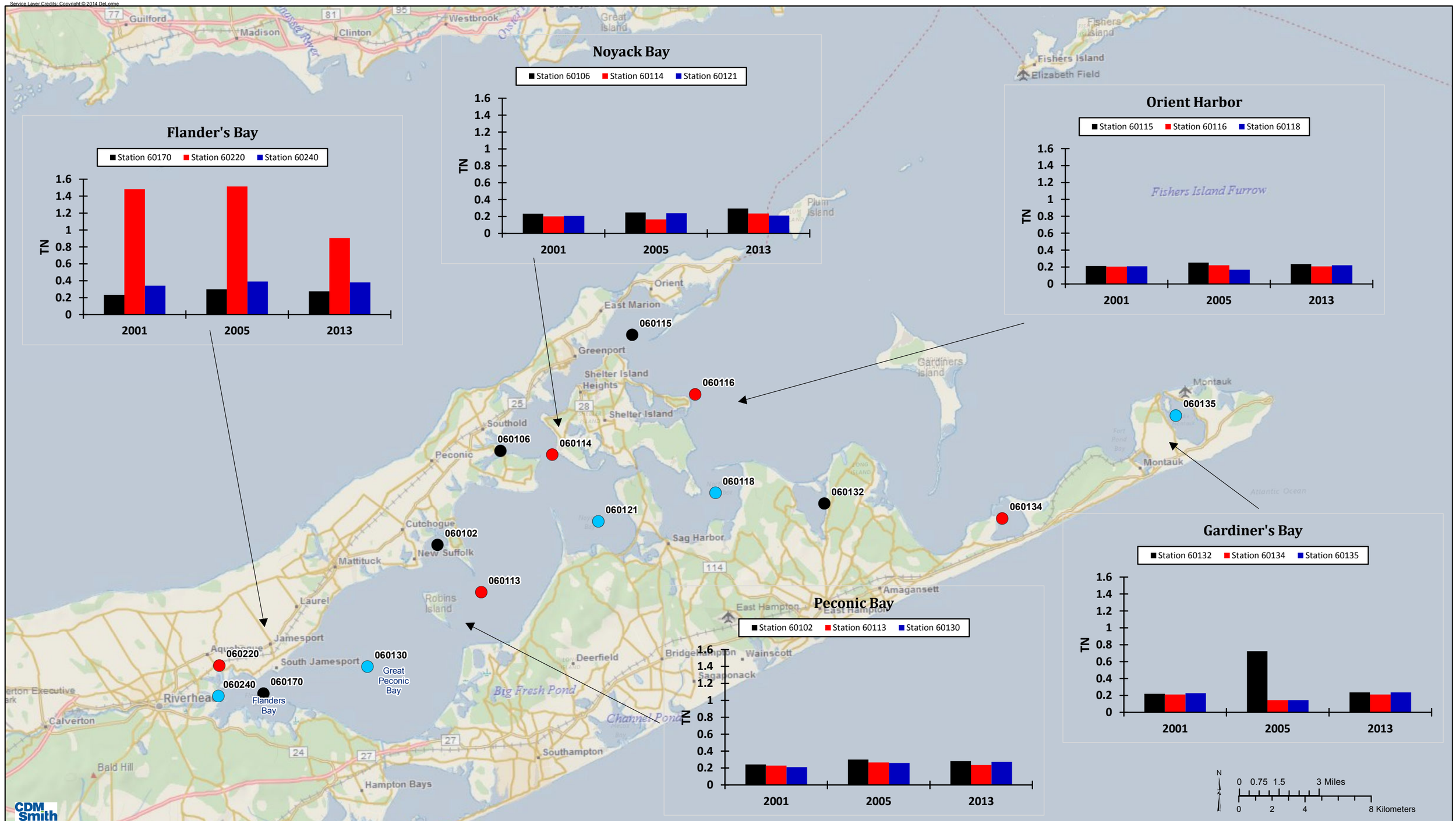


Average Annual Total Nitrogen Concentrations (mg/L) by Year at Selected Sampling Locations within Peconic Bay

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-8

In a recent study of ten tidal creeks in the Peconic Estuary, four had a benthic community structure that was representative of other New York-area nutrient rich waters such as Jamaica Bay and the New York Harbor. The primary source of nitrogen was identified as a sewage treatment plant (STP) discharge, or in the case of Meetinghouse Creek, a duck farm. The low oxygen, nutrient-rich waters were noted for causing the low benthic diversity of the creeks. In each case, the density of a single amphipod species (which can better tolerate such conditions) was very high.

Nitrogen reductions as a result of TMDL implementation progress have resulted in reduced algal blooms and chlorophyll a levels. The reduction in algal blooms and increased dissolved oxygen concentrations have benefited both the benthic and pelagic organisms.

Lower pathogen levels have been observed at approximately half of the stations monitored through the estuary, as a result of fewer duck farms, improved stormwater management, pet waste cleanup and establishment of pump-out stations for boaters.

There is widespread use of pesticides on farms in the watersheds that drain to the estuary. Pesticides and their metabolites have been detected in surface waters, sediments and groundwater, occasionally at levels exceeding State drinking water standards. Little is known about the impact of herbicide and pesticide "cocktails" on phytoplankton, eelgrass, shellfish, and other living resources of the estuary. Other potential contaminants to the Peconic Estuary and other Suffolk County coastal waters include endocrine disrupting chemicals contained in pharmaceuticals, flame retardants and personal care products.

The effort to acquire open space is being outpaced by development, with nearly 600 acres of agricultural land and open space being developed each year. The loss of open space results in an increase in impervious surface and offers the potential for increased runoff with the possibility of degraded water quality. However, the development of agricultural land for residential, commercial, or similar uses could potentially result in less risk to the estuary, if proper stormwater controls are implemented in conjunction with development.

Trends in Peconic Estuary water quality have been documented in **Peconic Estuary Water Quality Status and Trends** (Cameron Engineering & Associates, LLP, 2012). **Table 5-8** summarizes water quality trends since the Comprehensive Conservation and Management Plan was adopted in 2001, indicating improvement in many water quality indicators.

Table 5-8 Changes in Water Quality Post CCMP

Parameter	Result	Trend
A.Anophagefferens	Consistently lower	Improved
Chlorophyll a	Generally lower	Improved
Dissolved oxygen	Generally higher or much higher	Improved
Fecal coliform	Generally decreasing	Improved
Nitrate and Nitrite	Generally higher	Declined
Total nitrogen	Generally lower	Improved in some areas, but some areas are higher post-CCMP
Organic nitrogen	Similar or slightly lower	Slightly improved
Total phosphorus	Generally much lower	Improved
Dissolved organic nitrogen	Similar or slightly lower	Slightly improved

Note: Peconic Estuary Water Quality Status and Trends, 2012, Cameron Engineering and Associates, LLP

5.1.2.3 South Shore Estuary Reserve and Southern Coastal Waters

Impairments of the south shore waters result from pathogens from urban/stormwater runoff, and nitrogen from on-site wastewater treatment systems and urban/stormwater runoff. Although the shallow bays of the Reserve are generally well mixed, which enables reaeration and reduces oxygen depletion, low oxygen levels are typical along the northern margins of the bays and in the tributary mouths. Excess nutrients, in particular nitrogen, are responsible for eutrophication that triggers algal blooms that create low dissolved oxygen levels. The lack of oxygen threatens many forms of aquatic life in the Reserve. Fish kills have been noted in the Forge River, in response to hypoxic events believed to be triggered by excess nutrients.

The hard clam harvest in Great South Bay has fallen by more than 93 percent in the last 25 years. Shellfish, particularly the hard clams, provide important nutrient cycling and water filtration functions, and offer substantial recreational and commercial value as well.

The loss of salt marshes and other coastal habitats has reduced estuarine productivity and eliminated critical feeding and nursery habitat for finish, shellfish, shorebirds, and colonial water birds.

5.1.3 Contaminants of Emerging Concern

In addition to the pharmaceuticals and personal care products described in Section 3.1.1.6, microplastics are another emerging contaminant of emerging concern to surface water quality that are being studied by SCDHS. These plastic particles, usually made of polyethylene or polypropylene, and less than 5 millimeters in any one direction, are commonly found in personal care products such as toothpaste, creams, lotions and cosmetics. Microplastics, or microbeads have been in use by manufacturers of these products for approximately 10 years. Microplastics can be released to the environment by sewage treatment plants which discharge to surface waters. These tiny plastic particles can then adhere to toxic chemicals such as poly aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), etc. and bioaccumulate in animals upon ingestion. There are many alternatives available to manufacturers including rice, seeds, salt, sugar, bark, cornmeal, oats and shells. Microbeads have been banned in some states and several major manufacturers have agreed to phase out their use.

5.1.4 Summary

Non-point source contributions of nutrients, pathogens and other contaminants have been identified as the primary cause of surface water quality impairments in Suffolk County. Groundwater discharge is one primary source of nutrient loading to fresh and coastal resources. Management actions implemented to reduce nutrient and contaminant loads to groundwater within the areas contributing to the County's surface water features will reduce these non-point source loads to the surface waters. Based on estimated travel time from the water table to surface water discharge, it may take years for the benefits of improved water quality to be fully realized.

5.2 Goals and Objectives

Working together with the SCDHS, Suffolk County Water Authority (SCWA), and the Suffolk County Comprehensive Water Resources Management Plan Steering Committee, five surface water management goals were identified, along with more detailed and measurable objectives. These goals and objectives were developed to protect and improve surface water quality in the coming years, recognizing that maintenance of these invaluable resources is vital to the health and economic well-being of Suffolk County residents. Achievement of some of these goals may not be fully realized within the next twenty years; however the recommendations presented in this document provide the structure needed to build upon the existing regulatory framework to safeguard the resource for future generations.

The goals and objectives are consistent with the policy declarations that are articulated in the Suffolk County Sanitary Code:

§760-701: " The designated best use of all groundwaters of Suffolk County is for public and private water supply, and of most surface waters for food production, bathing and recreation .... it is hereby declared to be the policy of the County of Suffolk to maintain its water resources as near to their natural condition of purity as reasonably possible for the safeguarding of the public health, and to that end, to require the use of all available practical methods of preventing and controlling water pollution from sewage, industrial and other wastes, toxic or hazardous materials, and stormwater runoff."

The surface water resource management goals and objectives that were developed based on surface water issues identified during this study are summarized on **Table 5-9**.

Table 5-9 Surface Water Management Goals and Objectives

Table 5-9
Surface Water Management Goals and Objectives

GOAL 1: Surface water quality should be in compliance with New York State ambient water quality standards and guidance values for surface waters, and support human health, aquatic life and recreational and aesthetic values in accordance with their best usage classifications.

OBJECTIVE: All surface water should be in compliance with New York State ambient water quality standards and guidance values that have been developed to protect human health, aquatic life, and recreational and aesthetic values in accordance with their best usage classifications.

GOAL 2: Groundwater nitrogen inputs to the County's surface waters should be reduced, consistent with the goals of the Long Island Sound Study (LISS), Peconic Estuary Program (PEP) and the South Shore Estuary Reserve (SSER) programs – that is to protect, preserve and restore the estuaries for long term sustainability of the resource and to support coastal resiliency.

OBJECTIVES:

1. The magnitude of nitrogen loads discharged to surface waters from groundwater baseflow and the relative contribution of nitrogen loads from groundwater baseflow should be defined.
2. Nitrogen loading in areas within the twenty-five year contributing area to surface water features should be reduced to support aquatic life and recreational and aesthetic values, accomplish LISS, PEP and SSER goals and support coastal resiliency.

GOAL 3: Ground and surface water nitrogen management plans and water quality management plans should be integrated to minimize the impacts of VOCs, pesticides, pathogens and inorganics to human health and the ecology of Suffolk County's wetlands and aquatic ecosystems.

Table 5- 9 (continued)
Surface Water Management Goals and Objectives

OBJECTIVES:

1 Groundwater impacts on surface waters should be defined.
2 Nitrogen loading reduction alternatives should be identified and prioritized based on effectiveness and cost effectiveness.
3 Nitrogen levels should be managed for compliance with established TMDLs.
4 The most cost-effective nitrogen loading reduction alternatives should be implemented, to the extent feasible and practical.

GOAL 4: Harmful algal blooms resulting from water quality impairments from groundwater and stormwater discharges should be identified and prevented, and monitored and managed to minimize impacts.

OBJECTIVES:

1. The role of groundwater impacts on harmful surface water blooms should be better defined.
2. Nitrogen loading in areas within the twenty-five year contributing area to surface water features should be reduced to the extent feasible and practical.

GOAL 5: Existing programs to monitor, prevent contamination of, and manage the County's surface water resources should continue to be strengthened to provide the information necessary to protect, preserve and restore the County's surface water features for long term sustainability.

OBJECTIVES:

1. Monitoring programs (e.g., surface water features to be monitored, monitoring stations, parameters and frequencies) should be identified and documented.
2. The data should be entered into a database developed to facilitate data review, identification of trends and water quality concerns, and the evaluation necessary to support management functions.
3. Existing tools (e.g., contributing area coverages) should continue to be maintained and updated and should be made available to water resource managers.

5.3 Recommendations

5.3.1 Introduction

Working together with project stakeholders, a variety of alternative approaches to protect surface waters from further contamination, to better understand the impacts of groundwater baseflow upon surface water quality, and to implement the additional studies needed to identify necessary targeted management plans have been identified. Due to the significant contribution of groundwater baseflow to these surface water features, these recommendations are generally consistent with the groundwater resource management recommendations described in Section 3; they include:

- Guidance to reduce the impacts of new development on surface water resources;
- Recommendations for structural and non-structural methods to reduce the impacts of existing developed areas on surface water quality;
- Establishment of a framework and programs to collect and evaluate the additional information needed to fully accomplish the resource protection goals articulated in this Plan, and
- An approach to engage County residents in resource protection.

Because there are many comprehensive surface water-body specific programs that have been underway for decades (e.g., Long Island Sound Study, Peconic Estuary Program), this study has not sought to duplicate those efforts. Instead, recommendations are more targeted at better understanding and mitigating the impacts of groundwater on surface water quality.

5.3.2 New Development

5.3.2.1 Recommendation for Open Space Preservation

As described in Section 3.3, it has been well documented that preservation of open space is the most effective means of protecting ground and surface water resources (USEPA, AWWA, Trust for Public Land). Studies throughout the country have established that open space preservation is also often the most cost-effective approach to protect water quality. Major cities such as New York and Boston purchased land in their water supply source areas over a century ago, to protect the resource for future generations. Recent research has confirmed the foresight of earlier generations, concluding that "allowing water quality to degrade, in addition to threatening public health, increases treatment and capital costs" (AWWA, 2004).

Water quality data collected by SCDHS and the County's water suppliers and evaluations relating surface water quality to land use within a stream's contributing area also confirm that groundwater and surface water quality downgradient of areas of open space in Suffolk County (Task 5.1 and 5.2 memoranda) does not exhibit the levels of contamination evident downgradient of commercial, industrial, residential or agricultural land uses. Because contaminants of concern such as nitrates, VOCs and pesticides are not used, stored or disposed of in protected open space areas, the potential to contaminate downgradient resources is significantly reduced, or even eliminated.

From a national perspective, the costs and benefits of open space preservation have been considered in a variety of different ways. Because there are many societal benefits associated with open space preservation, the techniques used to assess the costs and benefits consider a much broader range of criteria than water quality protection. Some researchers have concluded that it is not possible or appropriate to attempt to assign a 'cost' to the non-tangible benefits afforded by open space, which can be characterized instead as "invaluable."

As described previously in Section 3, one approach is to conduct a fiscal impact analysis that compares the cost of providing community services and the tax revenue associated with properties of different land use types. For example, an American Farmland Trust summary of 83 studies completed around the country concluded that the median cost of providing community services to a property per tax dollar raised by that property was:

- $0.27 for commercial/industrial developments;
- $0.36 for farm/forest land and
- $1.15 for residential development.

That assessment documented that the cost of providing services such as schools, roads, police and fire protection, etc. to a property developed for residential use was greater than the tax revenue provided by that property, while the cost of providing community services to land maintained as farmland or forest was only about one third of the tax revenue that a community could expect to collect. This type of analysis does not consider secondary or long-term impacts however (e.g., that commercial/industrial development often instigates residential development or that the presence of open space can increase surrounding property values). A 2010 report by the New York State Office of the Comptroller reports that even if a municipality purchases development or full ownership rights of a property, on a long term

pay-back period of 15 years or longer, the municipalities realized net fiscal benefits, as a result of the maintenance of ecosystem services and limiting the growth of the demand for services.

Over the past six decades, Suffolk County has purchased more than 53,000 acres of land at a cost of more than $1 billion to preserve important environmental resources and significant ecological areas including wetlands, river corridors and upland habitat in addition to land for active recreation, hamlet parks, and historic and/or cultural uses. The County has also acquired the rights to 10,000 acres of productive farmland. The result of this preservation is a permanent benefit to the health and quality of life for current and future generations of Suffolk County residents. As of 2013, more than 162,500 acres, or more than 25 percent of the County has been preserved. Overall, 38,000 acres of the 55,000 Central Pine Barrens core preservation area is now in public ownership (NYS Office of Comptroller). Based on the land use information provided by the Suffolk County Department of Economic Development and Planning (2014), it is estimated that there are approximately 35,000 acres of vacant land available for development throughout Suffolk County, with the majority of that acreage located in the five eastern towns and Brookhaven. While properties purchased in the past often exceeded 100 acres, most vacant parcels that remain available today are considerably smaller. In addition to County programs, Town-specific programs such as the Community Preservation Fund, have been successful in preserving thousands of additional acres.

Continued open space preservation is recommended from a water resource protection perspective, as the most effective way to achieve the groundwater and surface water resource management goals.

The enabling legislation for the new Drinking Water Protection Program requires that a property being proposed for acquisition must meet at least one of the following five criteria:

1. Freshwater/tidal wetlands and buffer lands for same
2. Lands within the watershed of a coastal stream as determined by a reasonable planning or hydrological study
3. Any tract of land located fully or partially within a statutorily designated Special Groundwater Protection Area
4. Lands determined by the County Department of Planning to be necessary for maintaining the quality of surface or groundwater in Suffolk County

5. Lands identified by the South Shore Estuary Reserve (SSER), Peconic Estuary Program (PEP), and/or the Long Island Sound Comprehensive Conservation and Management Plan (LICMP) as needed to protect coastal water resources

The cost of historic land purchases for open space preservation programs has averaged about $17,700/acre. It is anticipated that future per-acre costs will be somewhat greater, as the value of the more limited land available for development increases, the size of the remaining vacant parcels decreases, and because a number of the properties initially purchased were in the Central Pine Barrens with more limited development potential. While preservation of open space is the most effective way to protect ground and surface water quality from a water resources management perspective, it is acknowledged that many other interests also require consideration. Therefore, open space preservation must continue to be considered within a comprehensive planning framework.

