HOOK POND WATER QUALITY IMPROVEMENT STUDY

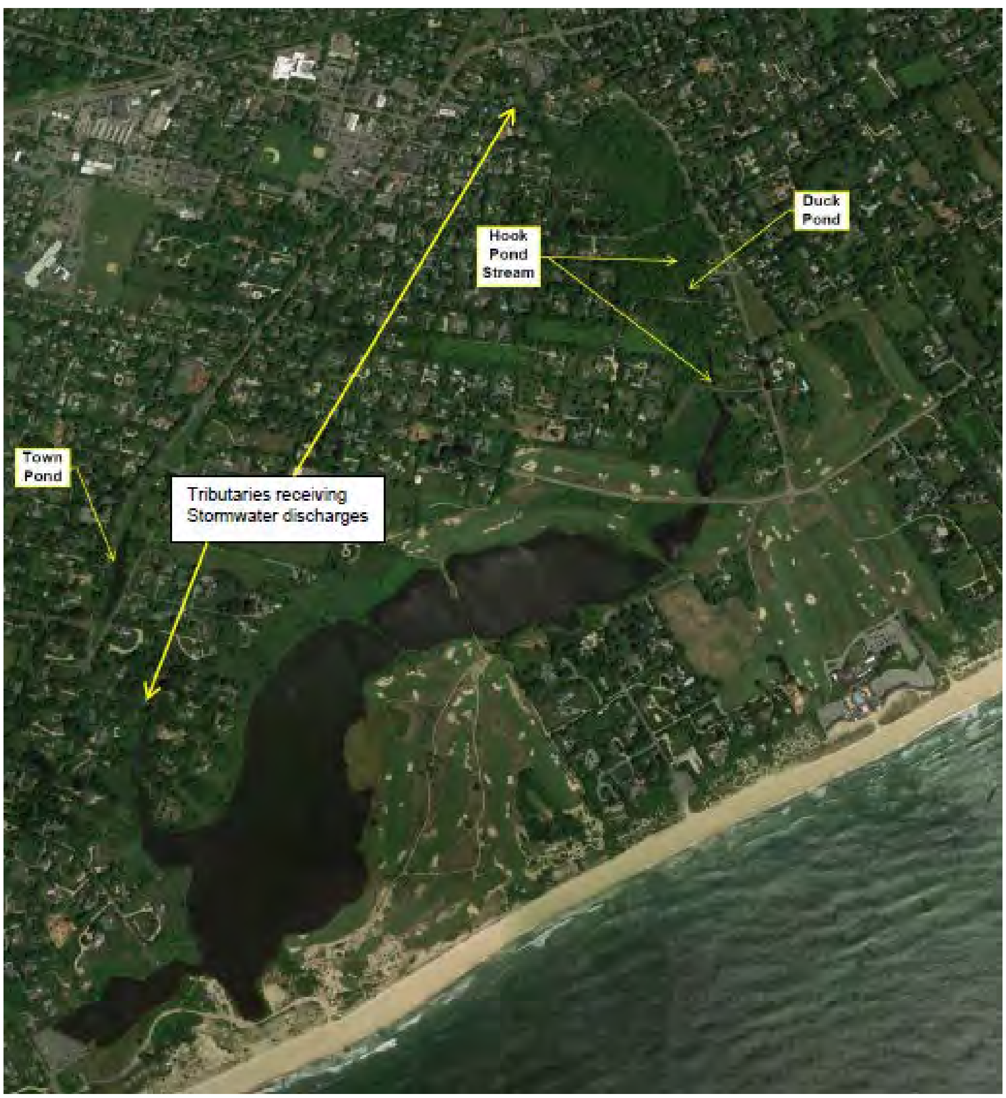
DIAGNOSIS, PROBLEM IDENTIFICATION & MANAGEMENT PLAN – APRIL 2015

TASKS 1 – 5 REPORT - DIAGNOSIS OF HOOK POND WATER QUALITY – PAGE 2 OF COMBINED PDF DOCUMENT

TASKS 6 – 9 REPORT - DATA GAPS, RECOMMENDED MONITORING PROGRAM & WATER QUALITY RESTORATION GOALS –– BEGINS ON PAGE 102 OF THE COMBINED PDF DOCUMENT

TASKS 10 – 13 PROBLEM IDENTIFICATION, RESTORATION MEASURES & MANAGEMENT PLAN – BEGINS ON PAGE 114 OF THE COMBINED PDF DOCUMENT

APPENDIX B–H FROM THE TASK 1-4 REPORT – BEGINS ON PAGE 143 OF THE COMBINED PDF



Environmental Engineers/ Consultants
LOMBARDO ASSOCIATES, INC.

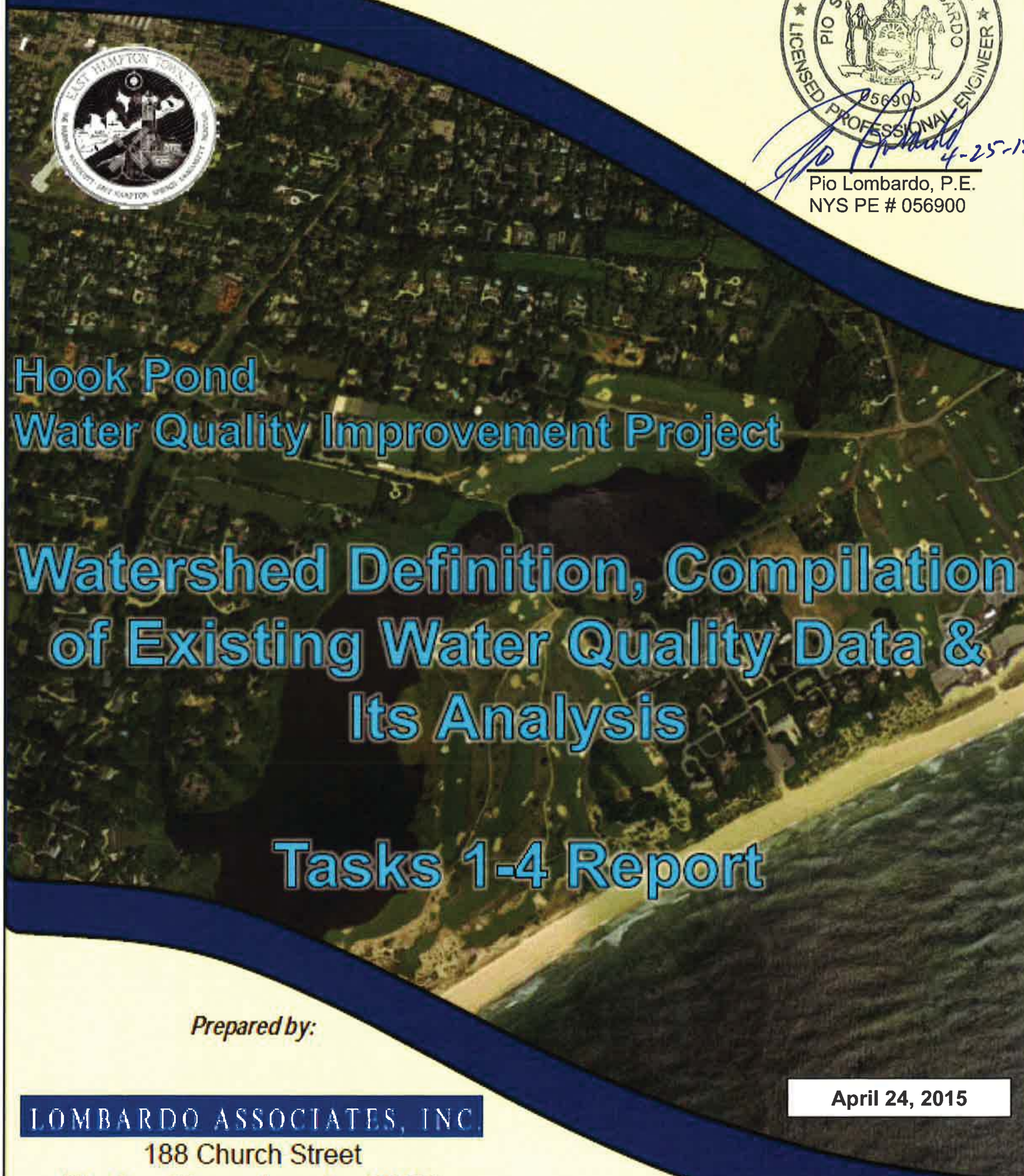
Pio Lombardo, P.E.
NYS PE # 056900

4-25-15

Hook Pond
Water Quality Improvement Project

Watershed Definition, Compilation of Existing Water Quality Data & Its Analysis

Tasks 1-4 Report



Prepared by:

LOMBARDO ASSOCIATES, INC.
188 Church Street
Newton, Massachusetts 02458

April 24, 2015

TABLE OF CONTENTS

List of Figures

List of Tables

1. PROJECT BACKGROUND

SCOPE

Hook Pond is located in the Town of East Hampton in Suffolk County, NY. Recent water quality data indicates that the pond is eutrophic and harmful algal blooms a threat. Lombardo Associates, Inc. (LAI) was retained by the Village of East Hampton, with partial funding by the Town of East Hampton, to conduct a Hook Pond Water Quality Improvement Study consisting of Diagnosis, Problem Identification & Management Plan Development.

This Report presents the results of the performance of project tasks 1-5, which consist of:

Diagnosis

1. Kickoff meeting and Site Visit
2. Watershed Definition and Land Use
3. Compilation of Existing Water Quality Data
4. Analysis of Water Quality Data
5. Tasks 1-4 Report and Presentation

Remaining project tasks with their grouping by Reports to be issued are:

Data Gaps, Recommended Monitoring Program and Water Quality Restoration Goals

6. Water Quality Sampling Plan Design
7. Water Quality Sampling Plan Implementation
8. Final Water Quality Sampling and Recommendations
9. Water Quality Restoration and Protection Goals

Problem Identification, Restoration Measures & Management Plan

10. Water Quality Impairment Source Identification & Quantification
11. Conceptual Development of Restoration Measures
12. Quantifiable Performance Metrics and Monitoring Requirements
13. Maintenance and Implementation Cost Estimates

Community Outreach

14. Community Outreach Meetings

A brief summary description of how each study activity would be performed under the project budget limitations and per the project contract terms is presented on Table 1-1.

Table 1-1 Description of Study Activities Approach

Study Activity	Basic Approach
Review of existing information	✓
Water and nutrient balances,	simplified
Water quality data collection,	none
Determination of required nutrient reductions & sources,	estimated
Identification, evaluation and costing of remedial actions,	simplified
Community outreach meetings	✓

Task 7 Water Quality Sampling Plan Implementation will be performed as contract amendments, if any, are issued by the Village.

SCHEDULE

The project schedule is presented on Figure 1-1.