Land acquisitions and preservation continue to be accomplished in Suffolk County under the auspices of a variety of programs that have different goals and objectives. Recently, the County undertook an effort to review, update and consolidate prior disparate Open Space "Master Lists" that included properties proposed for acquisition that were identified as important for open space preservation. The 2012 Comprehensive Master List Update identified 86 proposed open space sites and assemblages, totaling 4,650 acres that are recommended for future open space acquisitions.

In 2013, the Suffolk County Legislature amended Chapter 1070 of the Code of Suffolk County for Real Estate Appraisal, Acquisition and Disposition Legislation to streamline the acquisition of open space, farmland and active recreation parcels. The procedure, known as "Triple A" (referencing the appraisal, acquisition and approval steps of the planning process) provides more information to lawmakers earlier in the acquisition process, and allows for the prioritization of properties to be acquired by Suffolk County through the Drinking Water Protection Program, which funds open space farmland and active recreation acquisitions.

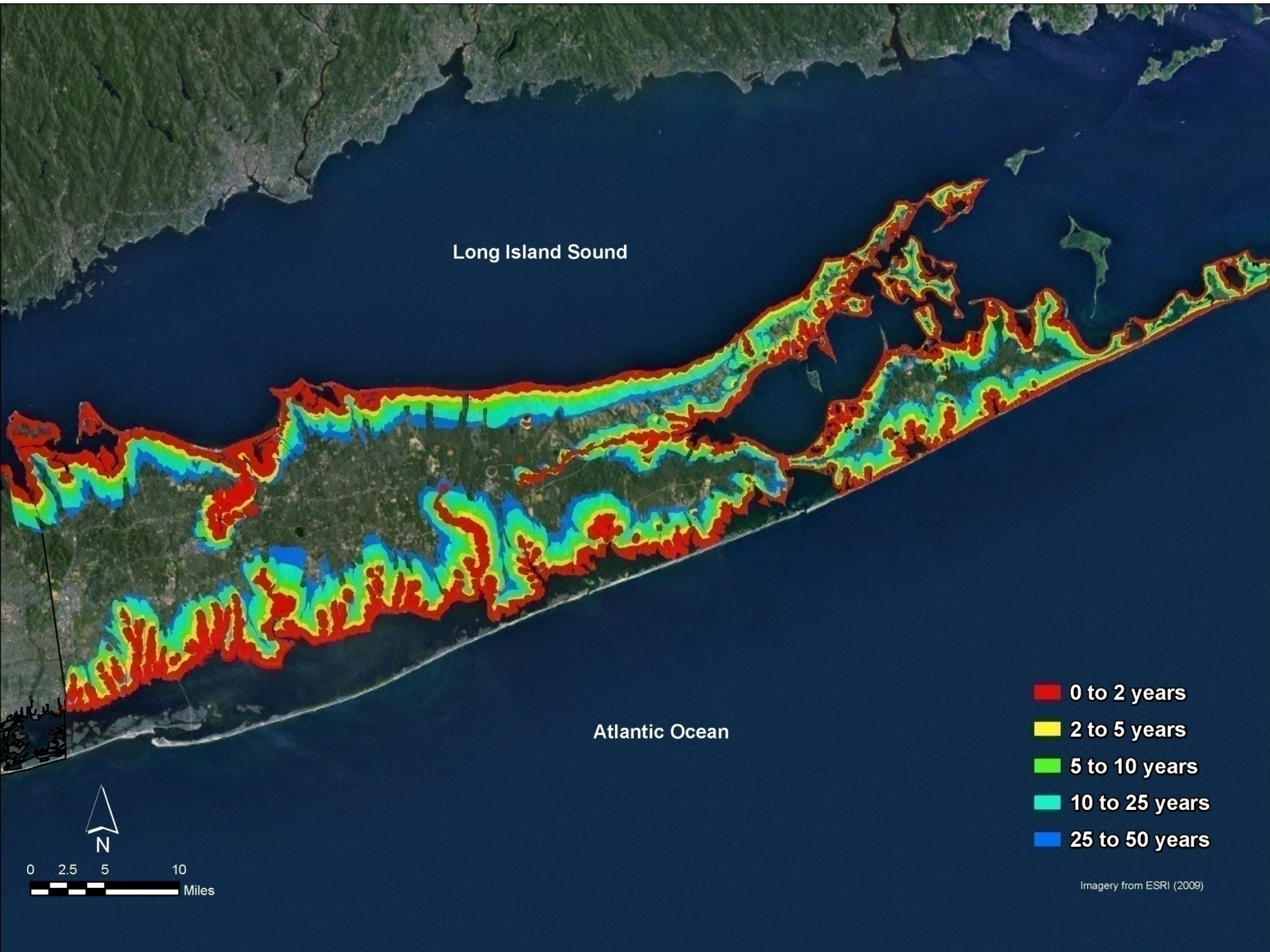
The procedural refinement builds on work by the Department of Economic Development and Planning to evaluate and rank all properties on the County's four master lists. Taken together, the new procedural tool and the Comprehensive Master List will be used to determine the best use of limited funds based on objective criteria, including environmental rating, appraisal value, recommendations from planning staff and available funding.

Continued open space preservation is recommended from a water resource protection perspective, as the most effective way to achieve surface water resource management goals. Parcels are currently selected based upon the policies articulated in the Suffolk County Department of Planning's Open Space Acquisition Policy Plan for Suffolk County. The Planning Department has identified the New Drinking Water Protection Program, the Multifaceted Land Preservation Program, the Save Open Space Program and the Environmental Legacy Program as the most significant County open space programs moving forward, given available funding.

Within this overall planning context articulated by the Department of Economic Development and Planning, it is further recommended that parcels within the 25 year contributing area to surface water features be specifically identified and assigned a high priority for purchase, particularly when there is a significant opportunity to protect and preserve existing ground or surface water quality. The areas contributing groundwater baseflow to the County's surface water features have been mapped as shown on **Figure 5-9**, and were documented on a stream-specific basis as part of Task 15 (as noted, surface drainage areas may extend beyond the areas contributing groundwater baseflow). These mappings will help to assess property compliance with Department of Economic Development and Planning criteria 2 and 4, above. Based on land use information from there are over tens of thousands of vacant parcels (or parts of parcels) located within the 25 year contributing area to surface water features, as shown on **Figure 5-10.**

Land acquisitions and preservation continue to be accomplished in Suffolk County under the auspices of a variety of programs that have different goals and objectives. Recently, the County undertook an effort to review, update and consolidate prior disparate Open Space "Master Lists" that included properties proposed for acquisition that were identified as important for open space preservation. The 2012 Comprehensive Master List Update identified 86 proposed open space sites and assemblages, totaling 4,650 acres that are recommended for future open space acquisitions.

In 2013, the Suffolk County Legislature amended Chapter 1070 of the Code of Suffolk County for Real Estate Appraisal, Acquisition and Disposition Legislation to streamline the acquisition of open space, farmland and active recreation parcels. The procedure, known as "Triple A" (referencing the appraisal, acquisition and approval steps of the planning process) provides more information to lawmakers earlier in the acquisition process, and allows for the prioritization of properties to be acquired by Suffolk County through the Drinking Water Protection Program, which funds open space farmland and active recreation acquisitions.


Long Island Sound
Atlantic Ocean
0 to 2 years
2 to 5 years
5 to 10 years
10 to 25 years
25 to 50 years
N
0 2.5 5 10
Miles
Imagery from ESRI (2009)

Suffolk County Comprehensive Water Resources Management Plan
Vacant Land within the 25 Year Baseflow Contributing Area to Surface Waters

Figure 5-10

The procedural refinement builds on work by the Department of Economic Development and Planning to evaluate and rank all properties on the County's four master lists. Taken together, the new procedural tool and the Comprehensive Master List will be used to determine the best use of limited funds based on objective criteria, including environmental rating, appraisal value, recommendations from planning staff and available funding.

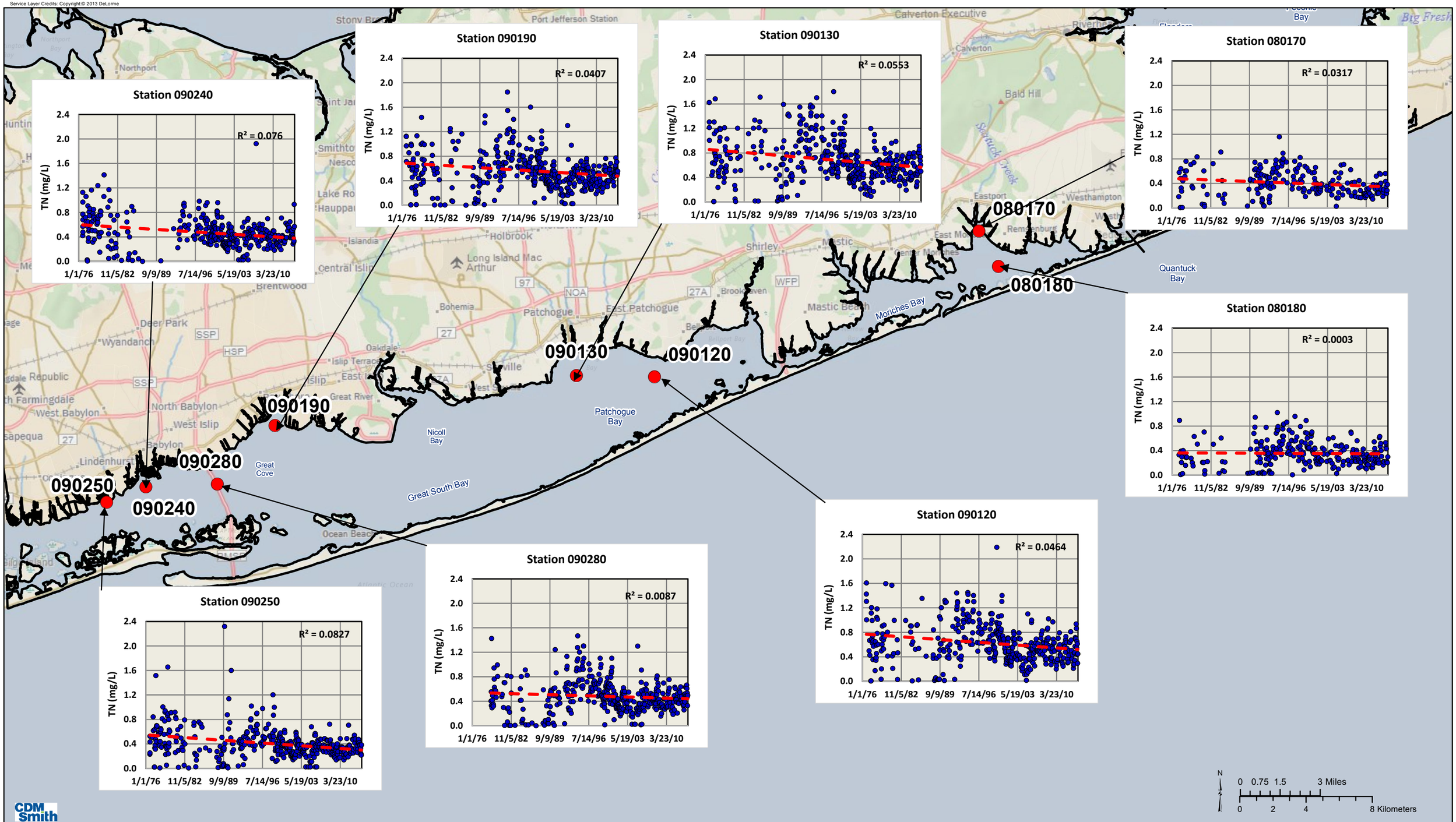
While preservation of open space is the most effective way to protect ground and surface water quality from a water resources management perspective, it is acknowledged that many other interests also required consideration. Therefore, open space preservation must continue to be considered within a comprehensive planning framework.

5.3.2.2 Recommendations for New Developments

The North Shore Embayment Watershed Management Plan (SCDHS, 2007) reported that groundwater was the greatest contributor of nitrogen to the embayments within the study area; it appears that this is the case in coastal waters along most of the north shore. Sanitary wastewater management is the most important factor affecting nitrate levels in groundwater throughout most of the County. Due to the significant contribution of groundwater baseflow to the County's surface waters, improved sanitary wastewater management practices can also affect nitrate levels in surface waters.

As described in Section 3, in 1980, Suffolk County amended Article 6 of the Suffolk County Sanitary Code to specifically address the impacts of sanitary wastewater on the County's groundwater. On-site sanitary wastewater disposal was limited to parcels that were either one or one-half acre in size, depending in which Groundwater Management Zones the parcel was located.

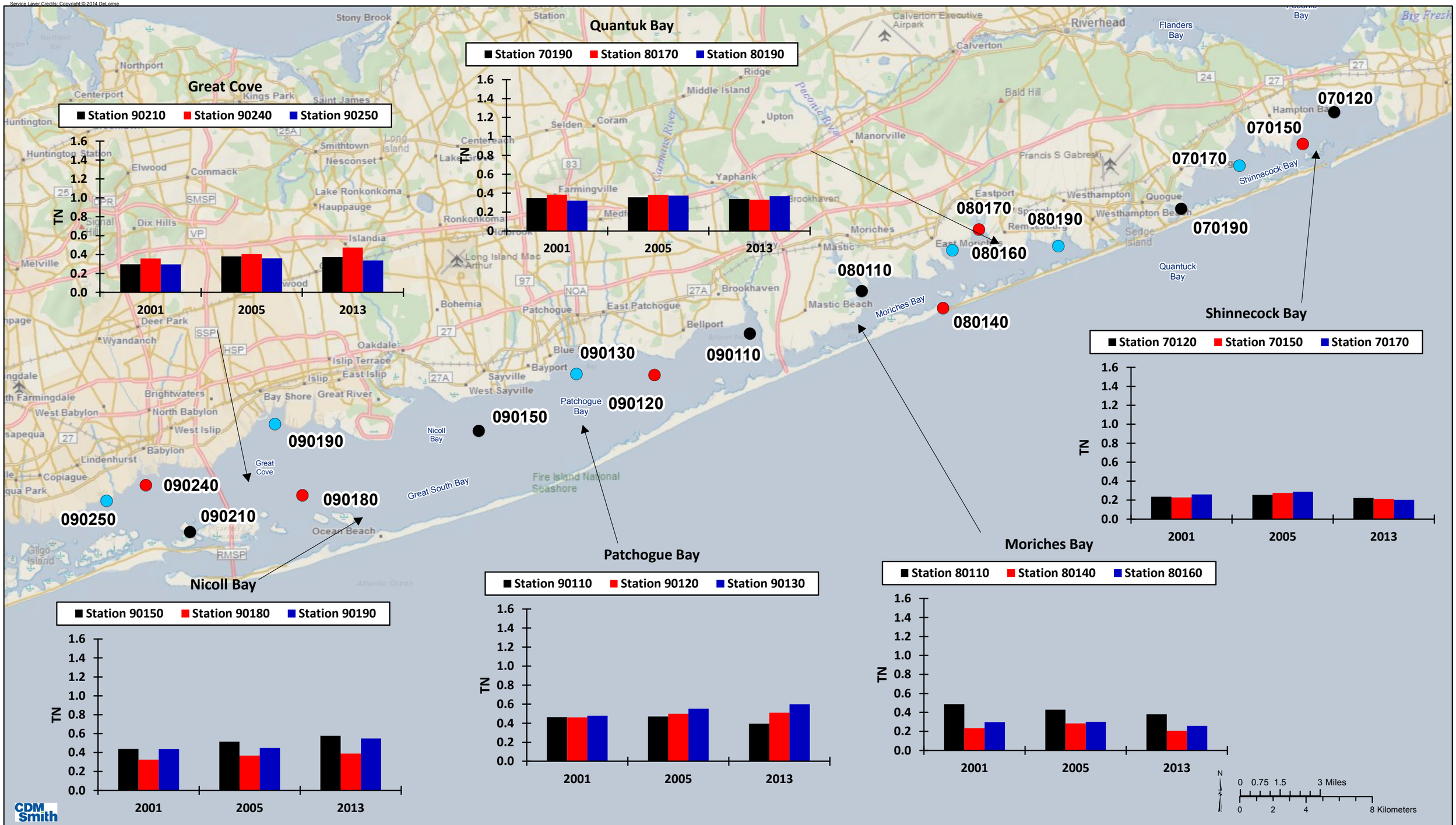
However, many existing residences with on-site wastewater disposal systems had already been constructed on smaller parcels prior to 1980. Data provided by the Suffolk County Planning Department (SCPD) show that almost 53 percent of the unsewered residential parcels in the County are less than or equal to one half acre. Almost three quarters of the residential properties in Babylon are less than or equal to one quarter acre; groundwater contamination resulting from the on-site septic systems prompted the implementation of the Southwest Sewer District in the 1970s. Groundwater data collected by both SCDHS and the Nassau County Department of Public Works (2005) has confirmed that sanitary sewering programs have successfully reduced groundwater nitrate levels in the sewered areas. Nitrogen trends in the Great South Bay south of the SWSD are shown on **Figures 5-11** and **5-12**.



Total Nitrogen Concentrations & Trends in South Shore Estuary Sampling Stations, 1976 - 2013

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-11



Average Annual Total Nitrogen Concentrations (mg/L) by Year at Selected Sampling Locations within South Shore Estuary

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-12

The observed nitrogen levels in groundwater, which have continued to increase since the 1987 Comp Plan was prepared, result from a combination of the Article 6-compliant and the older non-compliant parcels. Building upon the work documented in the 1987 Comp Plan, several evaluations of parcel size and downgradient groundwater nitrogen concentration have been conducted which demonstrate that nitrate levels in groundwater increase with increasing density. However, because existing water quality data and land use information are not always straightforward to interpret, given the variation in land use, density, household size and nitrogen loading in any given area of interest, a modeling assessment of the impacts of uniform residential densities on groundwater nitrogen levels was completed, as described in Section 3.

The results were consistent with observed data throughout the County, with simulated nitrate concentrations resulting from discharge of sanitary wastewater via on-site septic systems in areas with ¼ acre zoning exceeding 10 mg/L in the shallow aquifer, and simulated nitrate levels resulting from on-site wastewater disposal on 1 acre properties remaining below 4 mg/L; nitrate levels in groundwater downgradient of properties where lawns have been fertilized range from 4 to 6 mg/L.