Figure 1-1 Proposed Project Schedule

Schedule for Hook Pond Water Quality Restoration Plan Development Project							
	Months After Authorization to Proceed	1	2	3	4	5	6
Task	Task Description	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15
1	Kickoff Meeting and Site Visit						
2	Watershed Definition and Land Use						
3	Compilation of Existing Water Quality Data						
4	Water Quality Data Analysis						
5	Tasks 1-4 Report and Presentation						
6	Water Quality Sampling Plan Design						
7	Water Quality Sampling Plan Implementation	*To Be Determined*					
8	Final Water Quality Sampling and Recommendations						
9	Water Quality Restoration and Protection Goals						
10	Water Quality Impairment Source Identification & Quantification						
11	Conceptual Development of Restoration Measures						
12	Quantifiable Performance Metrics and Monitoring Requirements						
13	Maintenance and Implementation Cost Estimates						
14	Community Outreach Meetings						

PROJECT MANAGEMENT & REVIEW COMMITTEE

The project is managed by the Village of East Hampton through Town Administrator Becky Molinaro. A project review committee exists with the members of:

1. Becky Molinaro, Village of East Hampton
2. Barbara Borsack. Village Trustee
3. Kimberly Shaw, Town Director of Environmental Protection
4. Diane McNally, Town Trustee
5. Kevin MacDonald, The Nature Conservancy
6. Robert Deluca, Group for the East End
7. Scott Fithian, Village DPW Superintendent
8. Mike Bouker, Village Deputy DPW Superintendent
9. Arthur Graham, Maidstone Golf Course
10. Linda James, Hook Pond Lane property owner
11. Eve Lipper, Hook Pond Lane property owner
12. Peter Solomon, Pond area property owner

Governmental Jurisdictions Applicable to Hook Pond

The Village, Town and East Hampton the Board of Trustees has varying jurisdictions for areas within the Hook Pond watershed.

The Village of East Hampton Officials is:

    - Mayor Paul Rickenbach, Jr.

- Trustees:
    - Richard T. Lawler
    - Bruce A. Siska
    - Barbara S. Borsack
    - Elbert T. Edwards

The Town of East Hampton officials are:

    - Supervisor Larry Cantwell

- Town Council:
    - Peter VanScoyoc
    - Sylvia Overby
    - Kathee Burke-Gonzalez
    - Fred Overton

The East Hampton Trustees are:

    - Timothy Bock
    - Brian Byrnes
    - Stephanie Forsberg
    - Deborah Klughers
    - Stephen Lester
    - Sean McCaffrey
    - Diane McNally
    - Nathaniel Miller
    - Bill Taylor

Lombardo Associates, Inc. Project Team

Lombardo Associates, Inc. Project Team consists of the following professionals for the Basic Plan:

Pio Lombardo, P.E. Principal Investigator & Project Manager
Gary Rubenstein, Project Engineer
Emeritus Professor Eugene Welch, Limnologist
Paul Phillips, GIS Manager
Professor Christopher Gobler, Water Quality Scientist

With

Professor William Robertson, Hydrogeologist & Geochemist
John Kastrinos / Chris Jones, Hydrogeologists

available for the optional studies of:

- Field studies to determine levels of wastewater phosphorus removal in drainfields / soils
- Groundwater modeling for predicting where discharges to groundwater, such as wastewater, will travel and emerge to a surface water body, i.e. to Hook Pond or under Hook Pond to the ocean.

2. BRIEF SUMMARY OF PREVIOUS & ONGOING STUDIES

Following is a listing and brief overview of previous and ongoing studies on water quality and quantity issues in the Hook Pond watershed. The data/findings from each of these studies is included in the appropriate Chapters 3 and 4 sub-sections.

2.1 FINDINGS OF A LIMNOLOGICAL SURVEY OF HOOK POND, EAST HAMPTON, NEW YORK, ECOLOGICAL ANALYSTS, INC. 1981

The study collected data on:

- water depth
- sediment depth and quality
- fisheries
- aquatic vegetation
- limited water chemistry of 14 watershed locations on July 29-30, 1981
- Water column chemistry and bacteriology on July 30, 1981 at 3 Pond locations

Hook Pond was determined to be eutrophic. Preparation of a watershed management plan was recommended. Dredging, chemical treatment, flushing, sewers, limiting golf course fertilizer practices and limiting waterfowl were discussed. Concluded there is no easy / inexpensive solution to Pond's eutrophication problem.

2.2 1997 WATER QUALITY DATA COLLECTED ON HOOK POND WATERSHED BY THE TOWN DEPARTMENT OF NATURAL RESOURCES

Water quality data was collected at 13 locations in Hook Pond and contributing areas for a range of water quality constituents generally monthly during 1997.

2.3 USGS GROUNDWATER STUDIES, GROUNDWATER ELEVATIONS AND WATER QUALITY

The US Geological Survey (USGS) published the following relevant studies on groundwater on the South Fork that contain hydrogeological and groundwater information relevant to Hook Pond.

- Shubert, Christopher, 1998, Areas Contributing Ground Water to Peconic Estuary, and Ground-Water Budgets for North and South Forks and Shelter Island, U.S. Geological Survey Water-Resources Investigations Report 97-4136. http://ny.water.usgs.gov/pubs/wri/wri974136/WRIR97-4136toc.html

- Shubert, Christopher, 1999, Ground-Water Flow Paths and Travel time to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York, USGS, Water Resources Investigations Report 98-4181. http://ny.water.usgs.gov/pubs/wri/wri984181/WRIR98-4181.pdf

At various time intervals, the US Geological Survey (USGS) has monitored groundwater levels at 7 wells and quality at 6 wells that are within the Hook Pond watershed during the period 1974 through 2015. Appendices C & D contain the data from the wells.

Additionally, the USGS published Water-Table and Potentiometric-Surface Altitudes in the Upper Glacial, Magothy, and Lloyd Aquifers beneath Long Island, New York, April–May 2010 by Jack Monti, Jr., Michael Como, and Ronald Busciolano. http://pubs.usgs.gov/sim/3270/

2.4 Village of East Hampton Hook Pond Drainage Study", Dvirka and Bartilucci Consulting Engineers, October 2003

The purpose of the study was to determine the cause of the higher Pond surface water elevation as compared to the weir chamber of the outfall structure, which has caused localized flooding. The drainage study performed the following analysis:

- Determined the storm water runoff rates for various storm events, including storage capacity of Hook Pond
- Hydraulic analysis of the outfall structure and 20 inch pipe

The study concluded that the higher Pond elevation was due to outfall pipe obstructions. The study recommended:

- ✓ Install a screen upstream of the gate valve
- ✓ Clean and assess the 20 inch HDPE outfall pipe
- ✓ Replace 12" x 12" gate valve as it is not functioning properly
- ✓ Remove excess concrete at bottom of outlet chamber
- ✓ Remove weir to elevation 1.2 – which are the inverts of both the tide gate and outfall pipe openings
- ✓ Dredge in front of gate valve

Following completion of above and its evaluation,

- ✓ Measure Pond levels to determine if improvements are effective
- ✓ Replace 80 foot section of 20' pipe if needed
- ✓ Stormwater model assumption of groundwater at 3.0 feet elevation needs to be verified by installation and monitoring of three groundwater observation wells

It is understood that none of these recommendations have been implemented.

2.5 Maidstone Club Irrigation Improvement Project, Draft & Final Environmental Impact Statements", 2013 – 2014

As part of its Environmental Impact Statement (EIS), The Maidstone Club summarized previous studies and collected additional data as follows:

1. Groundwater sampling at 6 locations on January 29, 2013
2. Surface water sampling at 6 locations on January 30, 2013

The EIS concluded that phosphorus was the controlling nutrient for Hook Pond water quality behavior.

2.6 Suffolk County Department of Health Services Groundwater Well Water Quality Monitoring

The Suffolk County Department of Health Services (SCDHS) has monitored the quality of groundwater wells and surface water locations in or near Hook Pond for the following programs:

- Water Supply Wells – residential and small community
- Golf Course Groundwater Monitoring - Maidstone Club, East Hampton Well Number S-115135. Phosphorus not monitored. Nitrate-N averaged 5 mg/L.
- Investigation into contamination caused by a dry cleaner formerly on Newtown Lane for the period July 2009 through May 2010.

2.7 Town of East Hampton Trustees Water Quality Data, 2013-2014, as collected by Professor Chris Gobler

During 2013 and 2014, under contract with the Trustees of the Town of East Hampton, Professor Christopher Gobler collected Hook Pond water quality data with a focus on bacteria, algal concentrations and harmful algae species. It is expected that the Trustees Hook Pond water quality data collection program will continue in 2015.

2.8 Town of East Hampton Comprehensive Wastewater Management Plan, 2013 - 2014

The Town of East Hampton Comprehensive Wastewater Management (CWMP), as prepared by Lombardo Associates, Inc. in 2013 – 2014, performed a lot by lot analysis of wastewater management issues on all properties within the Town and Village. The CWMP also performed preliminary Total Maximum Daily Load (TMDL) analysis for Hook Pond with consideration of nitrogen and phosphorus loadings using a preliminary definition of the Pond's contributing watershed based upon groundwater travel time maps as prepared by the Suffolk County Water Resources Management Plan.

2.9 Linda James Photographic Survey

Property owner Linda James

3. HOOK POND CHARACTERISTICS

3.1 Historical

According to the Maidstone Dec 13, 2013 DEIS, Hook Pond was open to the ocean until November 1933, when sand dune stabilization efforts isolated the pond from the ocean. A one way drainage outlet was added to control pond water levels as needed for storm events. The water level is maintained by a Village-owned control gate and culvert, located on in the southwestern end of the pond. The Village operates the control gate to lower water levels after or in advance of storm events and also for control of phragmites.

However according to the 1981 limnology study, prior to the mid-1950s Hook Pond was saline and connected directly to the ocean. During the mid-1950s an outflow pipe was added and the sand dunes stabilized to prevent wash through. This change essentially created a freshwater pond with flow only going into the ocean.

Per the Maidstone DEIS, Hook Pond and related water bodies are classified as "Class C" based on the New York State surface water classification system. Pursuant to New York State Environmental Conservation Law, Part 701: Classifications-Surface Waters and Groundwaters §701.8, the usage of Class C waterbodies includes fishing and fish propagation and they are suitable for recreation contact.

Per the EHDNR 1997 Report, Hook Pond is a water table pond, i.e. its surface is at the same elevation as the water table under the land surrounding the pond. Its elevation is controlled by a weir at the south end which passes overflow water out to the ocean by way of an overflow pipe situated on the ocean beach.

3.2 Watershed Area

As shown on Figure 3-1, the watershed area of Hook Pond is approximately 2,600 acres (4.06 sq. miles), within the Town and Village of East Hampton. The watershed is comprised of Hook, Town and Duck Ponds, wetlands/small creeks and lands within the Pond's watershed. Flow to Hook Pond is a combination of:

- Direct rainfall
- Groundwater
- Tributary flows – which are exposed groundwater and recipient of stormwater discharges
- Stormwater runoff that is discharged, on the west, via Town Pond and on the east via the brook upgradient of Duck Pond.

The Town of East Hampton CWMP estimated groundwatershed boundaries, as presented on Figure 3-1, were based upon groundwater flow time maps as prepared by the SCDHS and presented on Figure 3-2. Figure 3-3 presents the Hook Pond surface watershed boundaries as developed in the Maidstone DEIS with the 2003 Hook Pond Drainage Study surface watershed presented on Figure 3-4, both of which are provided for reference purposes. Groundwatershed is more relevant for Hook Pond. Surface watersheds only affect the Pond when stormwater systems drain waters into the Hook Pond watershed when the water would normally have infiltrated the soil and drained to another watershed – an unlikely situation in Hook Pond watershed.

Water that reaches groundwater and materials that are discharged to lands within the watershed area that are not removed by or within soils, eventually discharge to Hook Pond. Stormwater and its constituents discharge to Hook Pond tributaries on the west at Hook Pond Lane and on the east at Fithian Lane via the stormwater system as shown on Figure 3-4. The locations of the watershed Ponds and tributaries are shown on Figure 3-5.

Approximately 80% of the land area in the watershed is developed. Approximately 50% of the land and parcels are each in the Town and Village.

Figure 3-1 Hook Pond Groundwatershed

Figure 3-2 Hook Pond Groundwater Travel Time

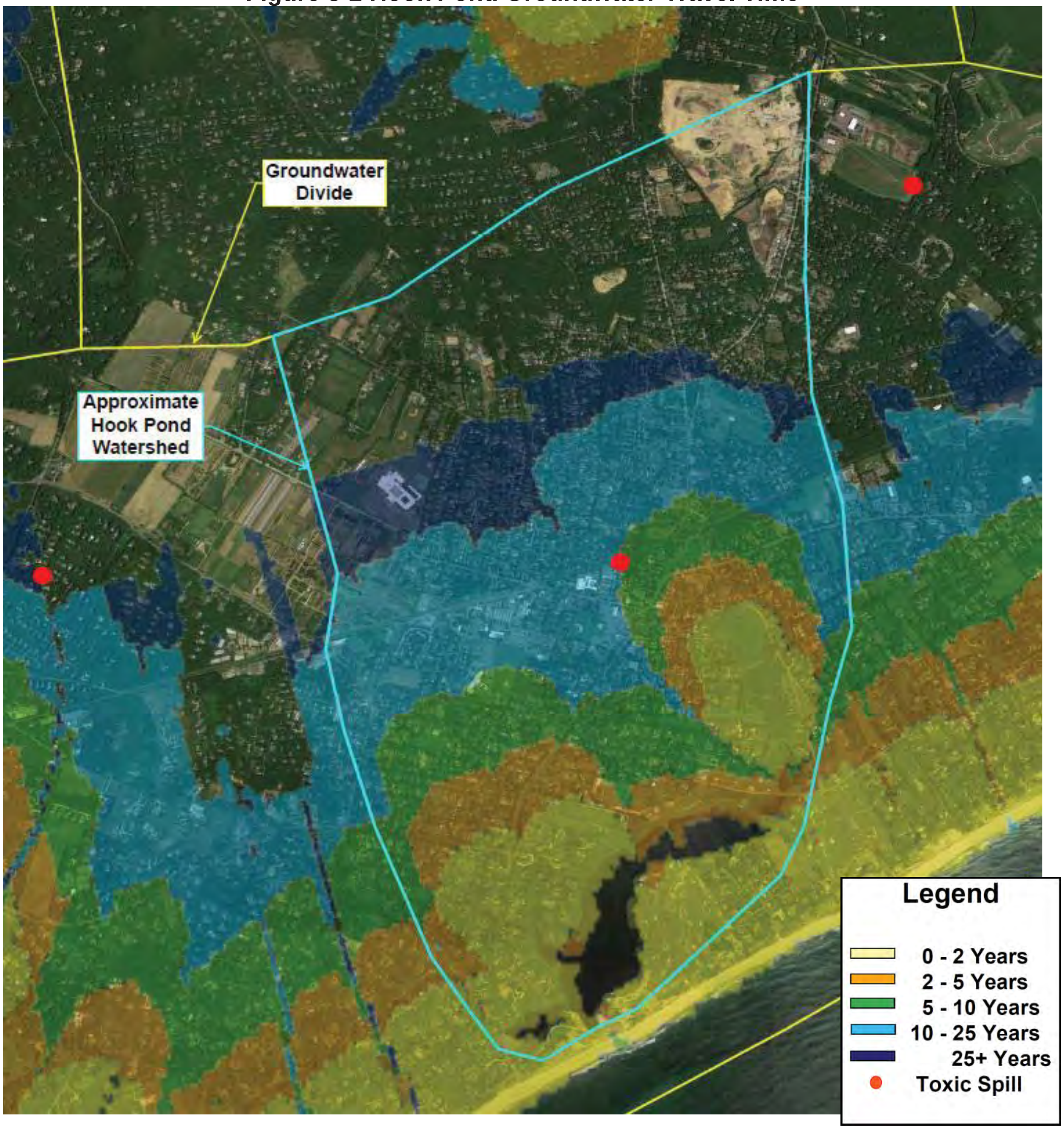


Figure 3-3 Hook Pond Surface Watershed (DEIS, 2013)

Figure 3-4 Hook Pond Surface Water-Stormwater Drainage Map

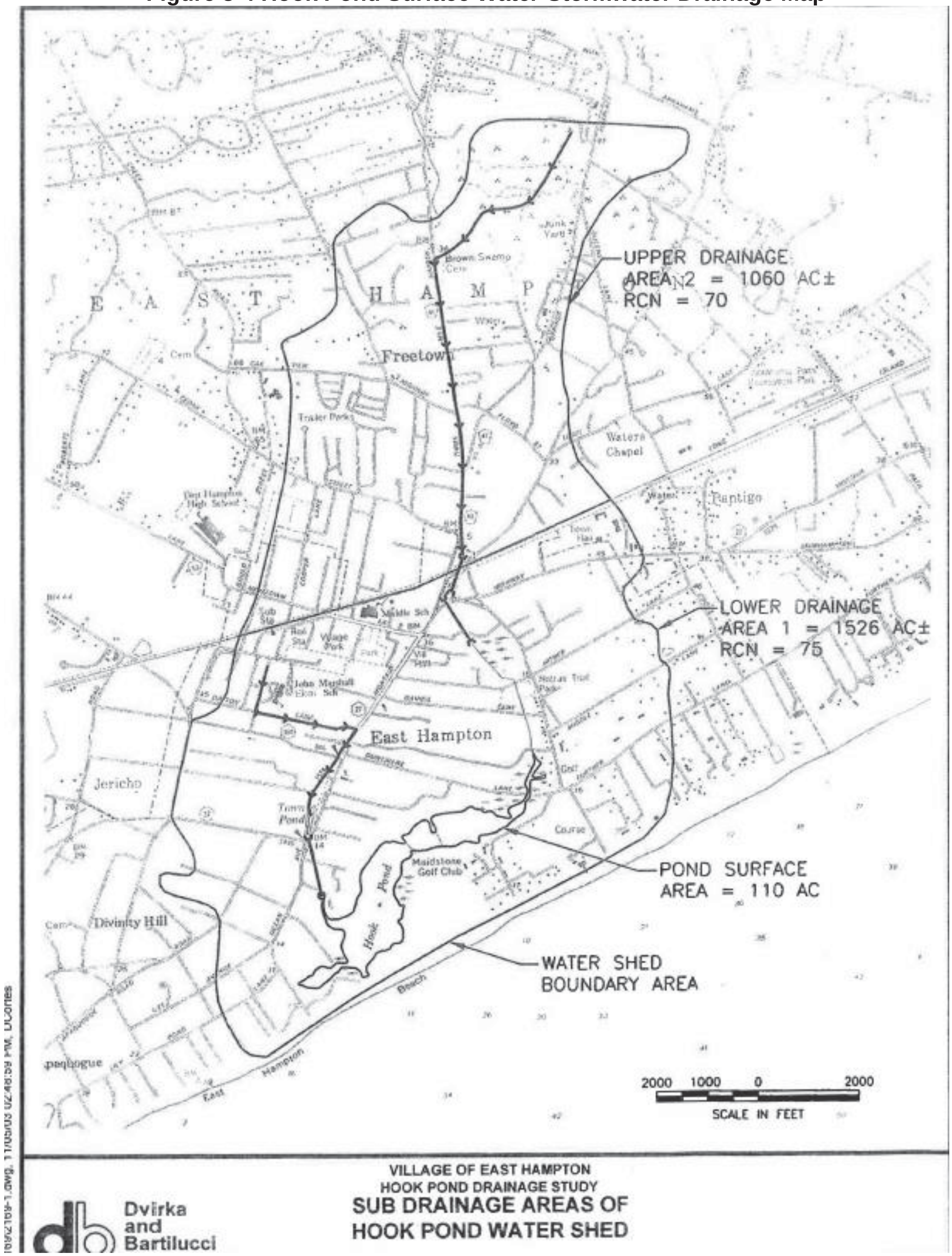
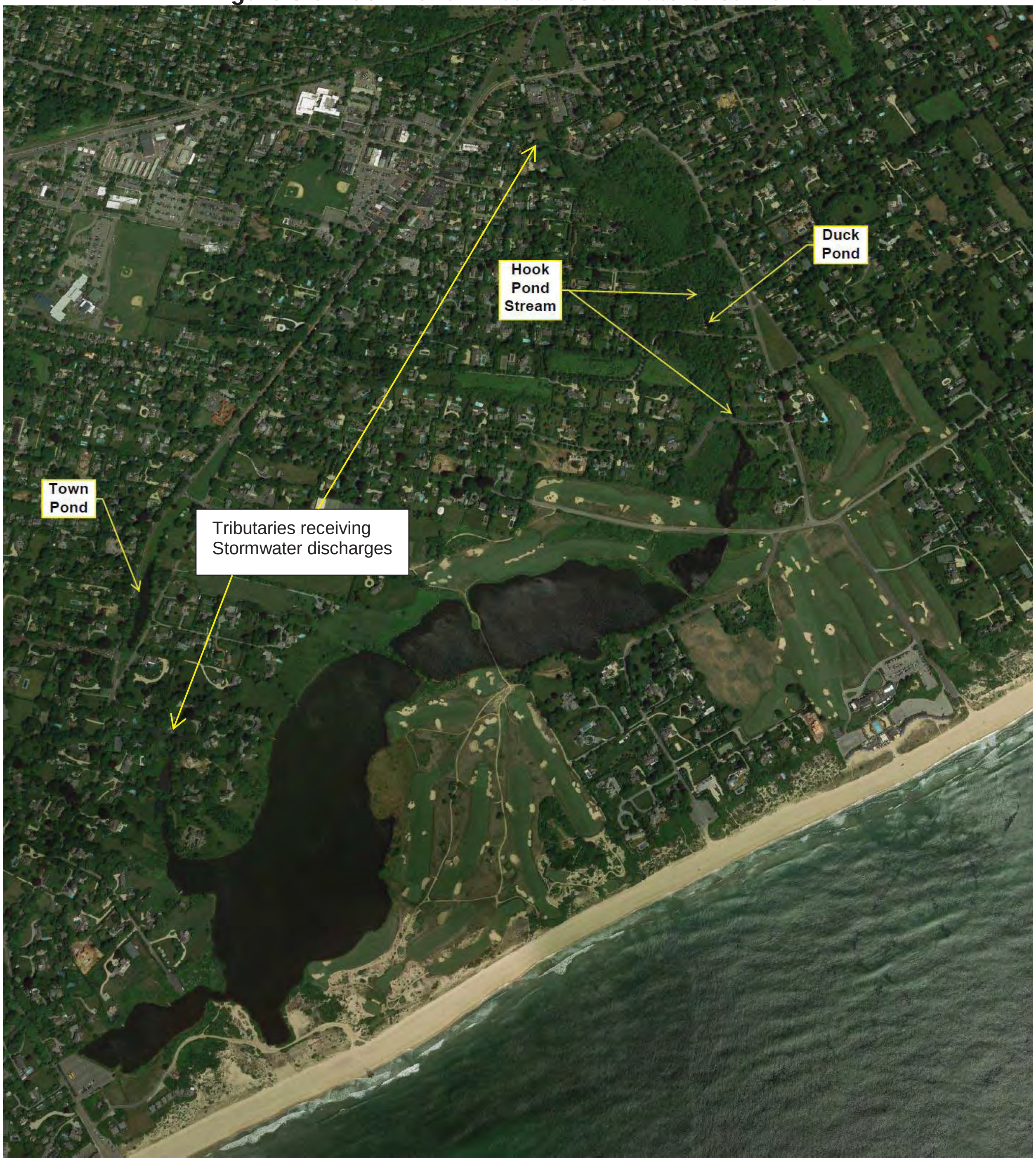


Figure 3-5 Hook Pond Tributaries & Watershed Ponds



3.3 Wetlands, Floodplains, SLOSH Areas and Soils

Figures 3.6, 3.7, 3.8 and 3.9 present the DEC Wetlands, FEMA Floodplains, Sea, Lake and Overland Surges from Hurricanes (SLOSH) areas of Hook Pond and watershed Soils Map, respectively. Figure 3-9 presents the USDA soils types grouped by suitability for onsite wastewater disposal systems. The soils within the Village area of the Hook Pond watershed largely fall in the category of having a low hydraulic loading rate (HLR). Soils with low HLRs require larger systems or treatment of effluent prior to discharge. The soils in the Town areas of the watershed are predominantly sandy soils that are suitable for onsite systems.