The results assumed an initial background nitrate concentration of zero in the groundwater, and illustrate that it can take years for nitrogen introduced at the water table to travel through the system to discharge to a supply well. Similarly, it can take years or decades for nitrogen introduced to the shallow groundwater to travel to a downstream surface water discharge point. Based upon a wide variety of factors, including pH, dissolved oxygen, benthic conditions, etc., transformation/uptake may affect the magnitude of nitrate that is actually discharged to the overlying surface water body.

Building upon the body of SCDHS work over the past decades, the evaluations relating land use to observed nitrate levels completed as part of this study (e.g., documented in task memoranda 5.1, 5.2, and 18), review of density/nitrate relationships established elsewhere in the country, and these most recent model results, it is recommended that Article 6 be modified to also require one acre density in hydrogeologic zones IV and VIII to protect surface water quality, unless provision is made for a higher level of treatment than is provided by a typical on-site wastewater treatment system, or, the development rights from existing undeveloped open space controlled by the developer are transferred, in accordance with standards adopted by the SCDHS in 1995. While nitrate concentrations resulting from an area of uniform ½ acre density are simulated to be close to 6 mg/L, development occurs within the framework of properties that have already been developed; many pre-1980 developments include parcels that are less than ½ acre or even ¼ acre in size.

The recommended minimum of one acre zoning in unsewered areas of Hydrogeologic Zones IV and VIII will also reduce nitrogen loading to surface waters from groundwater baseflow. While this recommendation focuses upon nitrogen criteria, it was also developed in recognition of the fact that many other contaminants of potential concern can be introduced to the subsurface from on-site wastewater disposal.

Developments of increased density (in areas permitted by local zoning regulations) discharge to sewage treatment plants. Because most new sewage treatment plants discharge to groundwater, the SCDHS Office of Wastewater Management (OWM) reviews the proposed discharge location to minimize potential impacts on downgradient resources. Developments of increased density (in areas permitted by local zoning regulations) discharge to sewage treatment plants. Because most new sewage treatment plants discharge to groundwater, the SCDHS Office of Wastewater Management (OWM) reviews the proposed discharge location to minimize potential impacts on downgradient resources, including public supply wells. Current SCDHS guidance for siting new or expanded STPs advises that siting of STPs within the zero to twenty-five year contributing area to sensitive surface waters **(as shown by Figure 5-9)** should be minimized to the extent feasible; if an STP is located within this zone, an advanced treatment process shall be provided (SCDHS, 2014).

5.3.3 Existing Developed Areas

While the preceding pages outlined an approach to protect surface waters from the impacts of additional development, the following recommendations were developed to respond to the impacts of the 1.5 million existing residents of the watershed.

5.3.3.1 Recommendations to Evaluate Sanitary Wastewater Treatment and Disposal Options

Sanitary wastewater disposal and fertilization practices are the two largest sources of nitrate to the aquifer system. As described in Section 3, unsewered areas where property sizes are less than an acre are likely to cause groundwater nitrogen concentrations that exceed target levels of 6 mg/L. In areas where property sizes are ¼ acre or smaller, groundwater levels are predicted to exceed 10 mg/L, as has been observed in several SCDHS studies.

Recognizing the impact that densely developed unsewered areas has on surface water quality, Suffolk County has already begun to develop projects to reduce the impacts of sanitary wastewater disposal on the environment. The County is prioritizing and addressing wastewater management in developed

areas through a series of projects identified by the Suffolk County Sewer District/Wastewater Treatment Task Force, including:

- Sewer District Capacity Study for seven unsewered areas (CP 8185)
- Expanding districts of four existing sewered areas (CP 8185)
- Expansion of Southwest Sewer District No. 3 (CP 8139)
- Expansion of Kings Park Sewer District

In addition, SCDHS is conducting a study of alternative on-site sewage system technologies that could reliably reduce nitrogen levels to 10 mg/L for individual residences or smaller sub-divisions, to identify alternative systems that could provide viable, low cost systems to protect public health. This study will include monitoring those most promising alternative technologies to collect data establishing system effectiveness, in an effort to identify more cost-effective alternatives to centralized sewage collection and treatment.

Consistent with the recommendations for groundwater resource protection presented in Section 3, it is recommended that Suffolk County complete the studies identified above, and utilize the results along with the GIS-mappings of areas contributing recharge to surface waters and relationships between density and nitrate levels developed during this study, in a County-wide wastewater planning study that considers density, conventional wastewater collection and treatment systems, alternative treatment systems, alternative on-site systems, and operational and maintenance guidelines for existing on-site systems. The County-wide evaluation should identify any additional high priority areas within the County where a new approach to wastewater treatment and disposal is required to achieve surface water quality criteria for nitrates. The proposed approach to implementing this program is described in detail in Section 8 of this Plan.

5.3.3.2 Recommendations with Respect to Nitrate Loads from Fertilization

Suffolk County has developed and is implementing a plan to reduce the impacts of fertilizer on ground and surface water features. The Suffolk County Legislature established a goal of reducing fertilization in residential areas by 10 to 25 percent, and passed Local Law 41-2007 in 2007 to reduce nitrogen pollution by reducing the use of fertilizer throughout the County. The law notes that *"the quality of our water should be considered a higher priority than the aesthetics of lawns, and that high maintenance lawns require more nitrogen and are more likely to leach excess nitrogen, so that high maintenance lawns should be discouraged."*

The Plan mandated by the widely acclaimed legislation includes the following components:

- A Countywide ban on fertilizer application between November 1 and April 1, to avoid applying fertilizer to frozen ground;
- A ban on fertilization of County properties, except for golf courses, athletic fields, the Suffolk County farm, and new turf establishment at public works properties;
- Codifying the County's Organic Parks Maintenance Plan, limiting fertilizer application to 3 pounds of nitrogen for each 1,000 square feet of golf course;
- Use of Best Management Practices (BMPs) at the County Farm;
- Expansion of educational programs to encourage reduction of fertilization rates and increase the use of slow-release fertilizers;
- Establishment of an inter-active website for residents to establish fertilization needs;
- Requirement that licensed landscapers (approximately 1,200 in Suffolk County) complete a turf management course;
- Requirement that retail establishments selling fertilizers post signs, and provide educational materials describing proper fertilization rates and practices;
- Preparation of annual reports summarizing the amount and types of fertilizers sold by the County; and
- Beginning in 2014, preparation of reports at five year intervals summarizing the effectiveness of this Law.

In July 2010, New York State adopted the Dishwasher Detergent and Nutrient Runoff Law to reduce phosphorus loading to the state's ground and surface waters. Reducing the amount of phosphorus that is released to the environment is much more effective and cost-effective than collecting and treating contaminated stormwater, or implementing treatment processes to reduce phosphorus levels in sanitary wastewater. Beginning in August, 2010, the sale of newly stocked phosphorus-containing dishwasher detergent for residential use was prohibited, and the sale of dishwasher detergent containing phosphorus for commercial use will be prohibited beginning July 2013.

Beginning on January 1, 2012:

- Lawn fertilizers containing phosphorus were prohibited, except for establishment of new lawns, or if data confirms that phosphorus is required;
- Application of lawn fertilizers on impervious surfaces was prohibited;
- Application of lawn fertilizers was prohibited within 20 feet of a surface water body except in cases where a vegetative buffer of ten feet or more exists, or special application techniques are employed;
- Application of fertilizer between December 1 and April 1 was prohibited state-wide.

The state-wide law does not affect agricultural or garden fertilization practices. However, to date, over 300 local vegetable, nursery, sod, and fruit farms and vineyards have participated in the tiered strategy of the Agricultural Environmental Management (AEM) Program being run by Suffolk County and Cornell Cooperative Extension of Suffolk County.

Over sixty farm demonstration projects have been implemented in cooperation with Cornell Cooperative Extension's agricultural research specialists and Cornell University to evaluate the costs and benefits of using alternative nutrient management practices to minimize groundwater quality while maintaining crop viability, and 25 sweet corn and 22 potato farms have participated in Controlled Release Nitrogen Fertilizer demonstration projects. Resulting improvements to groundwater quality in terms of reduced nutrient levels have not yet been demonstrated; as conservation plans and BMPs are implemented, groundwater quality data should be collected to assess the effectiveness of the program in reducing nutrient levels.

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Suffolk County continues to work with Cornell University and Cornell Cooperative Extension to reduce nitrogen loads from fertilizer. One of the activities, the golf course challenge, is seeking to implement best management practices at East End golf courses, so that nitrate levels in downgradient groundwater are maintained at less than 2 mg/L. The County should evaluate the effectiveness of the fertilizer BMPs and based upon the results, consider working together with golf courses throughout the County for wider implementation.

Finally, Suffolk County is evaluating and updating the 2004 Suffolk County Agricultural Stewardship Program, to address current needs of the farming community and the County, including the need to protect the quality of the County's water resources, soil and natural habitats. The collaborative effort includes participants from the farming community as well as Suffolk County Department of Economic Development and Planning, SCDHS, the Peconic Estuary Program (PEP), Cornell Cooperative Extension of Suffolk County, SCWA, the Suffolk County Soil and Water Conservation District, NYSDEC, and the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The updated Program describes the need for collaborative cooperation to reduce the nutrient loads from agriculture to the County's ground and surface water resources while maintaining a strong, viable agricultural industry. The primary goal of the program is to increase Suffolk County farmer completion of Tier III in the AEM program to at least 90 percent. The program will encourage participation by funding research to develop BMPs to reduce nitrogen impacts, by providing educational programs to encourage implementation of nitrogen reducing BMPs, and providing funding to continue to improve BMPs to reduce nitrogen impacts.

Farmers that participate in County preservation programs, purchase of development rights, and other programs should be encouraged to participate, by agreement, in the AEM program and adopt best management practices (BMPs) to minimize or prevent contamination from fertilizers, considering use of improved timing of fertilizer application, choice of product (e.g., slow-release formulations) and new technologies to limit fertilizer leaching and run-off.

5.3.4 Recommendations to Address Volatile Organic Compound Contamination

Review of water quality data has shown that the highest levels of VOCs are found in streams in the western part of the County with industrial, commercial, transportation or institutional uses within their contributing areas. VOCs were detected less frequently in streams with significant undeveloped areas within their contributing areas. Nevertheless, low levels of VOCs were widely detected in groundwater throughout the County, indicating a more widespread low-level source of the observed contaminants, such as residential septic systems. In general, as would be expected based upon their properties, VOCs have a lower rate of detection, and lower reported concentrations, in surface waters than in groundwater. Recommendations presented here are therefore focused primarily on VOC inputs to groundwater; as most fresh surface waters continue to derive most of their baseflow from groundwater; reducing VOC levels in shallow groundwater is also expected to reduce VOC detections and concentrations in downgradient surface waters, with the possible exception of MTBE. Since 2004, MTBE, the most frequently detected VOC in Suffolk County surface waters, has not been used as an additive in gasoline sold in New York State; this significant reduction in MTBE use should also result in concomitant reductions in MTBE detections in surface waters; SCDHS data confirms that MTBE contamination has declined since 2005.

It is not known whether the observed VOC contamination in the streams originates from groundwater baseflow, or from direct stormwater runoff. Given the significant contribution of groundwater to stream flow, even in the sewered southwestern part of the County, it is presumed that groundwater is the most significant source. Reductions in VOC levels in groundwater would therefore result in lower VOC levels in surface waters as well. Before targeted recommendations to reduce the release of VOCs to the County's groundwaters can be developed, a better understanding of the potential sources of the observed contamination is required. SCDHS Office of Pollution Control (OPC) has developed a scope of work for a capital project to evaluate existing industry in the County using or storing hazardous materials, including the volume of materials stored, location of storage, potential for release and assessment of contaminant fate and transport. The contaminant inventory and characterization should form the basis for a revised facility ranking system, and identification of potential new regulations, storage requirements, operator training requirements or inspection/enforcement procedures to improve the effectiveness of OPC programs, and to reduce the further release of toxic contaminants, including VOCs, to the environment.

It is recommended that Suffolk County implement this program as a priority.

As an additional task to that program, the SCDHS should also further explore the role that residential areas have in terms of VOC contamination. If residential areas are determined to be a significant source of the observed low level VOC contamination in groundwater, SCDHS should respond by:

- Incorporating information on the types of household products that may contain VOCs and preferred alternatives into the education and outreach program described below;
- Potentially regulating the use and disposal of specific contaminants of concern (e.g., household cleaners, etc.), and
- Incorporating relevant information on appropriate use and disposal of household products using VOCs into the public education and outreach and school curricula development programs described in the Task 10.2/10.3 memorandum and Section 4.1.5 below.

In general, reduced sources of VOCs in the watershed will result in reduced levels in surface waters.

5.3.5 Recommendations to Address Pesticides

Pesticide contamination of Suffolk County surface waters is primarily associated with agriculture on the East End. Multiple programs are in place to help reduce non-point pesticide sources from agriculture; however, the overuse of pesticides on agricultural lands continues to be one of the most significant sources of contamination in agricultural areas. Programs such as the AEM program described above in Section 3.3.3.2 are being implemented to address these issues. The AEM Program is a state-wide voluntary, incentive based process that helps farmers to make common sense decisions to achieve their business objectives while protecting and conserving natural resources and groundwater quality. Through the AEM program, the Suffolk County Soil and Water Conservation District, partners at Cornell Cooperative Extension of Suffolk County (CCE), NRCS and private sector planners and crop consultants provide on-farm environmental assessments, conservation planning and technical services.

It is recommended that farmers that participate in County preservation programs, purchase of development rights, and other programs should be encouraged to participate, by agreement, in the AEM program and adopt best management practices (BMPs) to minimize or prevent contamination from pesticides, considering integrated pest management or products that are safer

alternatives to the pesticides that have been observed to impact the County's groundwater.

Suffolk County and Cornell Cooperative Extension should continue to work closely with the agricultural community to identify crop-specific practices (e.g., integrated pest management) or products that provide safer alternatives to the pesticides that have been observed to impact the County's groundwater. It would be useful if monitoring well installation and groundwater sampling and analysis were also included to help determine the effectiveness of BMPs in reducing ground and surface water contamination. As BMPs are implemented, groundwater quality data would assess the effectiveness of the program in reducing pesticide levels. It is recommended that the agricultural community, Suffolk County and Cornell Cooperative Extension work together to install monitoring wells, and conduct targeted sampling, analysis and reporting to help assess the effectiveness of BMPs in reducing ground and surface water contamination from pesticide application.

Suffolk County is evaluating and updating the 2004 Suffolk County Agricultural Stewardship Program, to address current needs of the farming community and the County, including the need to protect the quality of the County's water resources, soil and natural habitats. The collaborative effort includes participants from the farming community as well as Suffolk County Department of Economic Development and Planning, SCDHS, the Peconic Estuary Program (PEP), Cornell Cooperative Extension of Suffolk County, SCWA, the Suffolk County Soil and Water Conservation District, NYSDEC, and the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The updated Program describes the need for collaborative cooperation to reduce pesticide loading from agriculture to the County's ground and surface water resources while maintaining a strong, viable agricultural industry. The primary goal of the program is to increase Suffolk County farmer completion of Tier III in the AEM program to at least 90 percent. The program will encourage participation by funding research to develop BMPs to reduce pesticide impacts, by providing educational programs to encourage implementation of pesticide reducing BMPs, and providing funding to continue to improve BMPs to reduce pesticide impacts.

As part of the Agricultural Stewardship Program, fifteen orchards are currently implementing integrated pest management plans.

Suffolk County and Cornell Cooperative Extension should continue to work closely with the agricultural community to identify crop-specific practices (e.g., integrated pest management) or products that provide safer alternatives to the pesticides that have been observed to impact the County's surface waters.

5.3.6 Recommendations to Address Pharmaceuticals and Personal Care Products

New information is published nearly every day on the detection, fate and transport characteristics, or potential effects of one or another of the PPCPs. It is recommended that SCDHS continue to monitor the literature and regulatory initiatives concerning PPCPs, including research on:

- Development of methods (e.g., analytical techniques) to identify PPCPs at the very low concentrations expected in the environment, development of efficient methodologies to analyze mixtures of compounds, development of cost-effective analytical methods;
- Identification of priority or target compounds that can be used for rapid/cost effective screening for PPCPs;
- Fate of PPCPs in the environment (including subsurface environment/groundwater);
- Exposure;
- Effects of low levels of PPCPs on human health and the environment;
- Establishment of sensible analytical detection limits and treatment goals;
- Additive effects of PPCPs with similar modes of action, and finally
- Treatability.

It is just not possible to monitor for all of the contaminants of emerging concern (CECs), including PPCPs that could potentially be present in the environment, given that more than 88 million organic and inorganic chemicals have been registered with Chemical Abstracts Services, and thousands of new chemicals are listed each day. It should not be necessary to monitor for all of these parameters, however the subset of compounds with potential human-health impacts that ultimately should be monitored has not yet been identified. In addition, analytical methods to detect the extremely low levels of some PPCPs and their metabolites that may exist in the environment are not yet available. While analytical protocols to detect some PPCPs have been developed, cost effective methods to rapidly detect the presence of many of the other compounds that may be present have not.

SCDHS should continue to conduct targeted monitoring as summarized below:

- Increase the number of sample analyses available from the Public and Environmental Health Laboratory (PEHL) to analyze each sample from all community supply wells as part of annual facility inspections, as well as samples from non-community and the private drinking water wells;
- To the extent staffing permits, the PEHL should explore expansion of existing analytical methods to increase the number of PPCPs analyzed, particularly focusing on those already identified in our groundwater resource, summarized on Table 5-10 below.
- Continue targeted monitoring, focusing on wells downgradient of laundromats, hospitals and nursing homes, using a similar approach to the focused plan implemented for the Pesticides Monitoring Program.

Table 5-10 Recommended New Analytes for SCDHS PEHL

PCCP	Use
Codeine	Pain killer
Cotinine	Pain killer
Cis-Diltiazem	Antihypertensive
1,4-Dioxane	Personal care product contaminant
Erythromycin	Antibiotic
Hydrochlorothiazide	Diuretic
Meprobamate	Anti-anxiety agent
Metropolol	Antihypertensive
Naproxen	Anti-inflammatory
4-Nonylphenol	Surfactant, known estrogen disruptor
Nonylphenolpolyethoxylate (NPEO)	Surfactant
Paraxanthine	Stimulant
Phenolbarbital	Barbituate
Ranitidine	Inhibits stomach acid
Sulfamethoxazole	Antibiotic
Tramadol	Analgesic

While there have been significant advances in the number of compounds that can be measured, at increasingly lower detection limits, the approach to linking the detection of CECs to human health or ecological effects is not clear

cut. For example, pharmaceuticals ingested by mammals are often excreted as the unaltered parent compound to only a small degree and many pharmaceuticals, steroids, and biogenic and anthropogenic hormones are chemically changed by human or animal digestive tracts by formation of glucuronide or sulfate conjugates (Berg et al., 2007). Thus in addition to studying the parent compound, it is necessary to examine the metabolic by-products of these compounds. For example, gemfibrozil, a lipid regulating pharmaceutical, is excreted mostly as the glucuronide conjugate, with less than 2% excreted as unchanged gemfibrozil (RxList, 2014).