Figure 3-6 Hook Pond 100-YR FEMA Floodplains

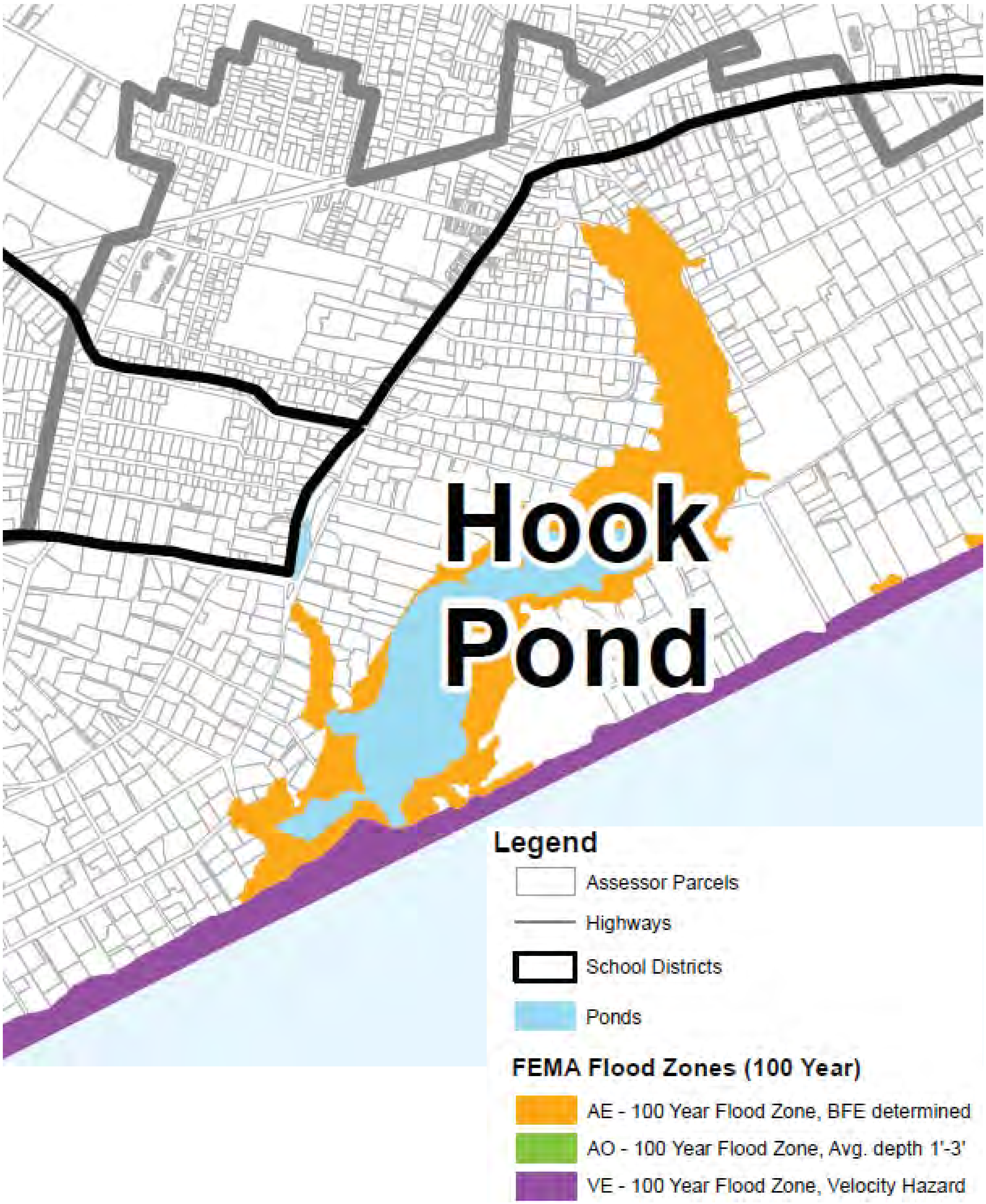


Figure 3-7 Hook Pond SLOSH Zones

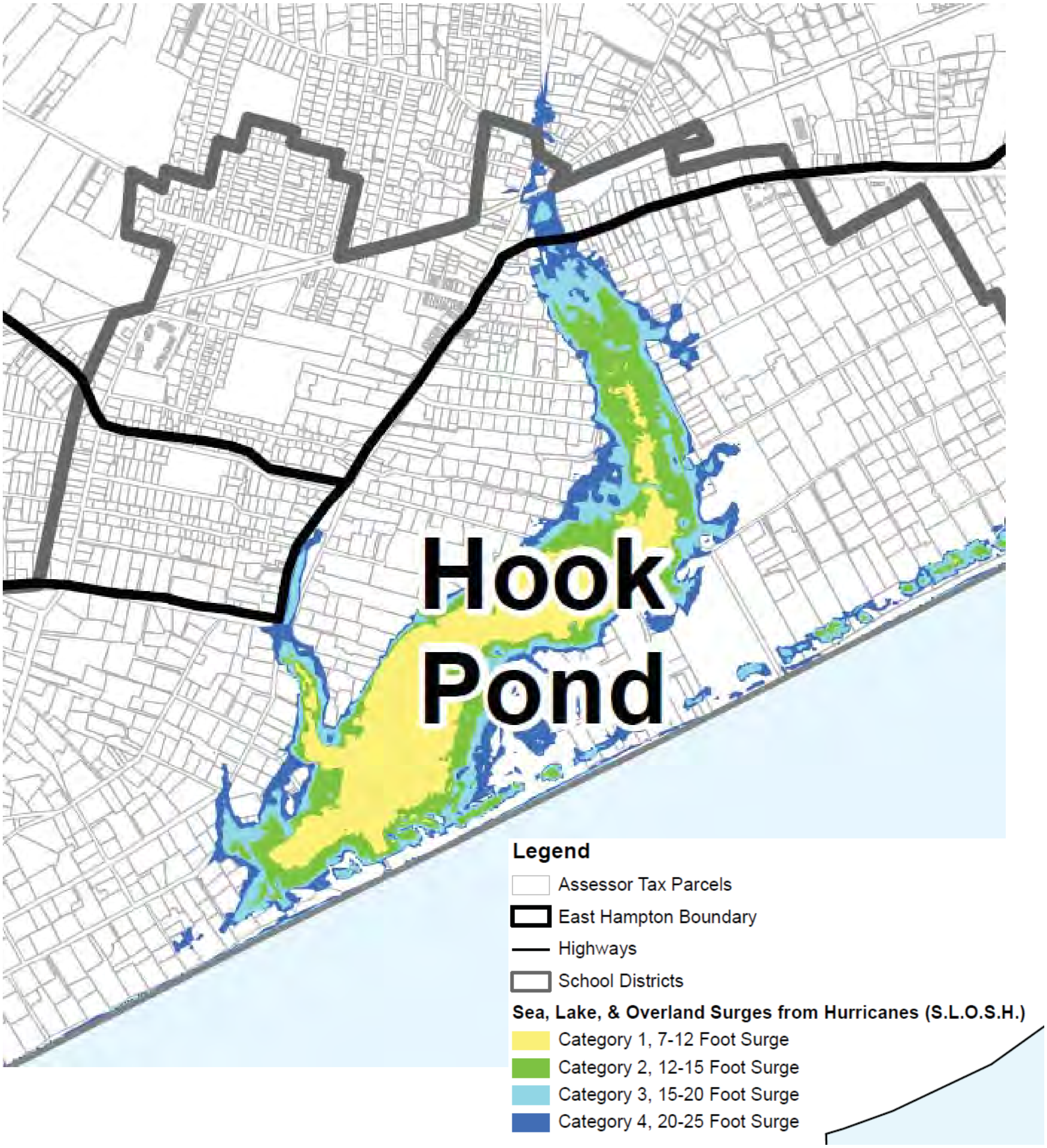


Figure 3-8 Hook Pond Watershed Boundaries per EHDNR - 1997

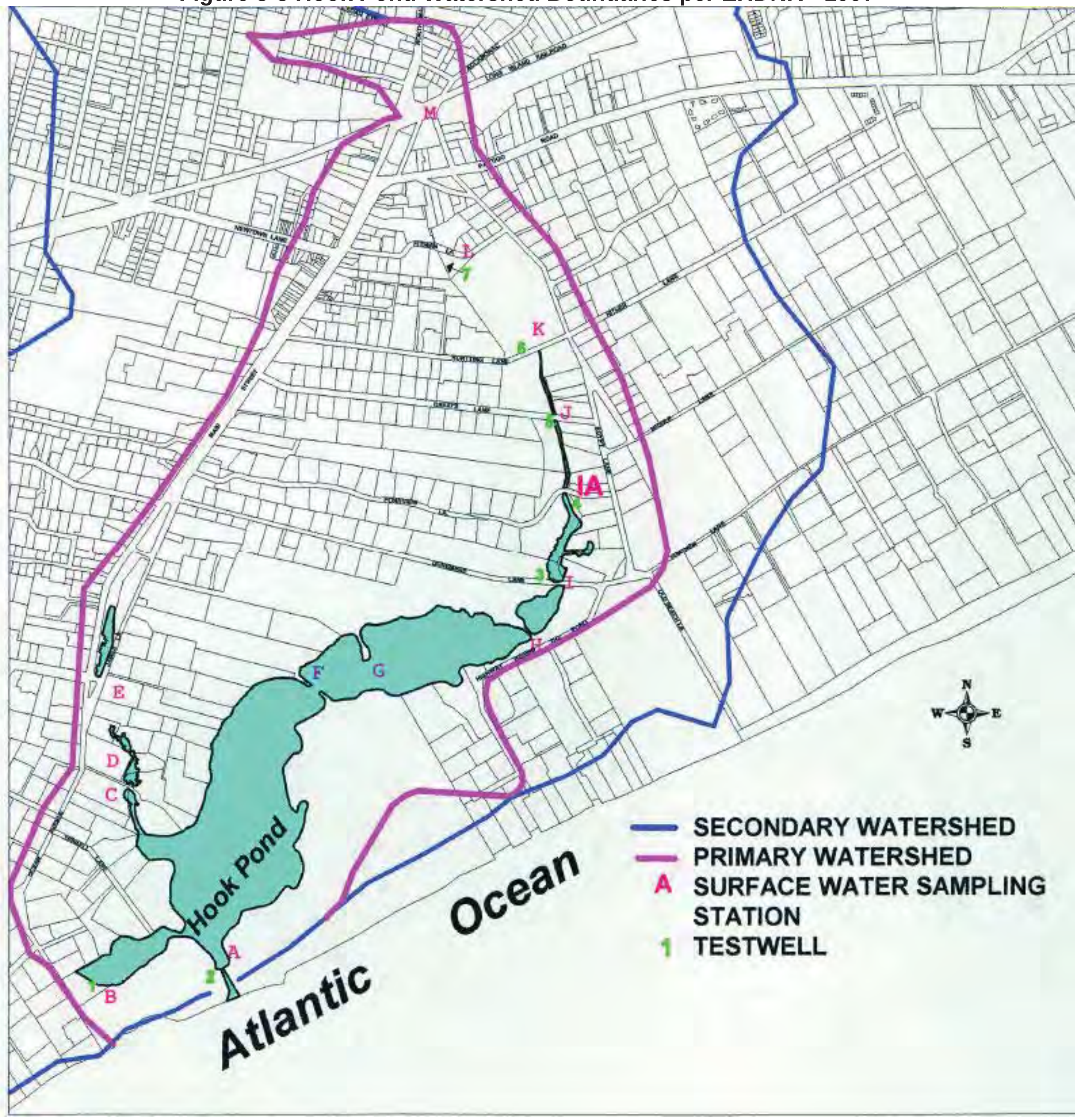


Figure 3-9 Hook Pond Watershed Soils by Suitability for Onsite Systems

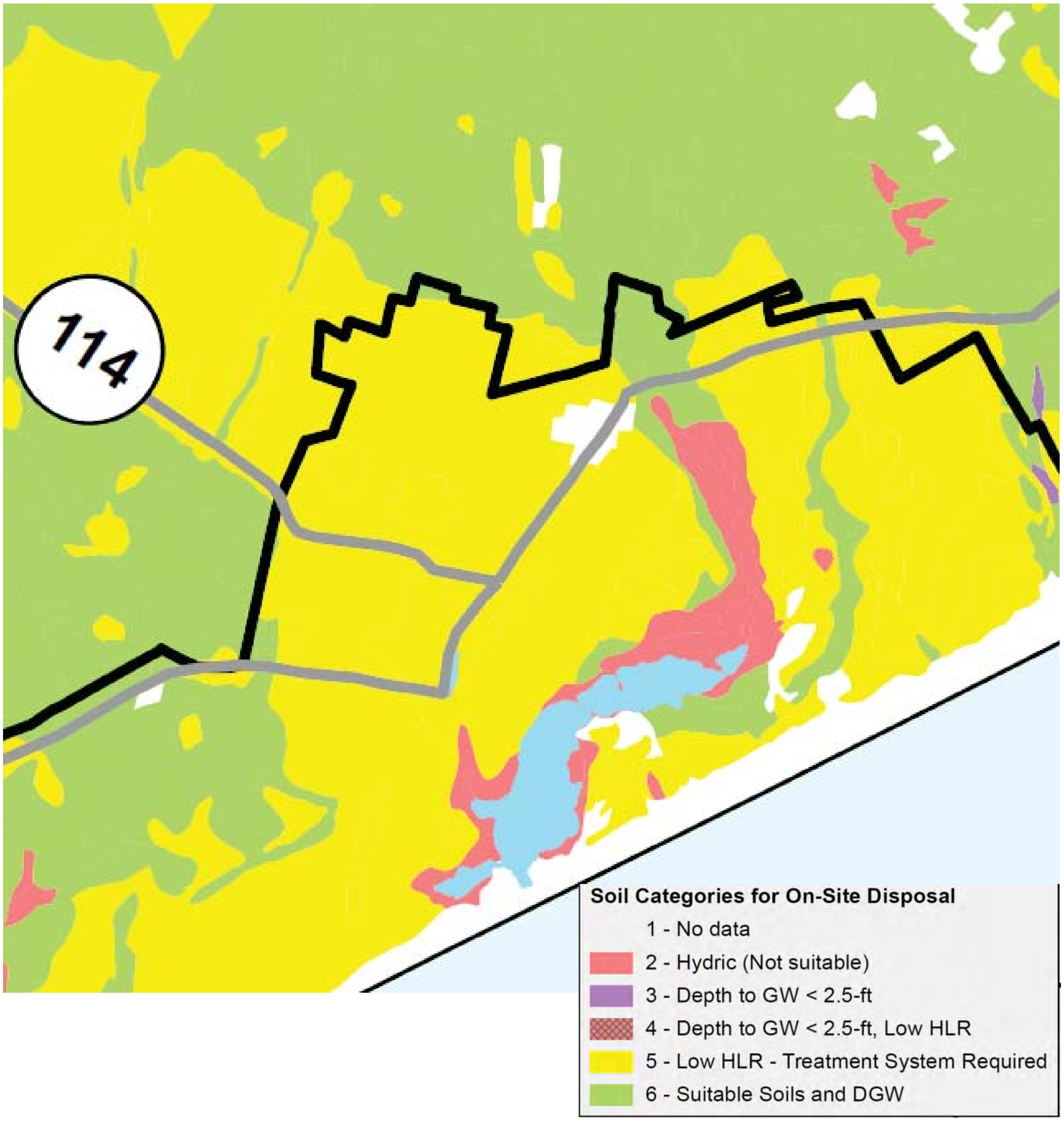


Figure 3-10 Hook Pond Water Depth – July 28, 1981

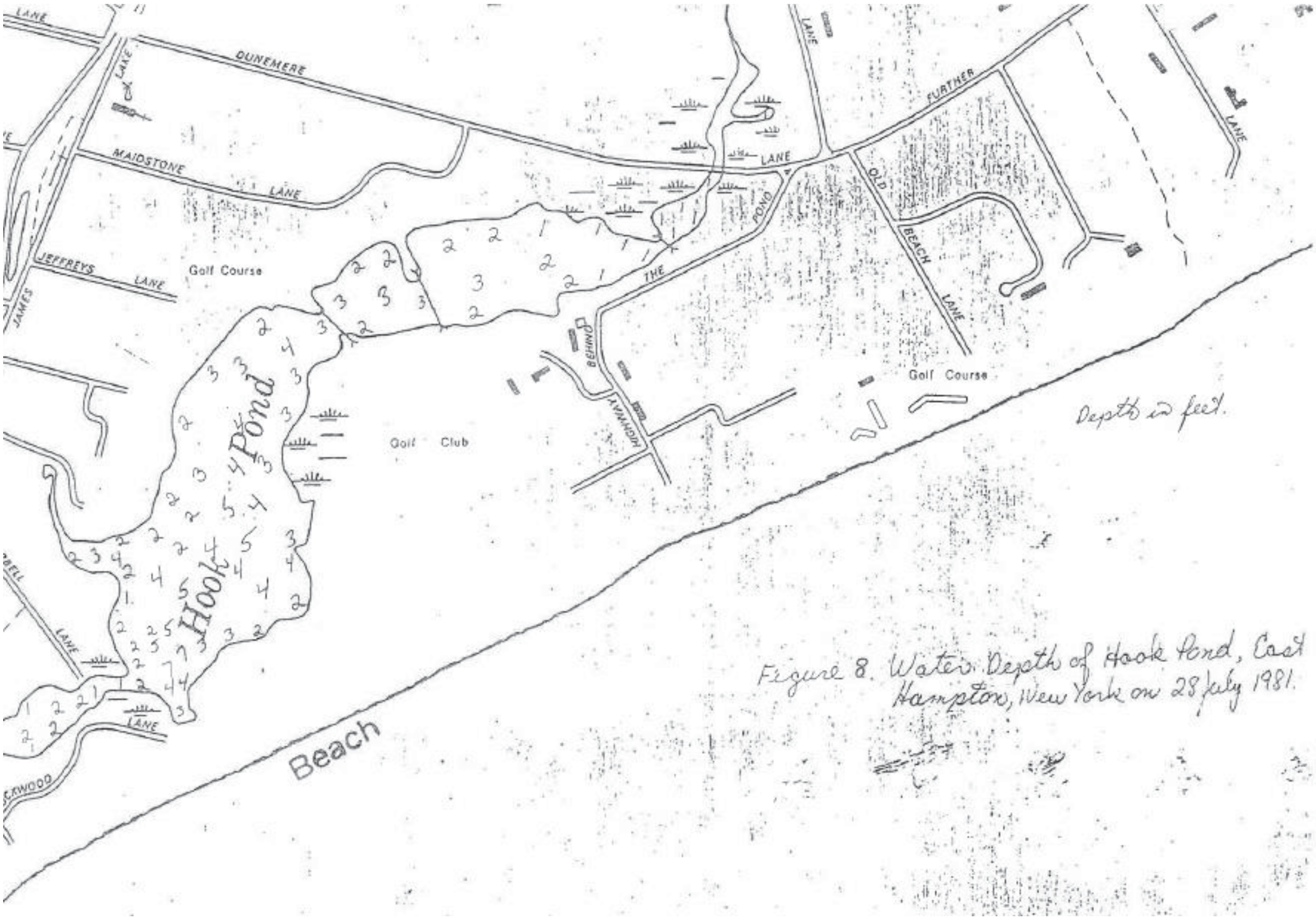
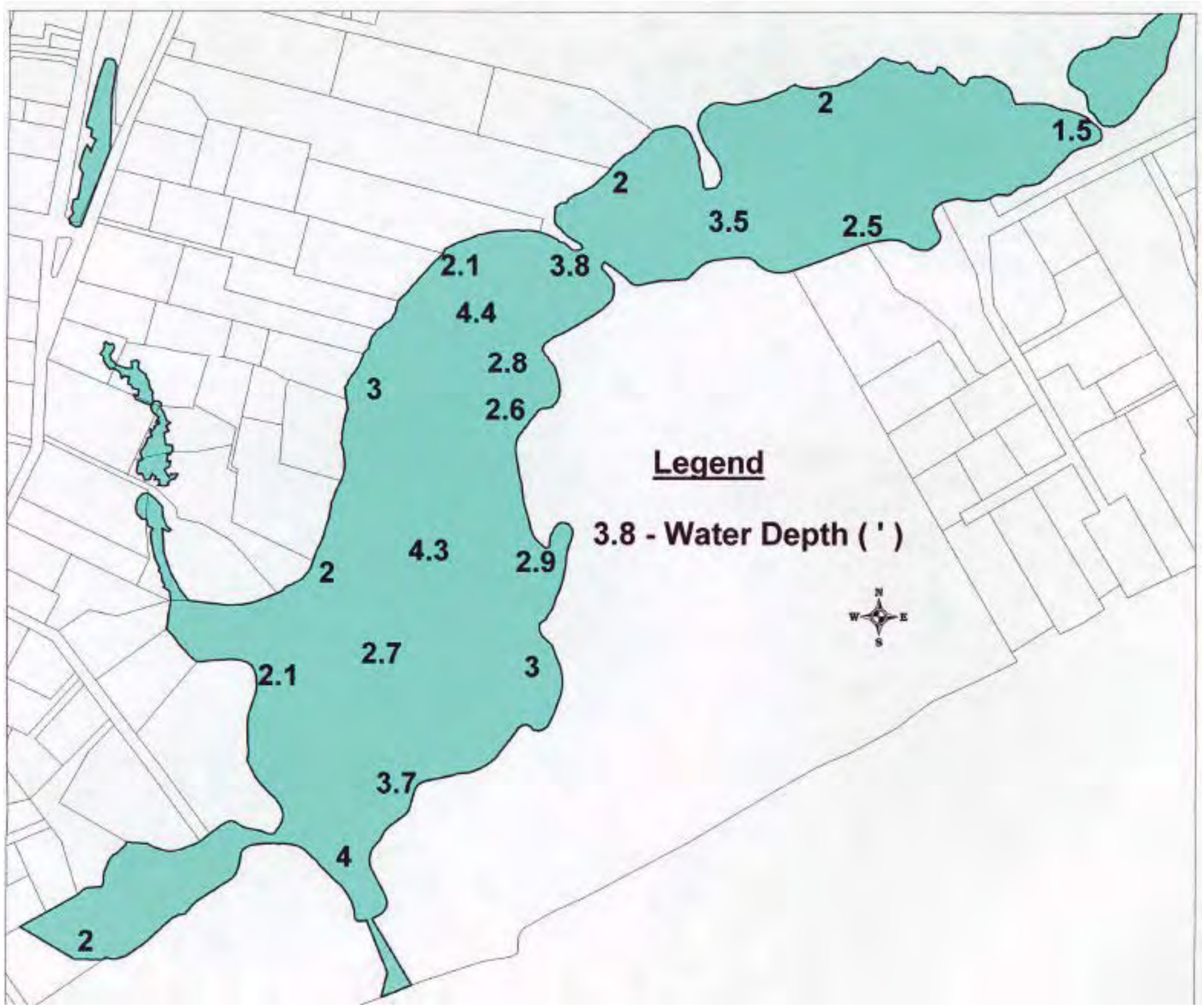