Considering the number of possible chemicals and their degradates that could be analyzed, our historical and current paradigms for evaluating occurrence, fate, and toxicity cannot keep pace with chemical development and commercialization, let alone regulatory evaluation. The objective of identifying all of the constituents and their degradation products that may be of concern in wastewater effluent is an impossible task.

With respect to monitoring for potential biological impacts, the use of biological surrogates has had a long history in protecting human health and, in fact the current risk assessment framework includes testing using in vivo animal models to extrapolate endpoints that can be translated to regulatory limits e.g., MCL for drinking water. However, with the number of chemicals and mixtures of chemicals and chemical transformation products, this approach is limited and high-throughput screening methods are being evaluated to provide information on the mechanisms of biological toxicity at a relatively small cost (Snyder, 2014).

Even with the limitations of extrapolation from a cellular response to human health outcomes, high throughput assays could provide a more comprehensive view of chemical constituents present in water as well as an assessment of their cumulative (mixture) toxicity.

Equipment to perform most in vitro cellular bioassays is significantly less expensive than those required for mass spectrometric techniques used for targeted analyses. Although many cell bioassays, such as the Ames test or Microtox®, are available commercially, EPA continues to develop a wide array of assays that could be made publically available for very little cost to water agencies. Cell culture equipment is already available in many water laboratories, and plate-scanning spectrophotometers can be procured at reasonable costs that are at least an order of magnitude less than commonly employed liquid chromatography tandem mass spectrometer equipment. The proliferation of 384 well-plate assays along with robotics for liquid handling also will continue to reduce labor and supply costs while simultaneously increasing reproducibility. These types of high throughput assays will continue

to be developed and applied for water quality evaluations, allowing for rapid and relatively inexpensive characterization of the mixtures of chemicals that may occur in water (Snyder, 2014).

In addition to monitoring, Suffolk County should continue to collaborate with water management colleagues and review the latest findings from other jurisdictions. Of equal importance, is continued public outreach and education efforts to encourage appropriate disposal of pharmaceuticals through take-back programs at pharmacies or other collection programs, such as "Operation Medicine Cabinet.

5.3.7 Wastewater Treatment Recommendations

As previously reported, sanitary wastewater management is one of the most significant issues facing Suffolk County in terms of ground and surface water resource protection. Prior to development, precipitation falling on the ground surface recharged the aquifer system, and the recharged precipitation travelled down through the aquifer system to eventual discharge to fresh streams, intertidal areas, harbors, coastal embayments or other marine waters. Prior to extensive development, private wells were used to withdraw potable supply from the aquifer; most of the water withdrawn was returned to the aquifer system via on-site cesspools or septic systems. The sanitary wastewater introduced nitrogen and bacteria to the aquifer system, but this was successfully diluted by the greater volume of recharging precipitation and did not cause widespread impacts. Eventually, the sanitary wastewater recharged by more and more residents exceeded the assimilative capacity of the resource in densely developed areas, causing noticeable impacts to the aquifer, drinking water supply and surface water ecology, and prompting implementation of wastewater management measures.

Sanitary wastewater management options were implemented to protect the groundwater resource, as indicated by compliance with the 10 mg/L drinking water standard. Centralized sewage treatment and collection systems such as Southwest Sewer District No. 3 were established to reduce levels of observed wastewater parameters in groundwater located beneath densely developed areas. Provision of a centralized sanitary wastewater collection and treatment is an effective way to reduce the impacts of development on ground and surface water features; conventional treatment schemes remove suspended solids, organic material, and deactivate pathogens via disinfection. More advanced treatment processes can be used to remove nutrients such as nitrogen and prevent eutrophication and degradation of ecological communities. Nitrogen levels in sanitary wastewater vary considerably; typical secondary wastewater treatment processes reduce influent total nitrogen concentrations by 50 percent or less. Additional treatment processes utilized at

biological nutrient removal (BNR) facilities can further reduce nitrogen levels to less than 10 mg/L, and sometimes to as low as 4 to 6 mg/L. The practical limit of nitrogen removal in Suffolk County is currently about 2 to 3 mg/L.

In addition to the significant economic costs associated with centralized sewage collection and treatment, there are other potential impacts. For example, discharge of the treated effluent off-shore results in a net loss of a significant amount of water from the aquifer system, and can have detrimental impacts on area streams, pond levels and wetlands. In addition, the energy requirements associated with operating a treatment plant, and treating and disposing of sludge greatly exceed the requirements associated with on-site disposal systems, and conventional wastewater treatment does not address all contaminants of concern, such as organics and PPCPs.

Suffolk County and NYSDEC also permit the use of alternative treatment systems for flows up to 15,000 gallons per day (gpd); these systems are required to meet effluent nitrogen limits of 10 mg/L. When successfully operated and maintained, these systems are, in many cases, capable of significantly reducing the nitrogen load to groundwater. However, they do require considerable operator attention to consistently and successfully operate, they require considerable SCDHS oversight, and they do not necessarily remove organics and PPCPs that may be contained in the effluent. SCDHS is currently implementing a study to specifically evaluate the effectiveness of innovative wastewater treatment systems capable of treating 30,000 gpd that reportedly can reduce nitrogen levels to less than 10 mg/L.

The last alternative, which is currently utilized by approximately 74 percent of County residents, is on-site wastewater disposal systems, typically consisting of a septic tank and leaching field. Septic systems are widely used throughout the world, they are passive systems that successfully reduce organic loading to the environment. Septic systems, or on-site wastewater treatment systems, have been identified by NYSDEC as the source of the nitrogen causing use impairment for several of the impacted water body segments in the Great South Bay drainage area.

When properly sited (e.g., appropriate density), all three of these approaches are capable of enabling the groundwater resource to achieve the 10 mg/L groundwater standard for nitrate on a regional basis. However, lower nitrate levels in groundwater discharging to some surface waters are required to meet water body-specific water quality and ecologic goals. Either nitrogen or phosphorus may be the limiting nutrient in a particular surface water body. In general, phosphorus is typically the limiting nutrient for algal growth and productivity in fresh water systems, and nitrogen is usually the limiting nutrient in marine water bodies. Like nitrogen, phosphorus may be introduced

to the aquifer system by sanitary wastewater or by fertilization. Unlike nitrogen, dissolved phosphorus is more likely to sorb onto sediments, and is not as mobile. Therefore, most discussions of nutrient loads to surface waters from groundwater baseflows focus on nitrogen.

Target nitrogen levels in groundwater discharging to surface water must be established on a water body-specific basis, taking into account a variety of factors such as biogeochemical reactions in the hyporheic zone, advective and tidal mixing, dilution, and other sources of nitrogen load to the system. In many locations, nitrogen concentrations in groundwater are reduced prior to discharge to the receiving surface water body by biogeochemical transformation in the hyporheic zone, the upper portion of the bottom sediment of the surface water body. For example, SCDHS found that the nitrate concentrations in groundwater discharges to West Neck Bay in 1999 were reduced by approximately 25 percent from nitrate levels in wells adjacent to the shoreline. Changes in nitrate levels that occur within this zone vary depending on the substrate, and may also vary by season.

Sufficient information does not exist at this time to establish a target nitrate level in groundwater to achieve surface water quality goals; these targets must be established on a water body- specific basis. Nevertheless, it is apparent that target nitrate concentrations are lower for surface waters than the 10 mg/L criteria established for groundwater for public health protection. In addition, nitrogen contamination is also an indicator of the presence of other contaminants of potential concern that are found in sanitary wastewater, some of which are routinely reduced via treatment systems, and others that are not.

It is recommended that:

- TMDLs be established for contaminants of concern causing water quality impairments in priority surface water features; SCDHS monitoring data should be used to support these efforts;
- For those surface waters where nitrate in groundwater is established as a significant component requiring reduction, site-specific studies should be completed to assess any reduction throughout the year in the hyporheic zone to establish nitrate groundwater level targets within the surface water contributing area, and
- An approach to provide any required higher levels of nitrate removal within the mapped surface water contributing areas should be implemented.

5.3.8 Stormwater Management Recommendations

Urban stormwater runoff is listed as the source of impairment for most of the water bodies identified on the New York State 2014 303 (d) list of impaired individual water body segments in Suffolk County, as well as for the water body segments identified as water bodies for which TMDL development may be deferred pending verification of cause/pollutant. The 2014 303 (d) list of impaired individual water body segments in Suffolk County requiring development of a TMDL includes eighteen fresh water segments. The source of pollutants resulting in impairments at fifteen of the individual fresh water body segments is identified as urban stormwater runoff. These include seven lakes (Millers Pond, Maratooka Pond, Fresh Pond, Canaan Lake, Lake Ronkonkoma, Big/Little Fresh Ponds, Mill and Seven Ponds) and eight rivers and river systems (Champlin Creek, Terrell River, Beaverdam Creek and tributaries, Motts Creek, Orowoc Creek, Awixa Creek, Penatquit Creek and Sampawams Creek). At the remaining three lakes, (Saint James Pond, Spring Lake and Lake Capri), contaminated sediment is identified as the source of the pollutant (chlordane, DDT and/or cadmium) impacting these water bodies.

Fifteen additional marine water body segments that drain to the Atlantic Ocean/Long Island Sound Drainage Basin are included on the 303 (d) list; however it is noted that these segments might be addressed by a water body-specific TMDL or possibly some other strategy to attain water quality standards. Sources of impairment to each one of these water body segments includes urban stormwater runoff. Onsite wastewater treatment systems and agriculture are identified as additional sources.

A final seven saltwater body segments that also drain to the Atlantic Ocean/Long Island Sound Basin are included on the 303 (d) list as water bodies for which TMDL development may be deferred pending verification of cause/pollutant. In each instance, urban stormwater runoff is again noted as the source causing the impairment. Additionally, onsite wastewater treatment systems are noted as an additional source for all of the water bodies listed.

Not all impaired waters of the state are included on the Section 303(d) list. By definition, the 303 (d) list is limited to impaired waters that require development of a TMDL. However, New York State maintains a list of Other Impaired Waterbody Segments Not Listed on the 303 (d) list to provide a more comprehensive inventory of waters that do not fully support designated uses. Waterbodies on this list are considered to be impaired, however a TMDL is not necessary. In most cases, this is because a TMDL has already been established for the segment/pollutant and identifies urban stormwater runoff as a source of impairment.

Per the Clean Water Act, New York State is required to develop TMDLs to address the source(s) of impairments. The County and Towns should work closely with the state to establish water body-specific TMDLs and determine which structural and non-structural controls will be the most effective to implement. TMDL allocations are calculated for all non-point sources that contribute to the use impairments, including stormwater runoff, and in some instances, onsite wastewater treatment systems and fertilizer runoff from agricultural areas consistent with the specific sources of contamination. Unlike point sources, the TMDL does not have authority in most cases to force a reduction of pollutants from non-point sources. In these cases, a TMDL Implementation Plan will outline a set of recommendations to reduce the non-point source pollution identified in the TMDL. These plans are the basis for initiating local, regional, and state actions that reduce pollutant loads to levels established in TMDLs for non-point sources.

Local input to the TMDL process is essential in determining which controls will be the most effective. Additional sampling will also be required to determine the effectiveness of the chosen controls. If the controls are found to be inadequate, then the implementation plan will be revised and more stringent measures may be adopted. Local jurisdictions may need to enact new zoning ordinances, require existing development to add new or additional stormwater BMPs, or conduct other actions. Where agriculture is determined to be a source of impairment, the plans may ask farmers to use new management practices to prevent fertilizers and pesticides from reaching water bodies. TMDLs are usually only effective at addressing non-point sources when enough local interest exists to carry out the implementation plan.

Since monitoring is necessary to determine the effectiveness of the chosen controls, the County's surface water monitoring programs will also continue to be relied upon to provide essential water quality information. Further study is needed to determine the relationship of nitrogen and other factors in causing harmful algal blooms (HAB) or Brown Tide. The Suffolk County regional groundwater model has been used to estimate groundwater underflow (by aquifer) to the coastal water bodies (see Task 4-3– Hydrology, CDM, 2006). These estimates of underflow can be used together with estimates of the hyporheic zone uptake to estimate nitrogen loading from onsite wastewater treatment systems to Great South Bay, which may provide useful information when examining the relationship of nitrogen to algal blooms. Water body-specific estimates of underflow can also be developed using sub-regional groundwater flow models to provide a higher level of accuracy and help investigate specific occurrences of Brown Tide.

Consistent with the recommendations documented in the LISS, PEP, SSER CMP, and the North Shore Embayments Study, non-structural efforts to reduce contaminants from stormwater impacting the County's streams, embayments, and groundwater should focus on the general practices of reducing fertilizer use; keeping pollutants out of stormwater runoff; reducing impervious surfaces; and preserving open space.

The Peconic Estuary Program has successfully guided the creation of a Stormwater Inter-municipal Agreement (IMA) in the Peconic Estuary watershed. The PEP's contract is being completed and it is anticipated that six towns and three villages will be members of the coalition. The IMA will establish collaborative efforts and shared resources to meet the MS4 General Permit (stormwater) requirements and facilitate cooperation and coordination among municipalities on a variety of water quality initiatives. The Action Plan prepared will provide a road map of recommendations, implementation strategies and prioritize actions for collective efforts to assist all the municipalities in meeting the MS4 General Permit Requirements. Additionally, the proposal includes implementation assistance for several of the key 2010 MS4 General Permit Requirements, resulting in increased compliance for the participating MS4s.

5.4 Establishment/Enhancement of Surface Water Monitoring Programs

Monitoring the state of the County's water resources is an essential function in terms of protecting human health (e.g., compliance with recreational water quality criteria for beaches) that should not be compromised. Monitoring data also provides the information necessary to identify areas and/or contaminants of concern, to evaluate cause and effect relationships with respect to sources of contamination and resulting water quality, and establish potential impacts on ecological communities. Summaries of the monitoring programs that should be continued and/or implemented are provided below.

5.4.1 Beach Monitoring

Suffolk County's beaches are an important recreational resource used by thousands of residents each year. Water quality at some beaches can be affected by pathogenic contamination introduced to the water body by stormwater runoff, boat discharges or area septic systems; the impacts of these potential sources are exacerbated in areas that are poorly flushed. SCDHS Office of Ecology is responsible for implementing the County's beach monitoring program to protect public health, in accordance with the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act.

From May to September, Suffolk County beaches are monitored by Public Health Sanitarians for the presence of enterococcus, the indicator organism selected by USEPA as most indicative of the presence of potentially pathogenic organisms in marine waters, as required by the State Sanitary Code (2004). Beaches are monitored under §6-2 of the state Sanitary Code to ensure compliance with water quality standards. The Office of Ecology has developed a risk-based approach to the monitoring program, and beaches that are most likely to be impacted by pathogens are sampled most frequently. Approximately 200 beaches in the County are monitored, including private community beaches and permitted beaches; thousands of samples are collected and analyzed each bathing season, as summarized on **Table 5-11** below. The permitted beaches monitored by SCDHS are located throughout the County on the Atlantic Ocean and Great South Bay, Long Island Sound and north shore bays and harbors, Peconic Estuary and lakes as shown by **Figure 5-13.**

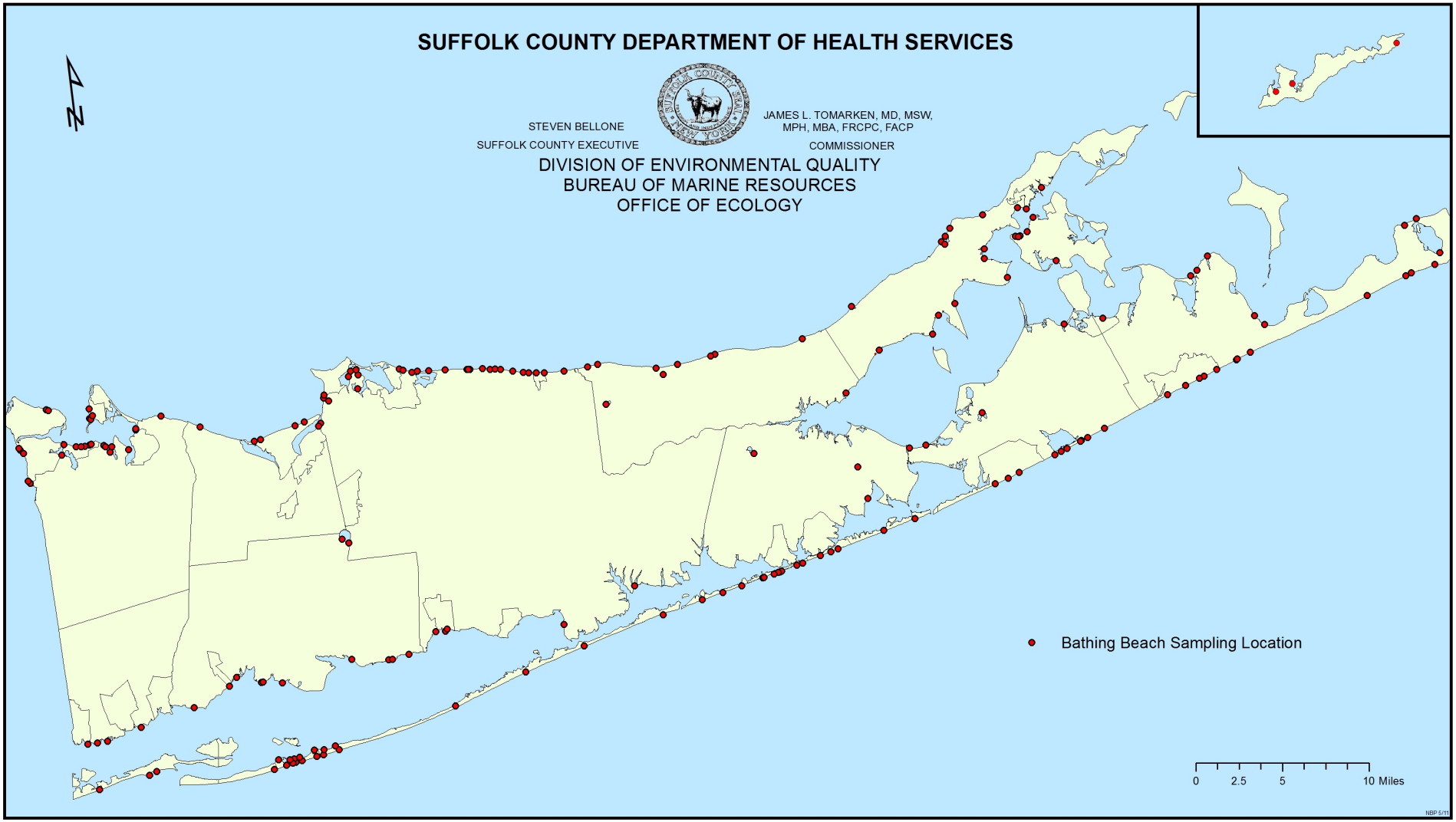
Table 5-11 Suffolk County Bathing Beach Monitoring Program Summary

Bathing Beach Program	2007	2008	2009	2010	2011	2012	2013	2014
Facilities Permitted	133	133	134	132	133	134	134	128
Inspections	141	148	151	148	159	158	163	159
Sampling Sites	230	240	241	267	260	212	206	200
Samples Collected	4,901	5,171	4,577	5,124	3,949	3,292	4,190	3,832
BEACH Act Grant ($)	99,324	99,557	171,999	91,278	91,278	95,550	93,650	95,890

Based on the sampling, SCDHS maintains a website that provides nearly real-time information on the status of beach closings and beach warnings. An annual federal BEACH Act Grant provides support to fund the positions and sampling supplies necessary to implement the program.

Only by collecting and analyzing water quality samples can water quality of the County's beaches be ascertained and public health adequately safeguarded. Continued implementation of this program is essential to provide continued protection of public health.

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Suffolk County Department of Health Services
Beaches Monitored by SCDHS

Figure 5-13

Suffolk County Comprehensive Water Resources Management Plan

5.4.2 Estuary Program Monitoring

Since 1976, SCDHS Office of Ecology has monitored water quality in parts of the Long Island Sound, the South Shore Estuary Reserve and the Peconic Estuary at varying frequencies. Currently, monitoring is performed at the locations shown on **Figures 5-14** through **5-23**. Samples are analyzed for temperature, secchi depth, irradiance, dissolved oxygen, salinity, conductivity, nutrients, coliform, suspended solids, chlorophyll-a, phytoplankton, and, in some cases, VOCs and pesticides/herbicides. Sampling is conducted to improve the understanding of the County's ecosystems, to help to understand the inter-relationships between water quality parameters and the marine and estuarine ecosystems, to assess the impacts of human activities on water quality and ecosystems, and to help to assess the effectiveness of management activities in terms of water quality improvements.

5.4.3 Stream and Pond Monitoring

In the past, SCDHS conducted regular monitoring of targeted streams and ponds. Monitoring, including assessment of start-of-flow, baseflow measurement and collection and analysis of water quality data, was performed to assess the ecological health and wellbeing of the surface water features. As citizen attention becomes increasingly focused on the resources of the community, it is recommended that the County's surface water monitoring program be restored. Based on historical sampling stations and a field survey of each stream to identify access points, discharge points, etc., sampling stations should be identified on each of the streams identified on **Figure 5-24** and **Table 5- 12**.

Shorter streams can be characterized with a single sampling station; longer streams should, as a minimum have upstream (typically reflective of groundwater baseflow quality) and downstream (reflective of groundwater baseflow and stormwater runoff) stations. The five major streams (Carlls, Carmans, Connetquot, Nissequogue, and Peconic) should be sampled at the same stations sampled in the past for consistency, and to enable analysis of long term trends.

As a minimum, stream samples should be analyzed for pathogens, dissolved oxygen and nutrients. To the extent that resources allow, stream samples should also be analyzed for VOCs and PPCPs. Streams on the North Fork should also be analyzed for pesticides. Depending upon water body-specific characteristics, a sampling program should be designed to characterize conditions during both dry weather, and during wet weather events, in order

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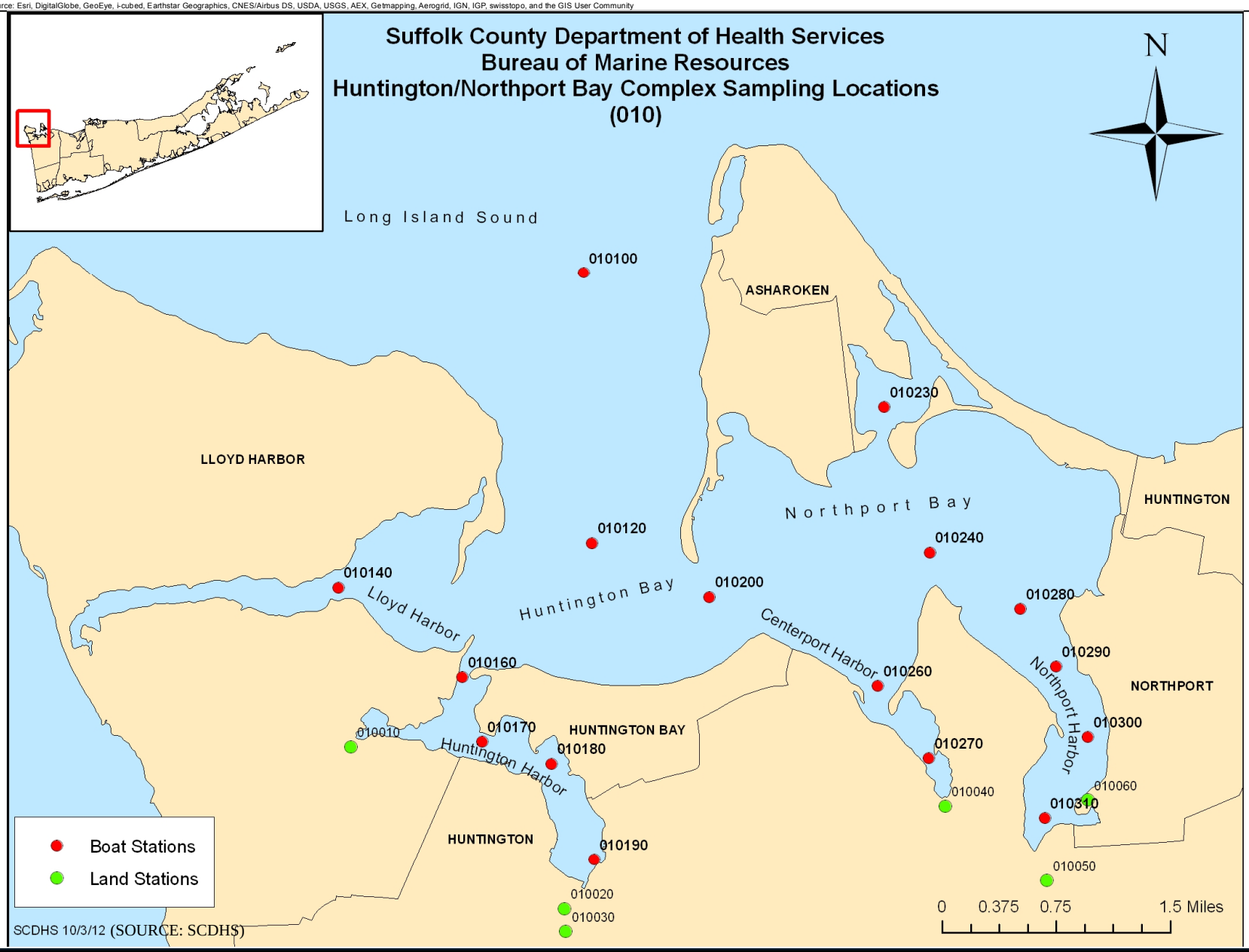
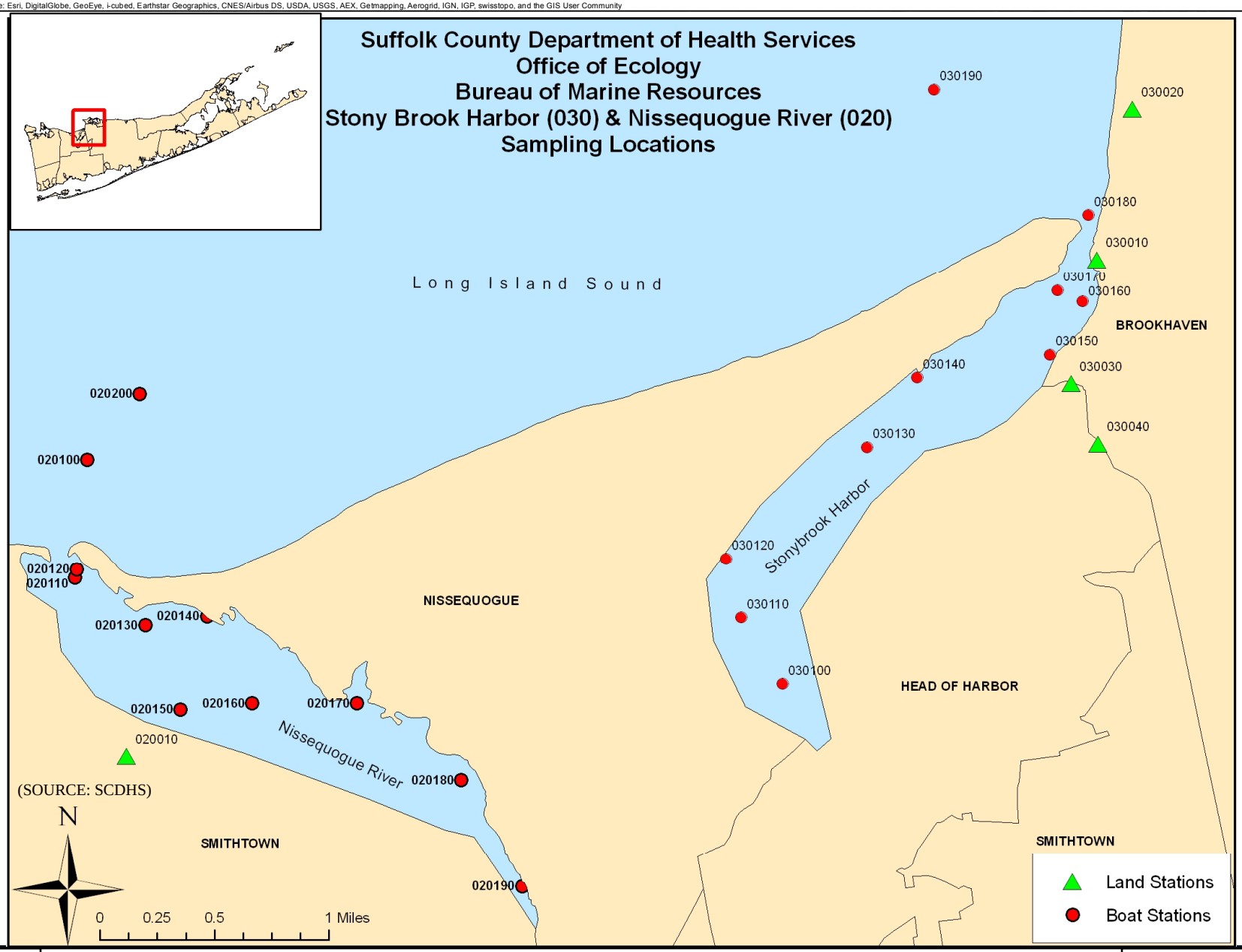


Suffolk County Department of Health Services
Sampling Locations
Huntington-Northport Harbor

Figure 5-14

Suffolk County Comprehensive Water Resources Management Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

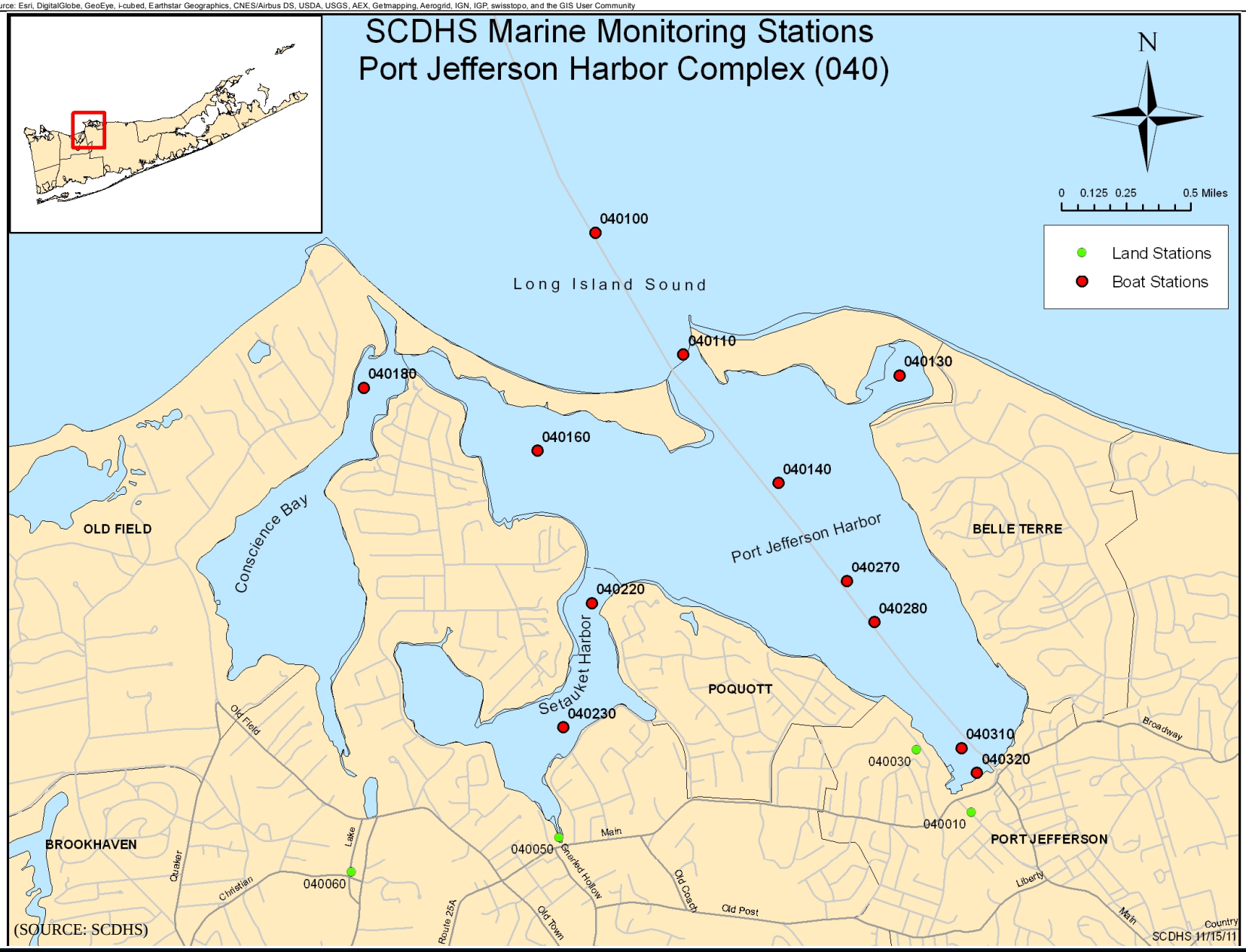


Suffolk County Department of Health Services
Sampling Locations
Nissequogue and Stony Brook Harbor

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-15

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

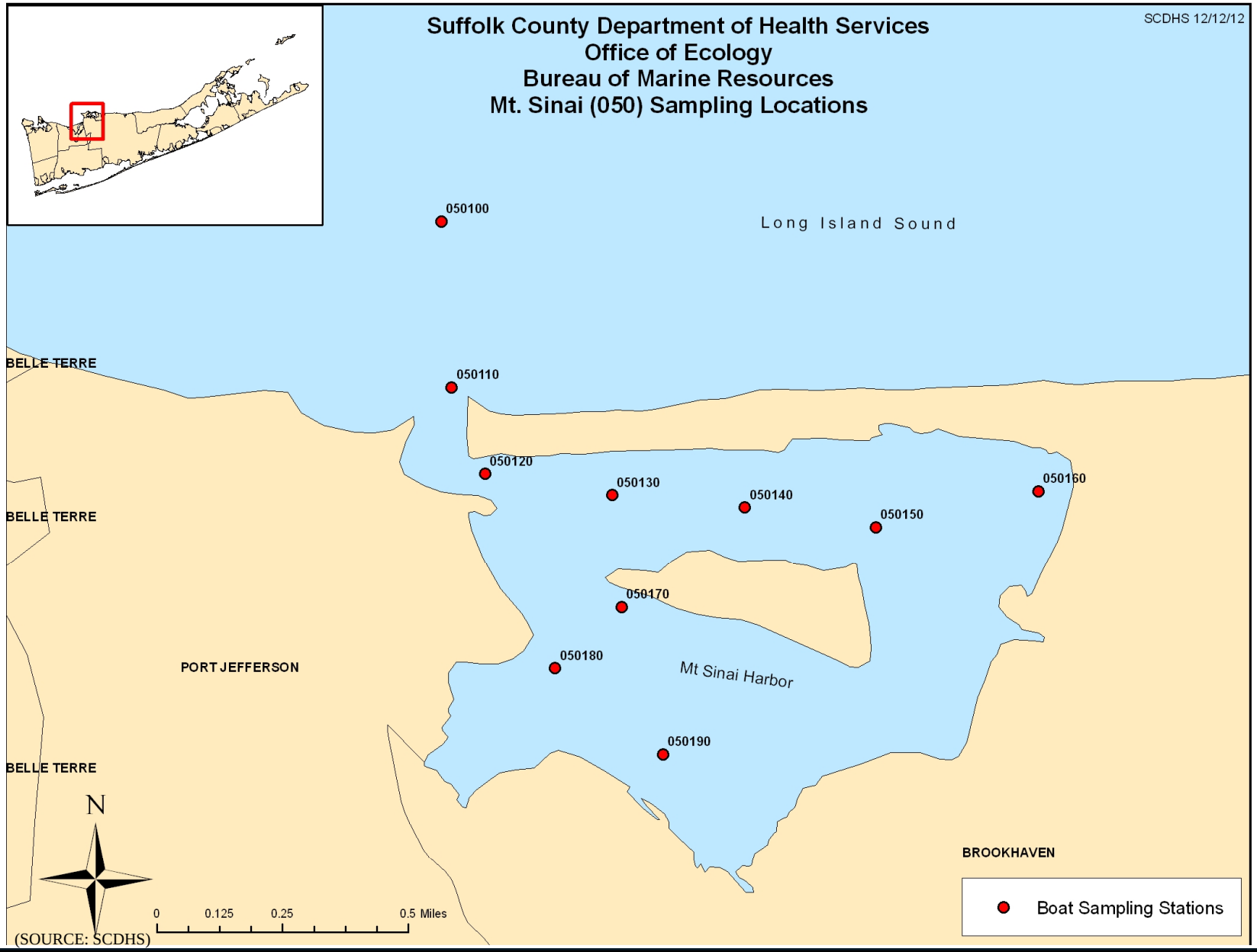


Suffolk County Department of Health Services
Sampling Locations
Port Jefferson Harbor