Figure 3-11 Hook Pond Water Depth (feet) - 1997



3.4 HOOK POND BATHYMETRY & WATER BUDGET

The bathymetry (water depth) of Hook Pond was determined in the 1981 limnological study as presented on Figure 3-10 and the EHDNR as presented on Figure 3-11. Unfortunately the Pond elevation above the outfall invert was not measured. An annual average water budget for Hook Pond is presented on Table 3-1 with a summertime – 90 day budget presented on Table 3-2 and 3-3 for current and future projected consumptive water uses. Using an average precipitation of 45-inches / year for Suffolk County (USGS, 1998) and 50% rainfall groundwater recharge for pervious areas and 95% for impervious areas, a preliminary annual water budget for Hook Pond, Table 3-1, was calculated using the groundwater watershed area as the source of groundwater discharging to the Pond.

It is recognized that groundwater recharge is seasonal and occurs predominately in the winter/spring. Table 3-1 includes a simple mass balance, excluding the effects of sedimentation, to calculate the maximum allowable phosphorus contributions (lb./yr) that would maintain concentrations less than the water quality standards 0.02 mg/l for phosphorus (http://www.dec.ny.gov/docs/water_pdf/nutrientstds2011.pdf.

The water balance assumes all of the groundwater in the Hook Pond watershed passes through the Pond. This may not be the situation as some watershed flow may discharge to the ocean below the Pond with the result that flushing rates would be lower than the water balance calculations on Table 3-1. Also, if springs exist in the Pond, then groundwater would be discharging into Hook Pond at various locations.

The sole source of natural freshwater to the water table in Suffolk County is recharge from precipitation. The amount of recharge is determined by the pattern and rate of precipitation, and by the amount of precipitation that is lost as evapotranspiration and as surface runoff. Although precipitation in Suffolk County is fairly evenly distributed throughout the year (Petersen, 1987), evapotranspiration is greatest during the summer (growing season); therefore, most recharge takes place during the fall, winter, and spring. Seasonal fluctuations in recharge generally are greater than any annual or longer term fluctuations. Long-term daily records for the precipitation measurement stations at Bridgehampton, Greenport and Riverhead were used to calculate long-term averages, which were essentially identical for the stations, Table 3-4. Estimates of the percentage of precipitation that becomes recharge on Long Island were reviewed and summarized by Peterson (1987) and are generally consistent with a recharge rate equal to about 50 percent of mean annual precipitation. An alternative method of calculating recharge (Steenhuis and others, 1985) specifies an annual recharge rate equal to 75 to 90 percent of precipitation from October 15 through May 15, i.e. essentially no recharge during summer. Calculations of recharge based on 50 percent of long-term mean annual precipitation are similar to those based on 75 to 90 percent of long-term mean precipitation from October 15 through May 15 at Bridgehampton, Greenport, and Riverhead, see Table 3-4.

Table 3-4 Precipitation and Recharge Estimates South Fork – USGS, 1998

		Precipitation (inches)			
		Calendar year		October 15 to May 15	
Station	Period	Total	50 percent of total	75 percent	90 percent
Bridgehampton	1931-94	[a]45.4	[a]22.7	[a]21.4	[a]25.7
Greenport	1959-94	[a]44.8	[a]22.4	[a]19.7	[a]23.7
Riverhead	1949-94	[a]45.6	[a]22.8	20.7	24.9

Table 3-1 Hook Pond Annual Water Budget & Preliminary Phosphorus TMDL

Hook Pond Water Budget & Estimated Nitrogen & Phosphorus TMDL Requirements					
PondArea (acres)	110	Weighted Avg Pond Depth (feet)	2.66		% of Area
Contributing Watershed Area (acres)	2,497			Impervious	20%
Hook Volume (gal)	95,420,000			Pervious	80%
Annual Water Inflow to Hook Pond - gallons				2,123,100,000	% of Total
Precipitation (In.), Net ET (in.) & % Rain Infiltration	45	34	50%		
1. Rain Onto Pond (gallons)				134,400,000	6%
2. Rain Infiltration	% of Precipitation in Watershed Reaching Pond & Volume (gallons)		50%	1,220,392,000	57%
3. Stormwater			95%	579,686,000	27%
3. Wastewater	Total Wastewater Design Flow (gpd)		869,000		
	Actual Use Factor & Gallons		50%	158,600,000	7%
4. Irrigation Excess Flow	Water Use (gal)	200,000,000			
	% of Irrigation & Volume (gallons)		0.15	30,000,000	1%
Annual Water Outflow from Hook Pond - gallons				2,145,900,000	% of Total
a. Evaporation from Pond (gallons)				101,547,000	5%
b. SCWA Wells Withdrawal				200,000,000	9%
c. Consumptive Irrigation Water Use				22,800,000	1%
d. Outfall Discharge				1,821,553,000	85%
Average No. Turnovers / Year & No. Turnover Days			22.25	16	
Average Turnover volume (gallons)		2,123,100,000			

TMDL Requirements	mg/L	lb / yr	lbs/day
Allowable P discharge @ mg/L	0.02	354	0.97
Allowable N discharge @ mg/L	0.4	7,083	19.40

Table 3-2 Hook Pond Currrent Summer 90 Day Water Budget & Prelim. Phosphorus TMDL

Hook Pond Water Budget & Estimated Nitrogen & Phosphorus TMDL Requirements					
PondArea (acres)	**110**	**Weighted Avg Pond Depth**	**2.66**		**% of Area**
Contributing Watershed Area (acres)	**2,497**			**Impervious**	20%
Hook Volume (gal)	**95,420,000**			**Pervious**	80%
Water Inflow to Hook Pond - gallons / 90 day summer period				**231,800,000**	**% of Total**
Precipitation (In.), Net ET (in.) & % Rain Infiltration	12	6	50%		
1. Rain Onto Pond (gallons)				**35,840,000**	15%
2. Rain Infiltration	% of Precipitation in Watershed Reaching Pond & Volume (gallons)		0%	-	
3. Stormwater			80%	**130,200,000**	56%
3. Wastewater	Wastewater Design Flow (gpd)		869,000		
	Actual Use Factor & Gallons		65%	**50,800,000**	22%
4. Irrigation Excess Flow	Water Use	100,000,000			
% of Irrigation & Volume (gallons)			0.15	**15,000,000**	6%
Water Outflow from Hook Pond - gallons / 90 day summer period				**234,400,000**	**% of Total**
a. Evaporation from Pond (gallons)				**17,920,000**	8%
b. SCWA Wells Withdrawal				**91,000,000**	39%
c. Consumptive Irrigation Water Use				**2,590,000**	1%
d. Outfall Discharge				**122,880,000**	52%
Average No. Turnovers / 90 Days & No. Turnover Days			2.43	37	
Average Turnover volume (gallons)		231,800,000			
TMDL Requirements	**mg/L**	**lb / 90 days**	**lbs/day**		
Allowable P discharge @ mg/L	**0.02**	**39**	**0.43**		
Allowable N discharge @ mg/L	**0.4**	**773**	**8.59**		

Water Use in Watershed (gal)	150,000,000
SCWA Wells Withdrawal (gal)	91,000,000
Imported Water (gal)	59,000,000