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-16

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



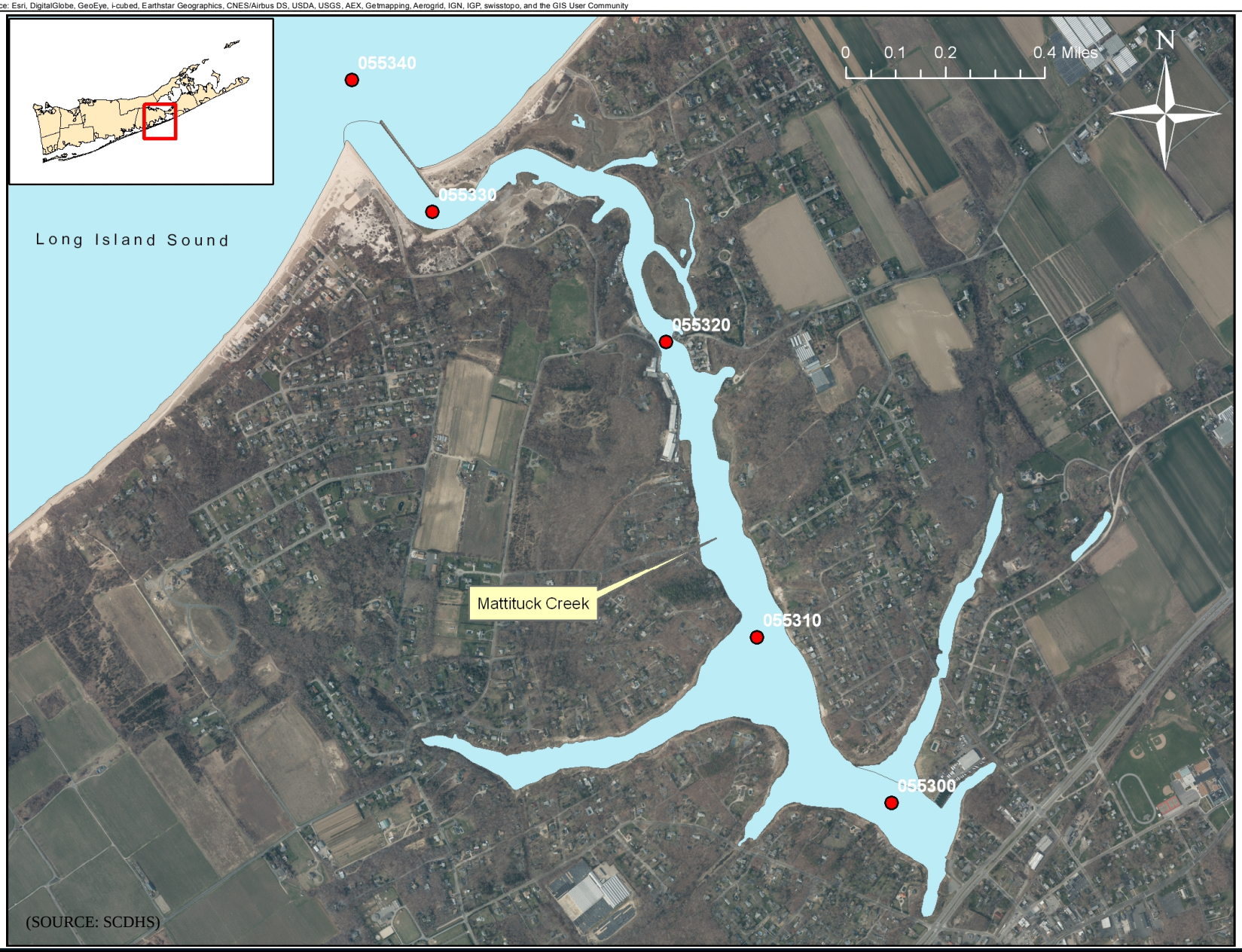
(SOURCE: SCDHS)

Suffolk County Department of Health Services
Sampling Locations
Mount Sinai Harbor

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-17

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



(SOURCE: SCDHS)

Suffolk County Department of Health Services
Sampling Locations
Mattituck Creek

Figure 5-18

Suffolk County Comprehensive Water Resources Management Plan

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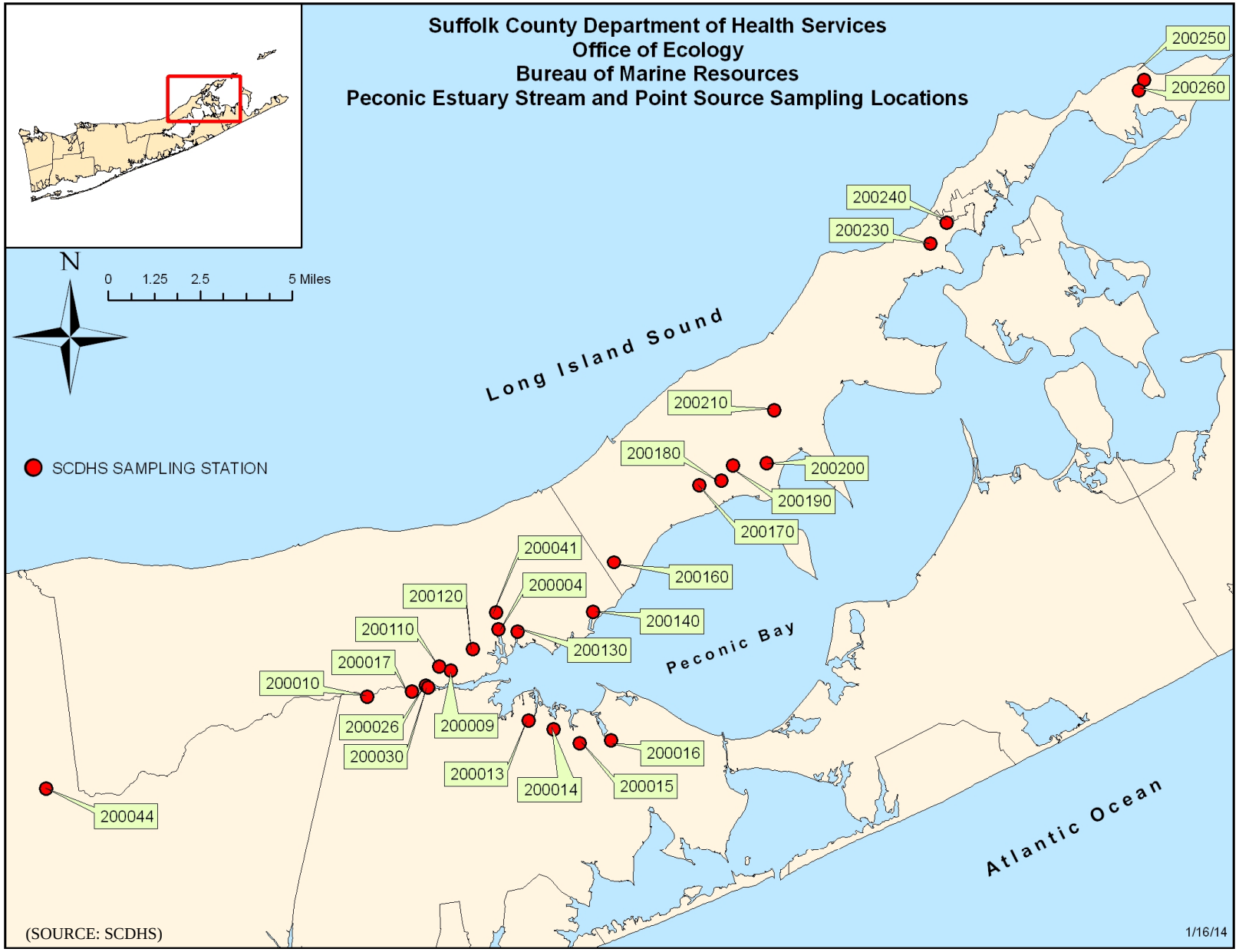
Suffolk County Department of Health Services
Marine Monitoring Locations
Peconic Estuary

Figure 5-19a

Suffolk County Comprehensive Water Resources Management Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

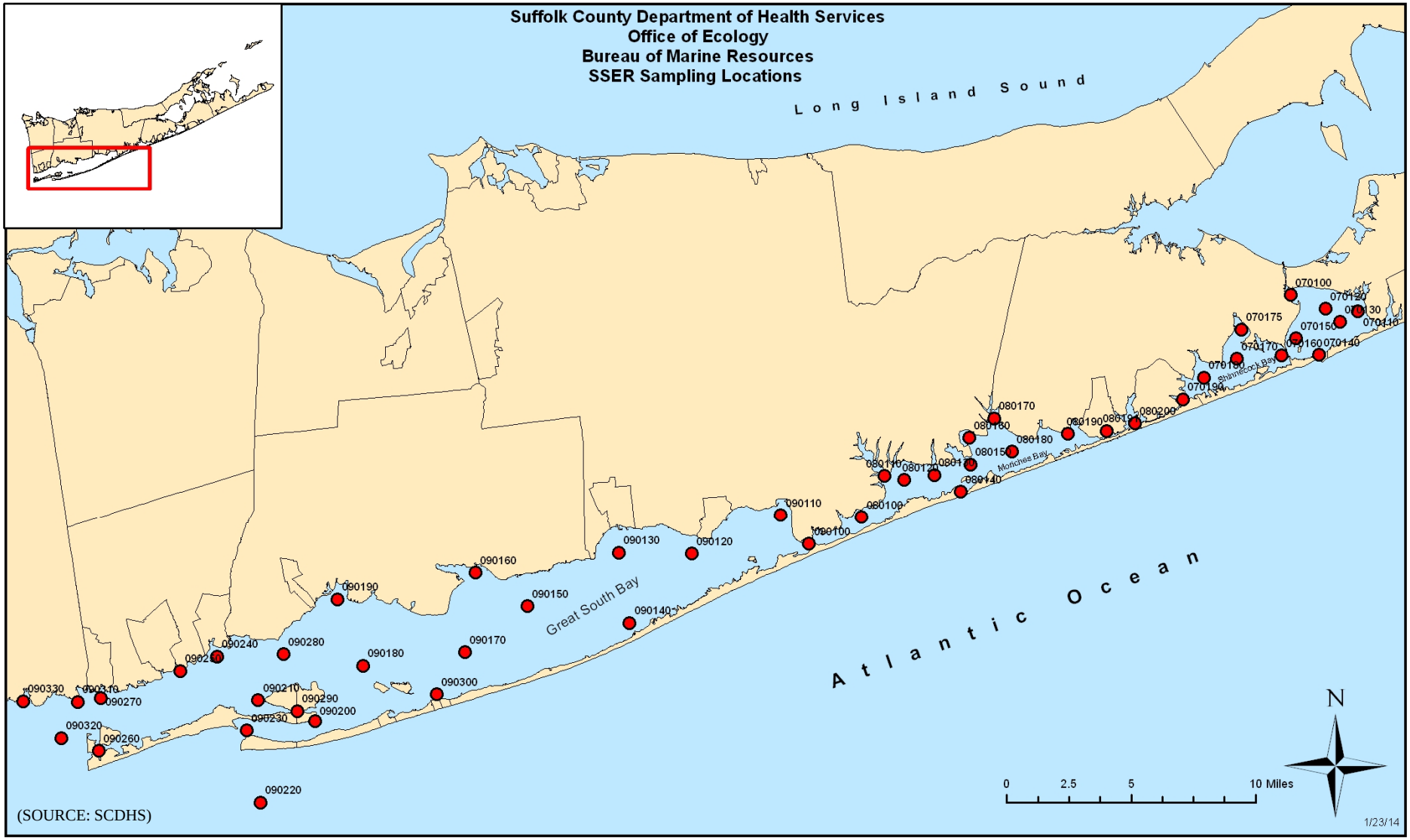


Suffolk County Department of Health Services
Stream Monitoring Locations
Peconic Estuary

Figure 5-19b

Suffolk County Comprehensive Water Resources Management Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



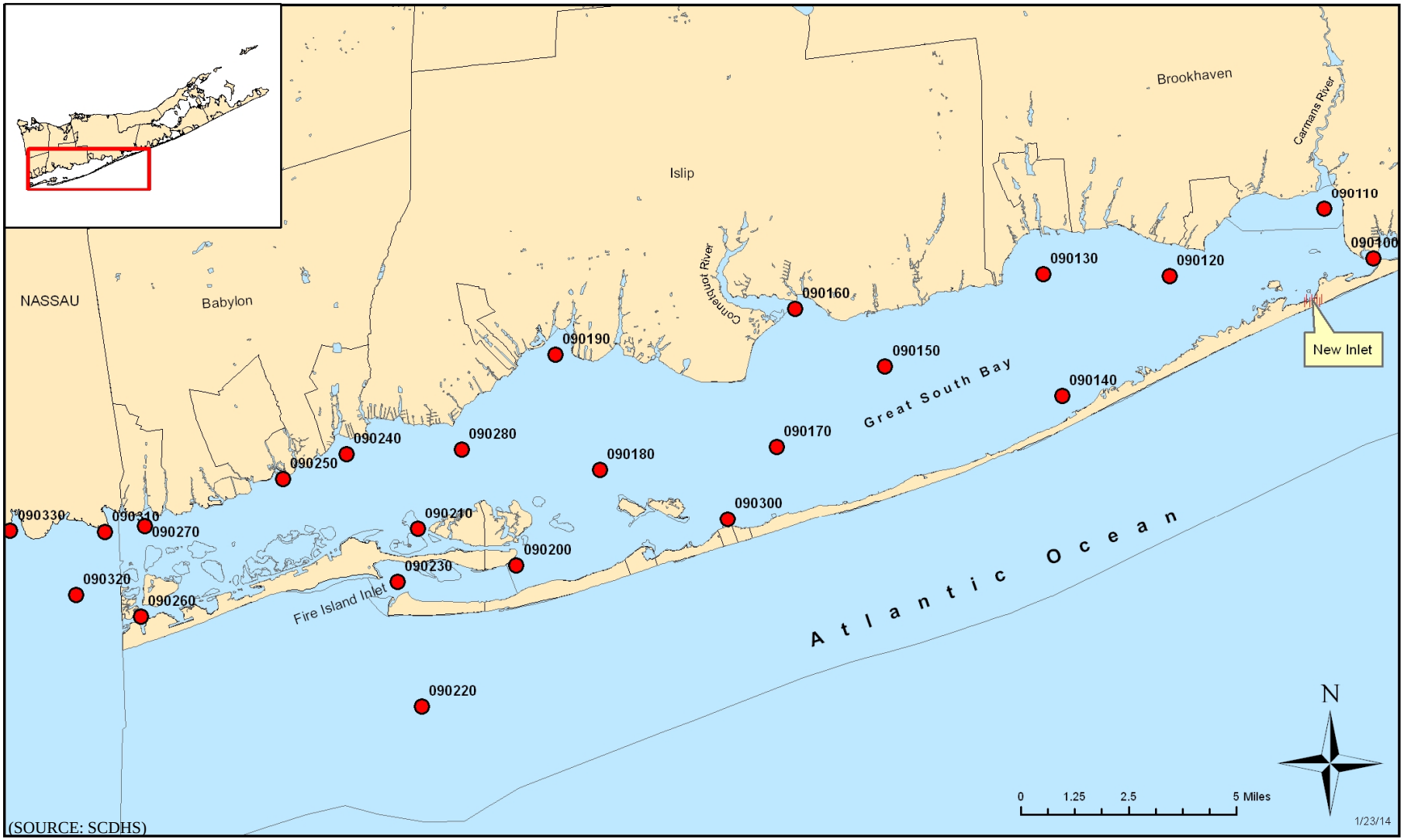
Suffolk County Department of Health Services
Monitoring Stations
South Shore Estuary Reserve (SSER)

Figure 5-20

Suffolk County Comprehensive Water Resources Management Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Suffolk County Department of Health Services
Office of Ecology - Bureau of Marine Resources
Great South Bay Sampling Locations (090)

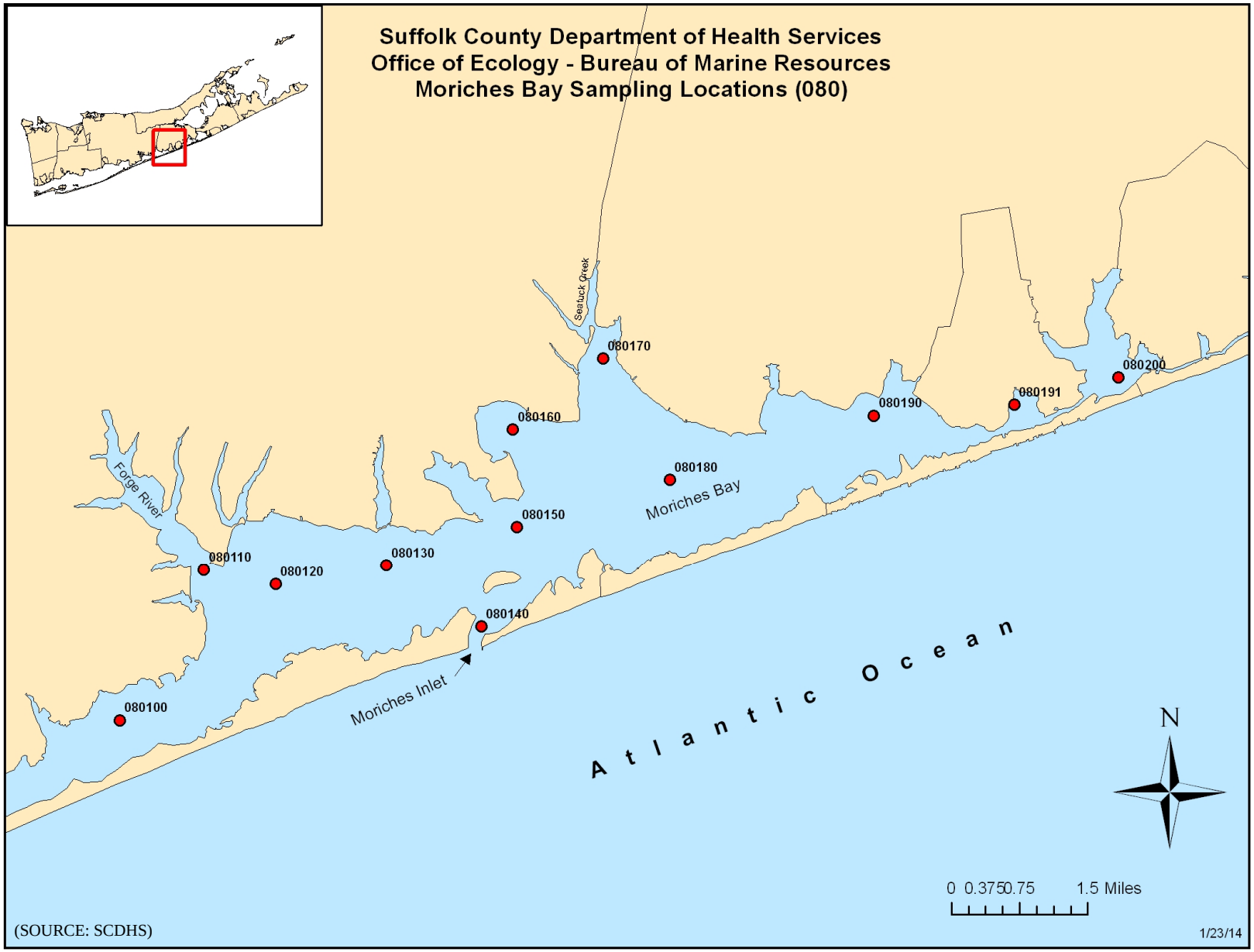


Suffolk County Department of Health Services
Monitoring Stations
Great South Bay

Figure 5-21

Suffolk County Comprehensive Water Resources Management Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

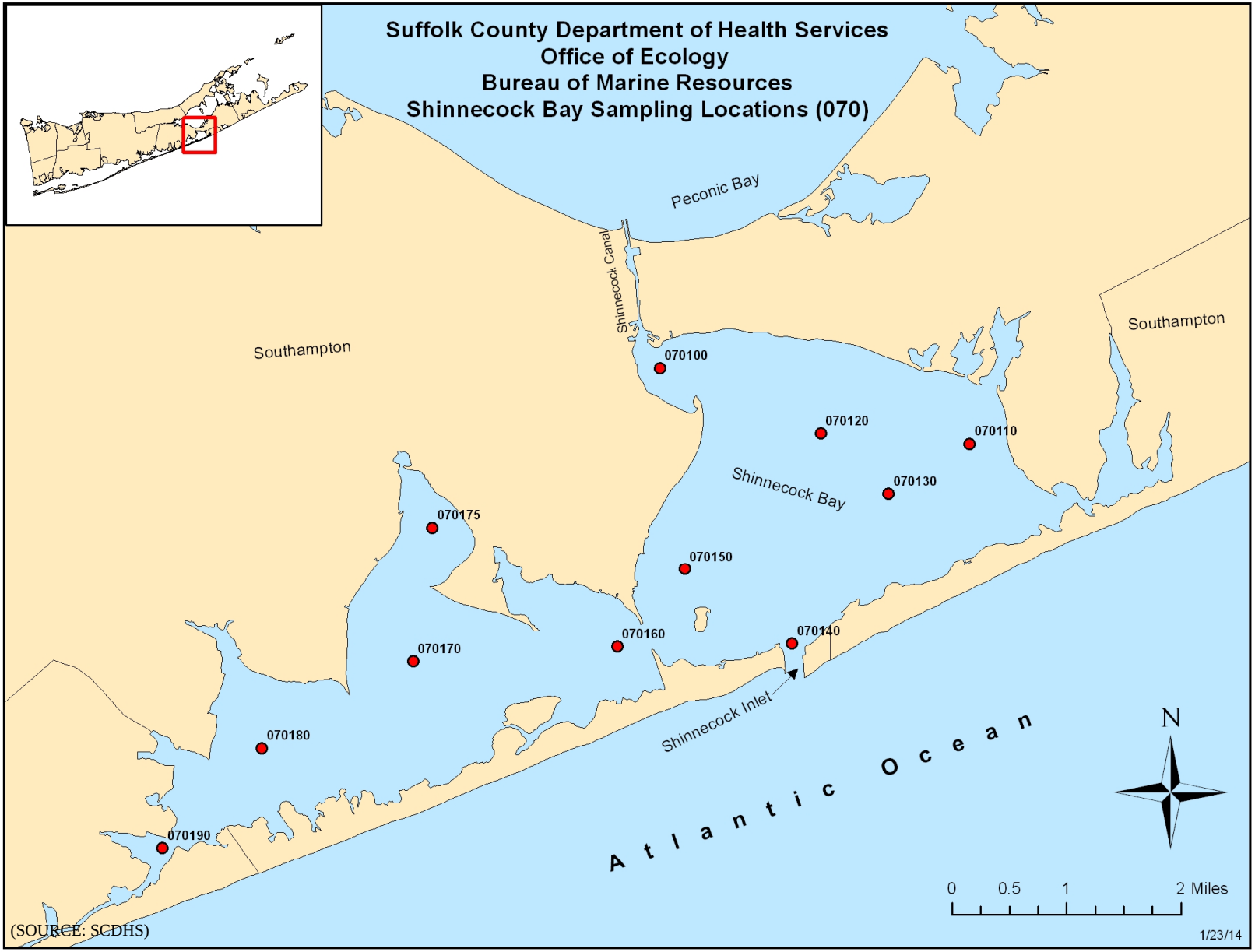


Suffolk County Department of Health Services
Monitoring Stations
Moriches Bay

Figure 5-22

Suffolk County Comprehensive Water Resources Management Plan

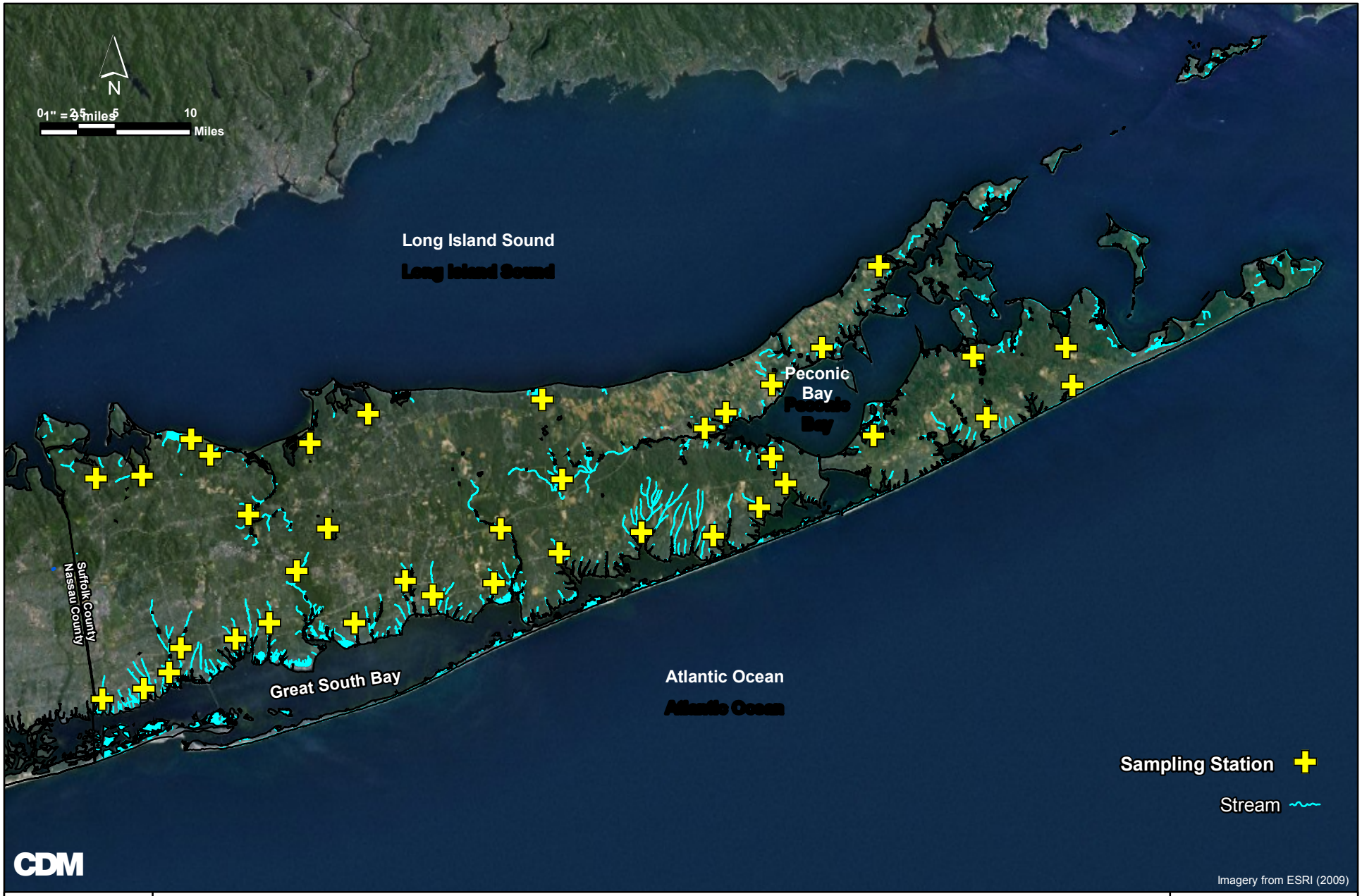
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Suffolk County Department of Health Services
Monitoring Stations
Shinnecock Bay

Figure 5-23

Suffolk County Comprehensive Water Resources Management Plan



Suffolk County Comprehensive Water Resources Management Plan
Recommended Stream Sampling Stations

Figure 5-24

Table 5-12 Streams to be Included in SCDHS Sampling Program

Fresh Water Streams	
Amityville Creek	Long Creek
Aspatuck Creek	Meetinghouse Creek
Beaverdam Creek	Mill Creek (Huntington)
Brookhaven Creek	Neguntatogue Creek
Brush's Creek	Nissequogue River
Carlls River	Patchogue River
Carmans River	Peconic River
Champlin Creek	Penatquit Creek
Connetquot River	Port Jefferson Creek
Down's Creek	Sagaponack Creek
Forge River	Sampawams Creek
Fresh Pond	Sawmill Creek
Green Creek	Seatuck Creek
Hook Pond Creek	Sebonac Creek
Hubbard Creek	Stony Brook
Lake Ronkonkoma Inlet	Stony Hollow Run
Ligonee Brook	Sunken Meadow Creek
Tanbark Creek	Swan River
Tiana Creek	Wading River
Weesuck Creek	

to assess the impacts associated with stormwater runoff. Based upon stream-specific objectives and available resources, dry and wet weather sampling events can be targeted in alternate years, or multiple events including both dry and wet events can be completed in a single season. Sampling programs should be developed in more detail to support TMDL development, implementation and evaluation.

5.4.4 Special Studies

Special focused studies may be required to support TMDL development, to assess whether phosphorus or nitrogen is the limiting nutrient in specific impaired water bodies, and to continue to assess the causes of harmful algal blooms (HABs) so that they may be mitigated.

In order to identify any required nitrogen controls within each surface watershed of interest, a nutrient balance should be conducted. Controllable sources of nitrogen to surface water such as point source discharges have been identified; non-point sources such as stormwater runoff have also been identified in some areas. Additional study would, however, be beneficial in identifying the contribution of the nitrogen load in groundwater baseflow. The existing suite of groundwater models has already been used to establish the

groundwater baseflow to many of the County's freshwater streams, harbors and embayments, and estuaries (CDM, 1999, Nelson & Pope, 2007). Observed groundwater nitrogen concentrations are also available to begin to characterize the high end of the range of potential nitrogen contributions. Model-generated contributing areas could be associated with groundwater quality and land use information via GIS to estimate nitrogen loads.

Additional information is, however, required to assess the load of nitrogen that actually travels through the groundwater to travel through the hyporheic zone to affect a surface water with an established TMDL. Existing literature and research documentation should be adequate to evaluate the transformation of various nitrogen species from septic field leachate through the groundwater as it approaches the County's surface water features. Scientific literature should be used to provide estimates of the rate constants associated with the transformation of organic nitrogen to ammonia nitrogen, and the subsequent transformations of ammonia to nitrite and nitrate (nitrification) and then to nitrogen gas (denitrification) where that occurs. It will be important to account for any nitrogen lost from the groundwater system via denitrification so that the groundwater nitrogen load is not over-estimated.

Based on a literature review to assess the types of factors affecting nitrogen transformation in the hyporheic zone, a field program can be developed to quantify nitrogen species in the shallow groundwater, groundwater discharge and adjacent surface water. A modeling tool such as the sediment nutrient diagenesis model (used by the USEPA and New York State and Connecticut in the Long Island Sound model) can then be used to estimate the delivery of groundwater nitrogen to the overlying water column based on the estimated transformations of ammonia nitrogen and nitrate nitrogen in the active benthic layer of the water bodies under study.

5.4.5 Data Management and Reporting

As a minimum, all surface water quality and quantity, groundwater quality and quantity and drinking water information should be entered into a new integrated database. Field data should be entered via portable hand held devices (e.g.; tablet such as an iPad or other mobile device) to reduce the time needed for transcription, data entry and data availability. Field and laboratory data should be regularly reviewed after routine uploading. SCDHS DEQ OWR should be responsible for maintaining this database. This database would be comprise a portion of the proposed Capital Project 4081, the Environmental Health Information Management System (EHIMS) described by SCDHS that would encompass all of the Environmental Health programs. In addition to the groundwater, surface water and drinking water supply data, the database

would incorporate data currently located within 30 different databases, including:

- Community, Non-Community and Bottled Water Supply Plant Inspections
- Private Well Inspection and Sampling
- Groundwater Pollution Investigations and Sampling
- Community Water Supply Plan Review
- Bathing Beaches
- Individual Water and Sewer Construction Plan Review
- Reality Subdivision Water and Sewer Plan Review
- State Pollutant Discharge Elimination System (SPDES)
- Sewage Treatment Plant Monitoring
- Petroleum Bulk Storage Tank Plan Review Inspection and Registration
- Enforcing Toxic and Hazardous Materials Storage regulations, which involve plan review, inspection and permitting of commercial and industrial facilities
- Sampling of Marine and Surface Waters for Chemical, Bacteriological and Algal Quality
- Environmental Remediation
- Public and Environmental Health Laboratory (PEHL) Laboratory Information Management System data integration with water quality databases
- State Environmental Quality Review (SEQR) Reviews

Integration of all of the existing databases addressing water quality and water quantity, as well as the factors affecting water quality and water quantity (e.g., facilities, spills, etc.) into a single database that could be viewed using a GIS interface would provide a number of benefits. For example, all of the datasets could be accessed by any user, instead of limiting access to an individual or group with access to and knowledge of a particular type of software;

information currently residing within different databases could be mapped simultaneously to help assess water resource implications, and the data back-up would protect against the impacts of any hardware malfunctions (e.g., individual personal computer failure) or facility disaster (e.g., paper records).

Alternatively, it could be part of a larger, comprehensive Countywide database as recommended by IBM's Smarter Cities Challenge Report, the data would be readily available to all departments within the County to help to identify public health concerns and water resources issues, to identify appropriate management actions, to assess priorities and guide decision making. This data would be readily accessible so that queries relating to ground or surface water quality or data trends can be readily answered, issues can be rapidly and appropriately addressed, and the County can have the information to develop responses to long range concerns such as sea level rise. Finally, the data should be made available to other stakeholders outside the County such as SCWA, NYSDEC, the estuary programs, etc., so that timely decisions can be made based on the best available information.

It is recommended that SCDHS prepare a concise annual report summarizing the results of the countywide groundwater and surface water quality and quantity monitoring.

The report should contain, at a minimum, the following information:

- Background information on precipitation over the sampling period;
- Water supply pumping from each of the major water use categories, and monthly pumping from community supplies;
- Mapping of ground water levels, and figures depicting baseflow and stream flow; figures showing groundwater baseflow as a percentage of total stream flow;
- "Dot plot" type graphics depicting countywide water quality within each aquifer for each parameter of concern (e.g., nitrates, most often detected VOCs, pesticides, PPCPs);
- Statistics on water quality comparing annual water quality with baseline (1987, 2005 and 2013) years (baseline year dependent upon parameter of concern);
- Trend graphs of contaminants of concern for selected indicator wells, as well as trends in the minimum, mean, and maximum concentrations from all the wells;

- Water level graphs of selected indicator wells showing trends;
- Saltwater interface monitoring results depicting chlorides concentrations with time;
- Results of nitrogen and pesticide analyses in monitoring wells characterizing agricultural areas;
- Identification of any newly observed contaminants of concern for future targeting;
- Tables summarizing surface water quality data identifying any contaminants of concern identified;
- Tables summarizing beach monitoring data;
- Figures depicting trends in nitrate concentrations at sampling stations in the Long Island Sound, Peconic Estuary and South Shore Estuary; and
- Tables summarizing water quality data at the estuary program sampling locations and figures showing time histories of nitrogen and dissolved oxygen at key estuary program sampling locations.

In addition, each document should identify the apparent most significant issues affecting the resource and identify any additional priorities for monitoring and/or research.

Over the years, new monitoring tools and improved analytical capabilities have facilitated the identification of increasing numbers of contaminants in the environment, and the presence of these constituents can be detected at lower and lower concentrations. In addition, new tools and more powerful computer capabilities have facilitated the synthesis of various types of data and information (e.g., GIS information, groundwater modeling output and groundwater quality data for example) and are conducive to presentation of data and results in comprehensive graphical representations, which are more robust and much faster to produce than in years past. The need to utilize and enhance the ability to use, analyze and share data within a GIS framework has previously been documented in the draft 2010 Comprehensive Water Resource Management Plan and supporting task memoranda going back as far as 2008.

The bi-annual monitoring report should be distributed to other County agencies, NYSDEC, SCWA and water suppliers to support their resources management efforts and should also be made available electronically via the Suffolk County website.

5.5 Public Outreach and Education

Because Suffolk County residents live within the recharge areas for all of our public supply wells and surface water resources, it is critical that all take an active role in protecting these resources. A wide variety of public education and outreach programs are already in place at the federal, state, County and local levels to address topics such as storm water pollution, lawn fertilization, conservation, proper use and disposal of hazardous household wastes and pharmaceuticals and personal care products, etc. However, continued detection of low levels of various contaminants in surface waters and continued inclusion of water bodies on the 303(d) list indicate that a more assertive effort is required.