Table 3-3 Hook Pond Future Summer 90 Day Water Budget & Prelim. Phosphorus TMDL

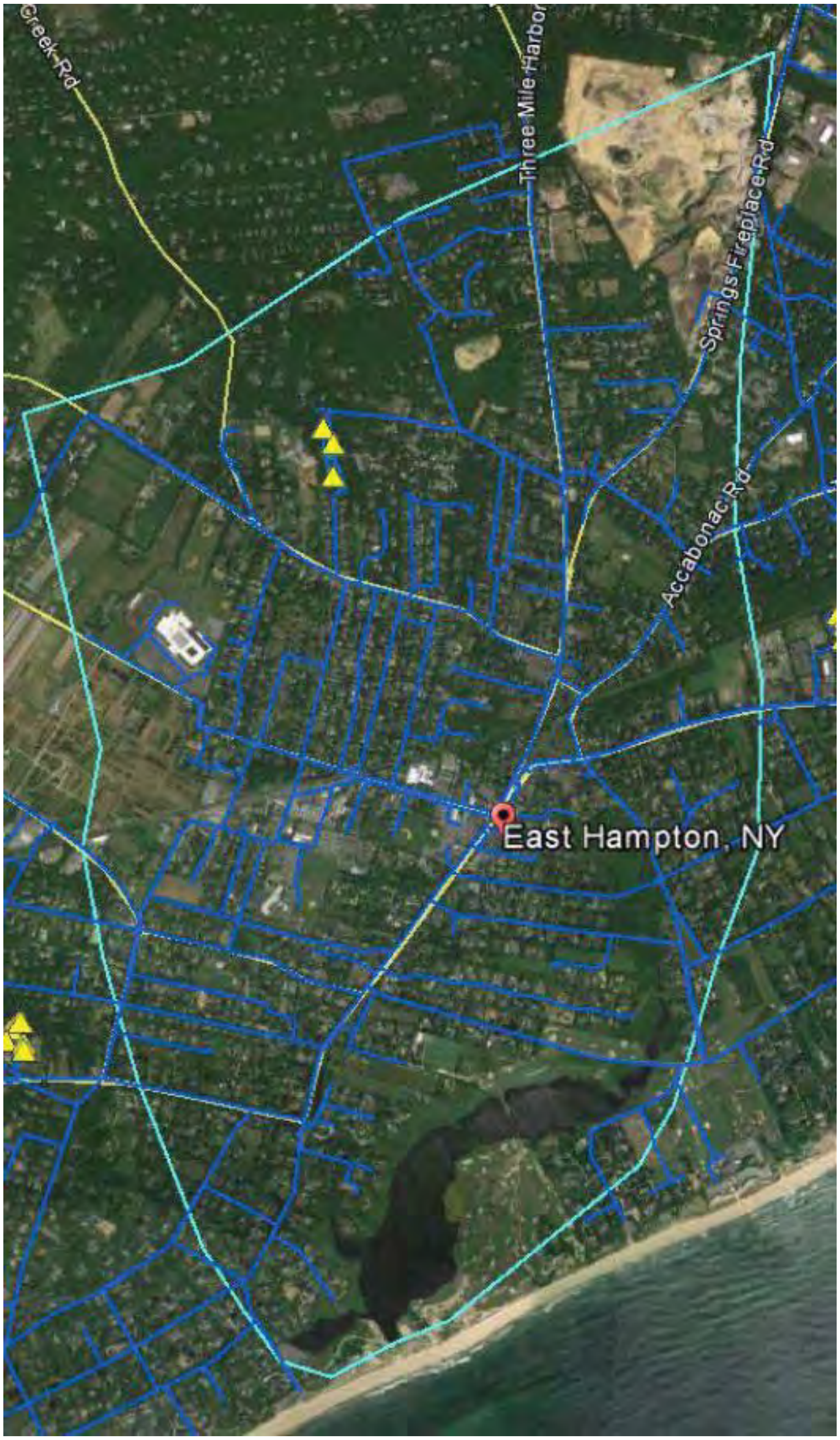
Hook Pond Water Budget & Estimated Nitrogen & Phosphorus TMDL Requirements					
PondArea (acres)	110	Weighted Avg Pond Depth	2.66		% of Area
Contributing Watershed Area (acres)	2,497			Impervious	20%
Hook Volume (gal)	95,420,000			Pervious	80%
Water Inflow to Hook Pond - gallons / 90 day summer period				231,800,000	% of Total
Precipitation (In.), Net ET (in.) & % Rain Infiltration	12	6	50%		
1. Rain Onto Pond (gallons)				35,840,000	15%
2. Rain Infiltration	% of Precipitation in Watershed Reaching Pond & Volume (gallons)		0%	-	
3. Stormwater			80%	130,200,000	56%
3. Wastewater	Wastewater Design Flow (gpd)		869,000		
	Actual Use Factor & Gallons		65%	50,800,000	22%
4. Irrigation Excess Flow	Water Use		100,000,000		
% of Irrigation & Volume (gallons)			0.15	15,000,000	6%
Water Outflow from Hook Pond - gallons / 90 day summer period				243,500,000	% of Total
a. Evaporation from Pond (gallons)				17,920,000	7%
b. SCWA Wells Withdrawal				91,000,000	37%
c. Consumptive Irrigation Water Use				11,730,000	5%
d. Outfall Discharge				122,880,000	50%
Average No. Turnovers / 90 Days & No. Turnover Days			2.43	37	
Average Turnover volume (gallons)		231,800,000			

TMDL Requirements	mg/L	lb / 90 days	lbs/day
Allowable P discharge @ mg/L	0.02	39	0.43
Allowable N discharge @ mg/L	0.4	773	8.59

Water Use in Watershed (gal)	150,000,000
SCWA Wells Withdrawal (gal)	91,000,000
Imported Water (gal)	59,000,000

During the 90 day period we have assumed wastewater & groundwater flows are zero. Figure 3-12 shows that essentially all properties in the watershed are served by public water and the location of the three SCWA water supply wells. We need to calculate the net water discharged to the watershed based upon SCWA water withdrawals and water recharge in addition to wastewater.

Figure 3-12 Hook Pond Watershed – Water Supply Distribution Network & SCWS Wells



Consumptive withdrawal within the watershed occurs via SCWA water supply withdrawals and private irrigation wells, with the Maidstone Club being the largest known private entity. According to the Maidstone DEIS (2013), "actual irrigation needs for the course would typically average approximately 0.1 inch per day over a long period the summer)." Based on one quarter-inch of irrigation on the currently-irrigated 10.6 acres, 28,782 gallons per day are required. Upon implementation of the proposed irrigation improvement project, an additional 37.4 acres would be irrigated, and the projected volume of water required for the approximately 48 acres of turfgrass would be approximately 130,332 gallons per day. This is a 101,550 gpd increase.

For the 90 day summer period that would be approximately 2,590,000 gallons of consumptive water use for current conditions and 11,140,000 gallons for projected future conditions.

For the calendar year, the proposed irrigation system would provide irrigation during the 23-to-27 week irrigation season (typically late-April through early-November). Golf course annual consumptive water use would increase from approximately 5,040,000 gallons for current conditions to 22,808,000 gallons for projected future conditions.

Table 3-3a SCWA Water Witdrawals – Hook Pond Watershed

SCWA Hook Pond Watershed Well Withdrawals (gallons)				
Oakview Hwy Well Field Stations 99275, 119865, 78310			3 Month Running Total	Annual Total
January	2013	6,060,800	27,216,900	173,896,800
February		7,486,200	19,512,300	
March		3,181,500	16,728,500	
April		8,670,500	19,338,200	
May		18,066,500	29,918,500	
June		20,856,300	47,593,300	
July		28,201,100	67,123,900	
August		27,213,800	76,271,200	
September		22,717,300	78,132,200	
October		19,924,800	69,855,900	
November		8,355,100	50,997,200	
December		3,162,900	31,442,800	
January	2014	7,605,500	19,123,500	187,885,200
February		4,170,200	14,938,600	
March		4,760,800	16,536,500	
April		13,541,300	22,472,300	
May		18,215,400	36,517,500	
June		23,484,500	55,241,200	
July		28,604,400	70,304,300	
August		31,101,700	83,190,600	
September		27,035,000	86,741,100	
October		16,124,300	74,261,000	
November		8,285,200	51,444,500	
December		4,956,900	29,366,400	
January	2015	5,113,300	18,355,400	
February		6,880,166	16,950,366	

2010 - 2014 Average	Monthly Average	3 Month Running Total
January	8,600,000	8,766,667
February	5,700,000	7,066,667
March	6,800,000	21,100,000
April	11,100,000	23,600,000
May	19,100,000	37,000,000
June	25,400,000	55,600,000
July	34,200,000	78,700,000
August	31,700,000	91,300,000
September	23,100,000	89,000,000
October	16,400,000	71,200,000
November	10,800,000	50,300,000
December	6,900,000	34,100,000
Annual Total	200,000,000	

SCWA Hook Pond Watershed Well Withdrawals (gallons)				
Oakview Hwy Well Field Stations 99275, 119865, 78310			3 Month Running Total	Annual Total
January	2010	5,826,900		
February		4,151,800		
March		3,675,100	13,653,800	221,883,000
April		8,048,700	15,875,600	
May		22,366,300	34,090,100	
June		35,156,300	65,571,300	
July		45,674,400	103,197,000	
August		41,182,800	122,013,500	
September		25,283,200	112,140,400	
October		14,643,400	81,109,400	
November		9,718,100	49,644,700	
December		6,156,000	30,517,500	
January	2011	8,070,000	23,944,100	174,779,400
February		6,780,000	21,006,000	
March		8,220,000	23,070,000	
April		7,298,500	22,298,500	
May		15,952,500	31,471,000	
June		19,281,600	42,532,600	
July		28,653,600	63,887,700	
August		23,618,100	71,553,300	
September		16,485,400	68,757,100	
October		13,485,400	53,588,900	
November		12,458,300	42,429,100	
December		14,476,000	40,419,700	
January	2012	15,221,600	42,155,900	240,441,900
February		5,815,900	35,513,500	
March		14,272,100	35,309,600	
April		17,925,800	38,013,800	
May		21,061,400	53,259,300	
June		27,980,800	66,968,000	
July		39,916,900	88,959,100	
August		35,248,200	103,145,900	
September		23,972,600	99,137,700	
October		17,870,500	77,091,300	
November		15,190,800	57,033,900	
December		5,965,300	39,026,600	

The proposed Maidstone lined irrigation pond is to be 10-feet in depth and have a water surface area of approximately 0.42-acre and would be constructed within a portion of an existing vegetated area on the East Course between the 2nd, 3rd and 4th fairway. The bottom of the proposed irrigation pond would be situated at El. 10 with a water surface elevation at El. 20. The irrigation pond would be designed for a capacity of approximately 785,000 gallons of water.

A test pit was excavated for the purposes of providing a recharge location for the test well aquifer pumping test, as well as an understanding of the subsurface conditions during excavation. Groundwater was encountered at El. 4, approximately 16 feet below the ground surface which was at El. 20.

As the proposed Maidstone irrigation system would use a local weather station in the center of the West Course (between holes five and 12) that weather station likely measures rain – which data would be valuable for future, refined water balance calculations.

Salt water intrusion was not determined to be a concern. Reference was made to the following regarding depth of freshwater – saltwater interface:

"The first physical formulations of saltwater intrusion were made in 1888 and referred to as the Ghyben-Herzberg relation (Todd, D.T. 1980 Groundwater Hydrology). The Ghyben-Herzberg relationship established that for every foot of freshwater above sea level, there is typically about 40 feet thick of freshwater in an unconfined aquifer. Therefore, if the water table elevation is five feet amsl, the anticipated freshwater lens is approximately 200 feet."

3.4 Hook Pond Sediment Depth & Quality

Pond sediment depth and quality was determined in the 1981 limnological study with the data presented on Figure 3-13 and Table 3-5 respectively. As noted below, the 1981 sediment data needs to be carefully interpreted for the following reasons:

1. Analytical methods used were not presented.

2. Percent solids data is extremely high and indicate a dry solid material. Lake sediments are usually 10 – 25 % solids – not the 57 – 66% stated in the 1981 report. However this may be resolved by clarifications on reporting units. Without a description of the analytical techniques used one cannot confidently determine how to interpret the data.

3. Sediment (dry) usually has 1,000-2,000 mg/kg of TP vs the 11 stated in the 1981 study. We suspect the 1981 data is probably concentration on bulk sediment (water + dry sediment)

Sediment thickness was also measured by EHDNR, 1997, see Figure 3-14.