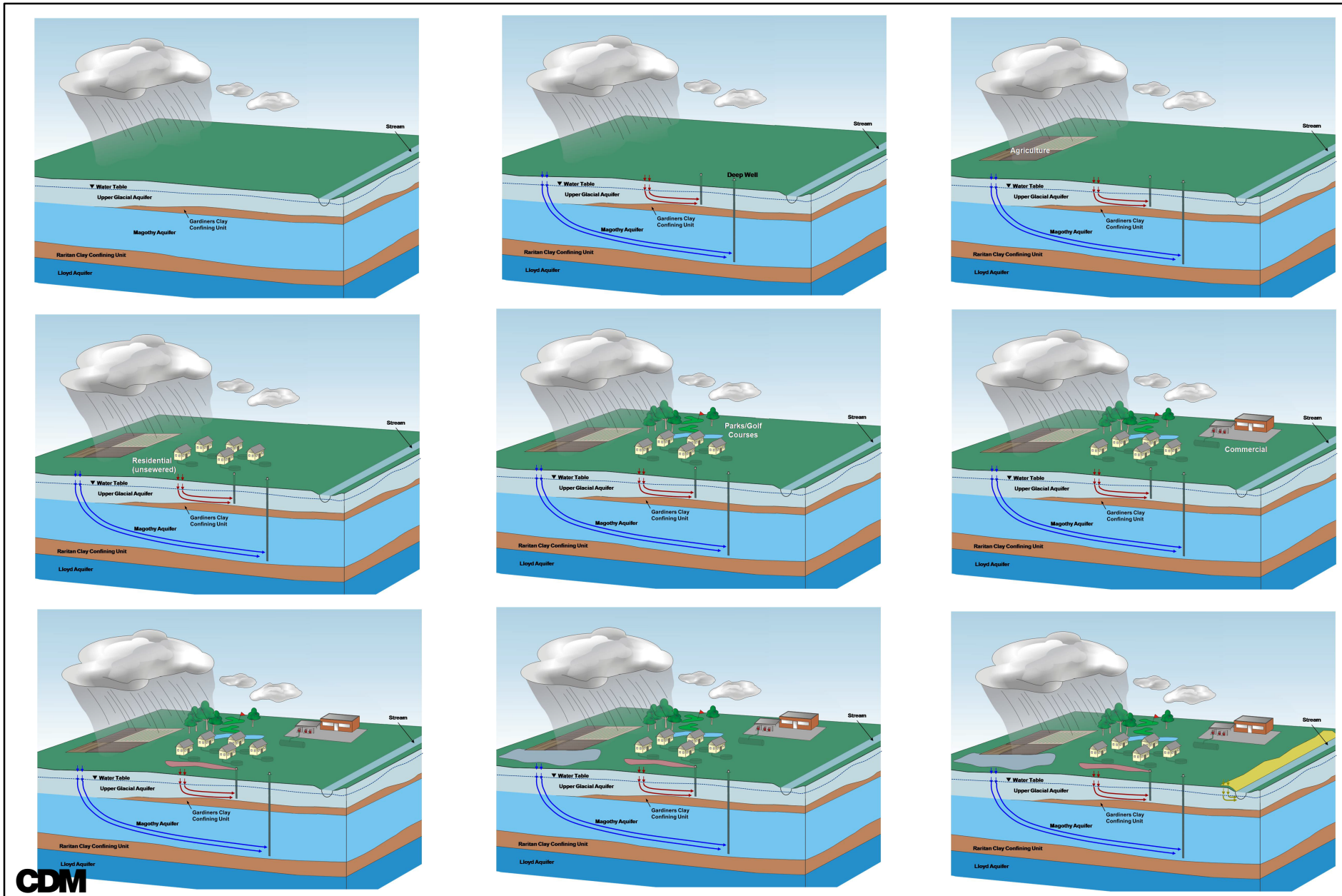
A report prepared in 2005 by the National Environmental Education & Training Foundation (NEETF) entitled Environmental Literacy in America reported that 78 percent of the American public does not realize that runoff from agricultural land, roads, and lawns is now the most common source of water pollution; and nearly half of Americans (47 percent) believe that industry accounts for most water pollution. Similar questions were posed to residents of the Long Island Sound watershed as part of a survey conducted in 2006 by the Stony Brook University Center for Survey Research as part of a USEPA grant. The results were analyzed by resident location; 49 percent of Long Island respondents believed that waste dumped by factories is the main source of water pollution. The role of personal responsibility and environmental stewardship needs to be emphasized in the County's public outreach efforts, and the significance of our surface waters must be more widely conveyed.

The Task 10 memorandum described a number of existing and overlapping public education programs, and identified a variety of potential enhancements. Overall, the existing programs are reaching a very small percentage of the County's 1.5 million residents. The IBM Smarter Cities Challenge Report (IBM, 2014) also identified the need for the County to engage County residents and visitors to embrace their role as stewards of water quality and motivating them to take action. A more ambitious approach is required and recommended here.

It is recommended that the SCDHS re-establish their public outreach and education program. The coordinator should work closely with the SCDPW (stormwater program), the SCDEE (fertilization program), the water suppliers (conservation program), the LIS, PEP and SSER program coordinators, and the Towns (STOP), to identify opportunities to leverage outreach opportunities and venues and coordinate water resources protection messages. Development of a school-based program is recommended to reach hundreds of thousands of

residents annually. Members of this target audience will bring the message home to their families to further disseminate the information and hopefully motivate broad-based changes in behavior throughout the County. As the students themselves age, the information will be part of the knowledge base that motivates their behavior.

Initially, a series of at least three lesson plans (for primary school, middle school and Earth Science target audiences) should be prepared and provided to all school districts in the County, either for integration into the science curriculum, or for delivery on Earth Day. The 45-minute sessions could be developed using materials already available at http://www.epa.gov/epahome/students.htm, http://water.usgs.gov/education.html; http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=8&minmeasure=1); http://www.classroomearth.org, the National Environmental Education Foundation website (http://neefusa.org/programs/classroom_earth.htm), the Water Environment Federation website or estuary program websites such as longislandsoundstudy.net. Materials obtained from these web-sites could also be modified to PowerPoint based presentations using Suffolk County-specific materials. An example simple set of PowerPoint slides that could be used to introduce the County's source of potable water, how human activity can impact groundwater quality, and groundwater's contribution to stream baseflow is provided by **Figure 5-25.**



CDM

Suffolk County Comprehensive Water Resources Management Plan
Potential Groundwater Pathways to Supply Wells & Surface Waters

Figure 5-25

Each year's lesson should begin with a brief 'quiz' or survey to assess both the knowledge and the behavior of the student with respect to water resources. The knowledge assessment portion of the survey would include questions such as "Where do you get your water from?" and the behavior assessment section of the survey would pose questions such as "How often do you clean up after your dog?" and "Do you water your lawn every day?". Survey questions should be grade-appropriate.

The lesson plans should address:

- Overview of the importance of clean water;
- Overview of Suffolk County water supply, the Suffolk County aquifer system and water cycle;
- Overview of the County's surface water resources;
- Example of how above-ground activities affect groundwater quality and surface water quality, including introduction to stormwater runoff and wastewater disposal;
- Identification of specific actions that students and their families should take to protect and preserve ground and surface water resources;
- Visual aids and discussion opportunities – kids respond better to seeing things/stories than words on paper;
- Use of hands-on activities, including lab or field work if possible to engage the students, and
- Hands-on homework, such as identifying the nearest storm drain to their home, or completing one of the on-line activities on the USEPA website.

Classes should close with another quiz or survey. While the knowledge assessment questions would remain the same as those evaluated prior to the lesson to assess how effectively the lesson was in communicating the material to the students, the behavior assessment would be slightly different than the pre-lesson assessment. The post-lesson behavior questions would be posed as "how likely are you to clean up after your dog?" and "how often will you water your lawn?".

Both the pre-lesson and post-lesson survey should be comprised of multiple choice questions (e.g. how often do you clean up after your dog would be

answered all of the time, most of the time, some of the time, hardly ever, or never) so that they can be readily scored. The results should be compiled on a grade and district basis, and forwarded to the County's public education coordinator.

The survey results should be monitored to assess the program's success, to identify the knowledge base of each age group, to identify existing behavior's contributing to pollution, and to modify subsequent year's messages to achieve the desired outcomes.

5.6 Summary of Recommendations

Surface water management recommendations are summarized on **Table 5-13.**

Table 5-13 Surface Water Protection Recommendations

Table 5-13
Surface Water Protection Recommendations

Undeveloped Areas

Within the existing Suffolk County Open Space Preservation planning context, parcels within the 25 year contributing area to surface water features should be identified and assigned a high priority for purchase, particularly when there is a significant opportunity to protect and preserve existing surface water quality.

Article 6 should be modified to require one acre density throughout all hydrogeologic zones, ***unless*** provision is made for a higher level of treatment than is provided by a typical on-site wastewater treatment system, or, the development rights from existing undeveloped open space controlled by the developer are transferred, in accordance with SCDHS standards. This would be subject to a zone-specific evaluation considering the extent and location of affected areas, resulting benefits and costs in relation to other management alternatives.

SCDHS Transfer of Development Rights standards should be re-evaluated to ensure protection of areas contributing recharge to surface water resources.

Existing Developed Areas

SCDPW should complete the alternative on-site wastewater management system pilot program.

The results of on-going SCDHS and planned SPDPW wastewater management studies should be used along with the GIS-mappings of areas contributing recharge to surface waters and relationships between density and nitrate levels developed during this study in a County-wide wastewater planning study that considers density, conventional and alternative wastewater treatment collection and treatment systems, alternative on-site systems, and operational and maintenance guidelines for existing on-site systems. Any additional high priority areas within the County where a new approach to wastewater treatment and disposal is required to protect surface water quality, ecosystems and coastal resiliency should be identified.

SCDHS OWM should continue to maintain active involvement with small sewage treatment plant system manufacturers, owners and operators, to maintain compliance with 10 mg/L nitrate effluent limits.

The effectiveness of Local Law 41-2007 in reducing groundwater nitrogen levels should be carefully evaluated and documented. If it does not achieve the objective of reducing fertilization by 10 to 25 percent, Peconic Estuary Program fertilization recommendations should be implemented on a County-wide basis.

Table 5-13
Surface Water Protection Recommendations (continued)

Farmers that participate in County preservation programs, purchase of development rights, and other programs should be required to participate, by agreement, in the AEM program and implement BMPs to reduce nitrogen release to surface waters.

Alternative pest management approaches or products should be identified to provide the agricultural community with safer alternatives to protect both groundwater quality and crops.

VOC Reductions

The SCDHS Office of Pollution Control "Reducing Toxics" capital program should be implemented to identify the sources of observed VOC contamination, develop an approach to reduce contaminant sources and investigate the role of household products. If residential areas are identified as significant sources, the County should respond by:

- Incorporating information on the types of household products that may contain VOCs, and preferred alternatives into the education and outreach program,
- Regulating the use and disposal of products with viable alternatives
- Incorporating information on appropriate use and disposal of household products using VOCs into the public education and outreach and school curricula development programs
- The SCDHS Office of Pollution Control should increase the frequency of facility inspection in accordance with their facility ranking system targets; inspection of facilities within the 25-year contributing area to surface water resources should be prioritized.

PPCPs

To the extent staffing permits, existing analytical methods should be expanded to increase the number of PPCPs analyzed to those identified on the CCL 3.

Findings from other jurisdictions should be reviewed and assessed to guide water management and policy decisions.

Public outreach and education efforts encouraging appropriate disposal of pharmaceuticals should be continued.

Table 5-13
Surface Water Protection Recommendations, continued

Surface Water Monitoring Programs

The existing Beach monitoring program should be continued to protect public health.

The existing Estuary Program Monitoring should be continued.

The Surface Water Monitoring program should be reinstated to assess the causes of use impairments, evaluate stream contributions to estuary contaminant loadings, to assess the relationships between ground and surface water quality, and to monitor the effectiveness of water quality improvement programs.

A study should be conducted to quantify nitrogen transformation and transport from groundwater to surface water bodies to better estimate the impacts of groundwater quality on surface water quality, and to better identify landside nitrogen reduction targets to achieve surface water quality goals.

SCDHS should support the development of TMDLs for impacted water bodies as necessary.

Database Development and Reporting

A new user-friendly, integrated geo-spatially referenced database should be developed to house all well, pumping, water quality, facility, discharge and surface water information.

SCDHS OWR should maintain the database and implement an approach to routinely share data and information with other stakeholders.

Reports on ground and surface water quality should be published annually.

Public Outreach and Education

SCDHS should coordinate with other Suffolk County departments, the three estuary programs and water suppliers to leverage public education and outreach concerning water resources protection, non-point sources, conservation, household hazardous waste, PPCPs, fertilization, etc. SCDHS should work with Suffolk County schools to integrate specific lesson plans into Earth Day and Earth Science curricula throughout the County.

5.7 Implementation

5.7.1 Implementation Framework

The framework for implementation of the surface water resource management recommendations is included in Section 9. The recommendations are intended to provide the framework to guide surface water quality protection in the years ahead, within the context of adaptive management. In addition, a comprehensive summary of estuary program recommendations can be found in Section 6 of this document.

Table 9-1 identifies the "owner", or entity responsible for initiating and coordinating implementation of each key milestone that must be achieved or action that must be taken to fully implement each recommendation, along with other stakeholders or collaborators whose participation will be required. The time frame for implementation of each recommendation is identified as short term (less than five years), medium (five to ten years) or long term (over ten years). Successful implementation of each recommendation is subject to a variety of variables, including funding availability, as well as other factors that will influence the timing of implementation, or even whether the recommendation can be fully implemented (e.g., community support). Most of the key activities associated with protection of surface water quality have already been initiated.

It is the County's intention that this table provide a flexible framework to guide water resource management, acknowledging that implementation of each recommendation is likely to be affected by changing priorities and opportunities and the availability of key resources, including funding. Because the County's surface waters are groundwater fed, implementation of recommendations to improve groundwater quality identified in **Table 9-1** will also help to improve surface water quality. Recommendations to implement wastewater management are explained in detail in Section 8 and a complete set of wastewater management recommendations may also be found in Section 9 of this Plan.

There are numerous direct and indirect costs and benefits associated with various Plan recommendations. A comprehensive analysis of these costs and benefits was out of the scope of this Plan, and should be further explored as implementation of individual recommendations is considered, to the extent practicable. Costs to improve surface water quality considered here are largely linked to the costs of improving the quality of the groundwater that provides a significant component of baseflow to the County's surface water features. In addition, funding will be required to implement a study to assess nitrogen transport/transformation from groundwater to surface water bodies so that the

impacts of groundwater contaminants upon surface water quality can be better quantified, and landside nitrogen reduction targets to achieve surface water quality goals can be established. The three recommended capital projects outlined in Section 3.7.1 and in Section 8 (development of a comprehensive wastewater management plan, the Reducing Toxics program and development of a GIS-based data management program) would also help to protect surface water quality.

Water quality management includes water quality protection through improved methods of collecting, organizing, evaluating and communicating data and facility inspections to County water resource managers and to other agencies and water purveyors. Prevention of releases of contamination to groundwater by improved and more efficient inspection, record keeping and communication helps to protect downgradient surface water resources, through prevention of contaminant releases.

Full implementation of Plan goals is a long-term process requiring coordination and collaboration with agencies and organizations on the federal, state, county and local level, a careful reevaluation of resource allocation issues, and will also necessitate exploring grant opportunities and other innovative and alternative funding mechanisms. Suffolk County should continue to work with state and federal agencies and stakeholders to explore implementation options to cost-effectively execute Plan recommendations.

5.7.2 Implementation Responsibilities

Responsibilities for many of the surface water resources management activities identified are currently shared by a number of agencies, on the federal, regional, state, county, town and local levels. With the regulatory authority provided in the Suffolk County Sanitary Code, SCDHS currently has the primary responsibility for continuing to implement many of the recommendations identified, such as monitoring beaches for the potential presence of pathogens (as indicated by the presence of enterococcus in marine waters). Other key collaborators who will support implementation efforts include SCDEDP, SCDPW, SCWA, USEPA, USGS, NYSDOH, NYSDEC, Towns, Estuary programs and Cornell Cooperative Extension of Suffolk County. Review of water quality data, the number of water body segments on the state's 303(d) list, and continued threats to the marine resources indicate that additional efforts and continued vigilance will be essential to protect and preserve the resources for continued use and enjoyment by future generations. It is essential that the County take a long term view with respect to water resource protection, as there will be no quick-fix solutions available if the current trends are permitted to continue.

The IBM Smarter Cities Report has recommended that water resource management responsibilities be centralized in a single authority. While many other agencies share responsibility for various aspects of water resources management, continue to play very significant roles in water resource protection, and may administer similar overlapping programs, it is recommended that a single agency have primary responsibility for program coordination. Clearly defined roles and responsibilities will help to ensure that the work is completed as required to protect the County's water resources. SCDHS has an established framework for beach and surface water monitoring and data collection, regulatory authority to monitor potential point sources of contamination, and the capability of using powerful tools such as computer models and GIS to evaluate most contemporary water resources issues.

Nonetheless, all agencies involved with water resources management must be responsible for sharing the information and the results of their evaluations to inform and guide programs being implemented under the auspices of County agencies, State and Federal regulators, Town and village governments, and water suppliers. Ready access to accurate information is increasingly important given the ramifications of land use and policy decisions that rely upon accurate and timely data and data interpretation.

5.7.3 Assessment Monitoring

Implementation monitoring has two objectives:

- To monitor implementation of the Plan recommendations, and
- To monitor the effectiveness of the Plan recommendations in achieving the Plan goals and objectives.

It is important to monitor the effectiveness of the Plan recommendations in achieving the stated goals and objectives, focusing on measures of progress that are quantifiable; the USEPA has reported that if indicators cannot be measured, then it is not possible to identify progress towards achieving goals. The effectiveness of these recommendations in achieving water resource protection goals and objectives will be assessed according to key performance indicators, also summarized in **Appendix K**.

Annual monitoring of Plan effectiveness and early assessments of Plan effectiveness will allow the County to modify their approach within an adaptive management framework and make improvements as necessary. The effectiveness of Plan recommendations in improving surface water quality, for instance, can be readily assessed by compiling and reviewing the surface water quality data that is collected by SCDHS and other estuary program

cooperators. Ineffective actions and programs should be discarded and those recommendations that are most effective can be further enhanced.

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