Table 3-5 1981 Sediment Nutrient Sampling Data

TABLE 5 SEDIMENT ANALYSES OF SAMPLES COLLECTED 30 JULY 1981 FROM HOOK POND , EAST HAMPTON, NEW YORK

Analysis	Station 2	Station 3
Organic Nitrogen (mg/kg Organic-N)	170.0	75.0
Tot. Kjeldahl Nitrogen (mg/kg TKN-N)	275.0	197.5
Ammonia (mg/kg Ammonia-N)	105.0	122.5
Nitrite (mg/kg Nitrite-N)	<0.25	<0.25
Nitrate (mg/kg Nitrate-N)	1.5	2.5
Tot. Phosphate Phosphorous (mg/kg Phosphate-P)	11.0	25.0
Ortho Phosphate Phosphorous (mg/kg Phosphate-P)	8.75	5.0
Percent Solids (%)	57	66
Halogenated hydrocarbons (pesticides)		
Chlordane (μg/kg)	27	29
DDE (μg/kg)	>50	>50
DDD (μg/kg)	>50	>50
Aldrin (μg/kg)	<0.2	<0.2
Lindane (μg/kg)	<0.1	<0.1
αBHC(μg/kg)	<0.1	<0.1
BHC (μg/kg)	<0.2	<0.2
Heptachlor epoxide (μg/kg)	<0.3	<0.3

Figure 3-13 Hook Pond Sediment Depth – 1981

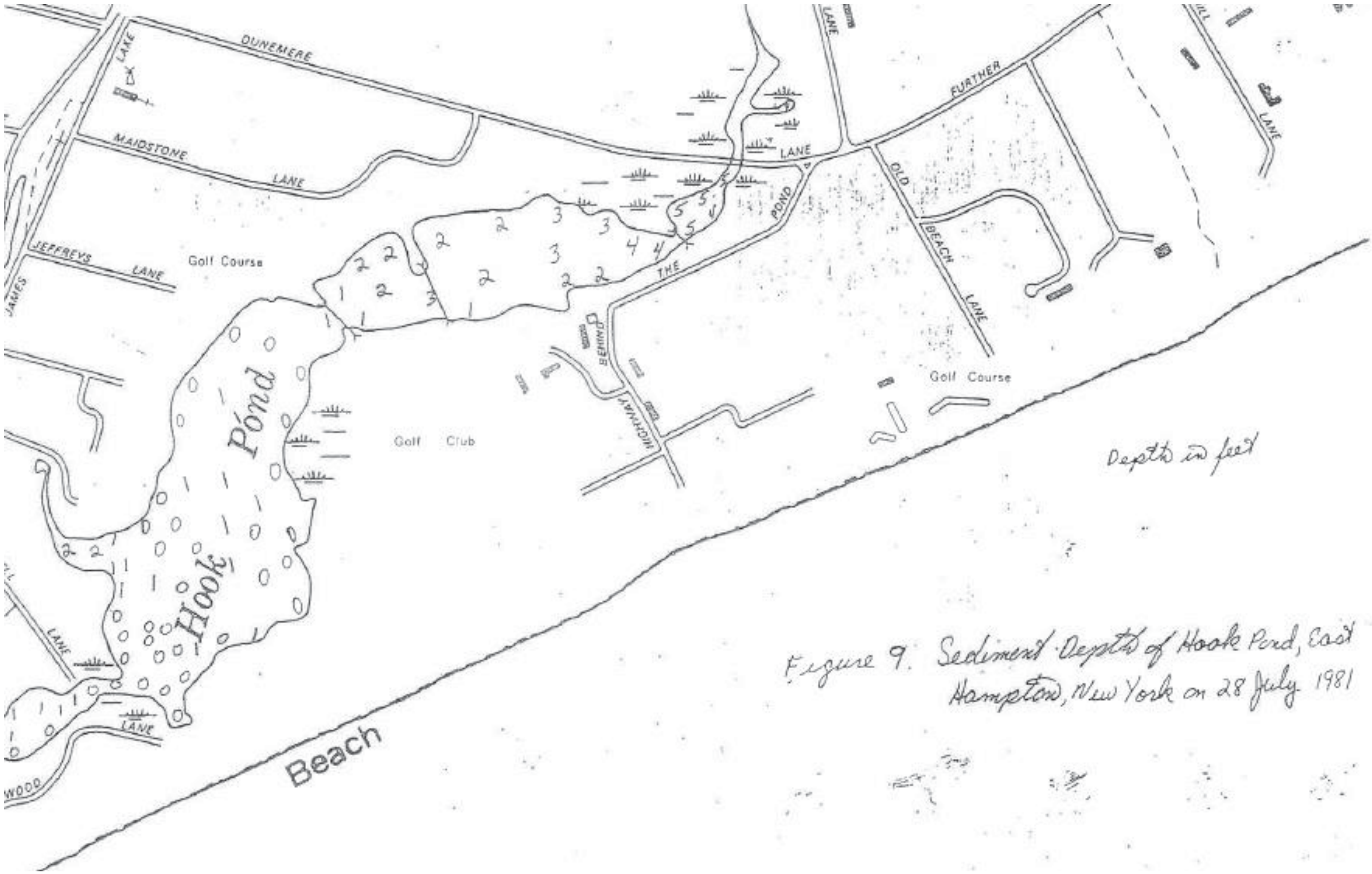
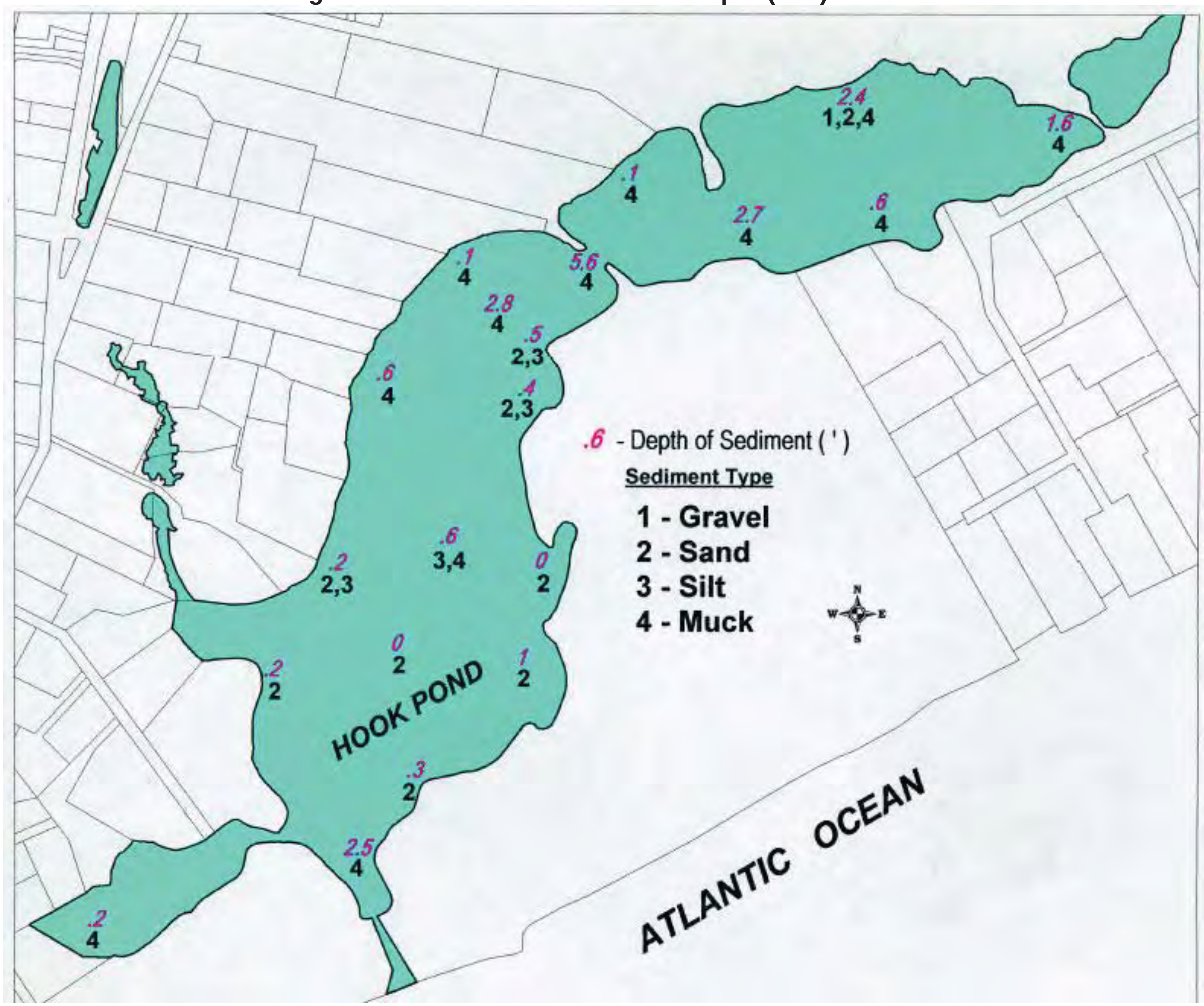


Figure 3-14 Hook Pond Sediment Depth (feet) – 1997



Under contract to The Maidstone Golf Club, sediment borings were collected by D.B. Bennett for a proposed pedestrian bridge north of Dunemere Lane, near Tee #2. Figure 3-15 presents the locations of the borings, and Table 3-6 presents the data collected.

Figure 3-15 Sediment Boring Locations for Proposed Sediment Bridge

Table 3-6 Water Boring Data

WB-1		WB-2		WB-3	
Depth (ft)	Material	Depth (ft)	Material	Depth (ft)	Material
0 - 2.0	Black Mud / Bog	0 - 4.6	Black Mud / Bog, Wet	0 - 4.0	Black Mud / Bog, Wet
2.0 - 2.5	Tan Sand, Fine, Wet	4.6 - 5	Tan Sand, Fine, Wet	4.0 - 4.5	Tan Sand, Fine, Wet

The role of sediments on the water quality of shallow ponds, such as Hook Pond, can be significant. Table 3-7 presents simplistic calculations, using the 1981 sediment data, on the potential impact of sediments on Hook Pond's water quality. Researchers have recently found (Niemisto et al, 2011) that high pH resulting from algal blooms could result in phosphorus release from resuspended sediments. The researchers pointed out that coupling of resuspension and high algal blooms induced pH in the water column can liberate significant amounts of soluble P into the water column. The importance of this phenomenon for the Pond studied was emphasized by the fact that the P pools susceptible to pH dependent P release (Al-P and Fe-P) formed a large part of the total extractable P of the surface sediment. Only a small fraction of sediment (~ 1 – 4 inches) would be expected to resuspend during windy conditions.

Table 3-7 Impact of Sediment Suspension on Water Quality

Impact of Sediment Suspension on Hook Pond Water Quality Calculations - using 1981 Sediment Data			
	Sediment	Pond	
Average Depth	1.08	2.66	
Area (Acres)	110	110	
Volume (gal)	38,634,000	95,421,000	
Volume (liter)	146,229,690	361,168,485	
Estimated Wet Density (g/cm^3)	1.2	1.0	
Mass (kg)	175,495,000	361,208,000	
Percent solids	61%		
	Nutrients		Pond Nutrient Conc. with Sediments Suspended (mg/l)
	Sediment (Conc.) (mg/kg)	Sediment Mass (kg)	
Average TN	238.3	41,812	116
Average Ammonia	113.8	19,963	55
Average Phosphorus	18.0	3,159	8.7
Average Orthophosphate	6.9	1,207	3.3
% of Sediment Needing to be Suspended to Achieve Target P Conc. only from ortho-P		0.60%	0.02
Inches of Sediment Needing to be Suspended to Achieve Target P Conc. only from ortho-P		0.077	0.02

3.5 GROUNDWATER ELEVATIONS

Groundwater elevations in the Hook Pond watershed have been measured by the USGS at 7 wells during the period 1974 through 2015. The location of the wells along with the average and range of elevation measurements are presented on Figure 3-16. The data for each well is presented in Appendix B and summarized on Table 3-8 and shows that groundwater elevations typically fluctuate 3 +/- feet over the year.

Figure 3-16 Hook Pond USGS GW Elevation Monitoring Wells & Data

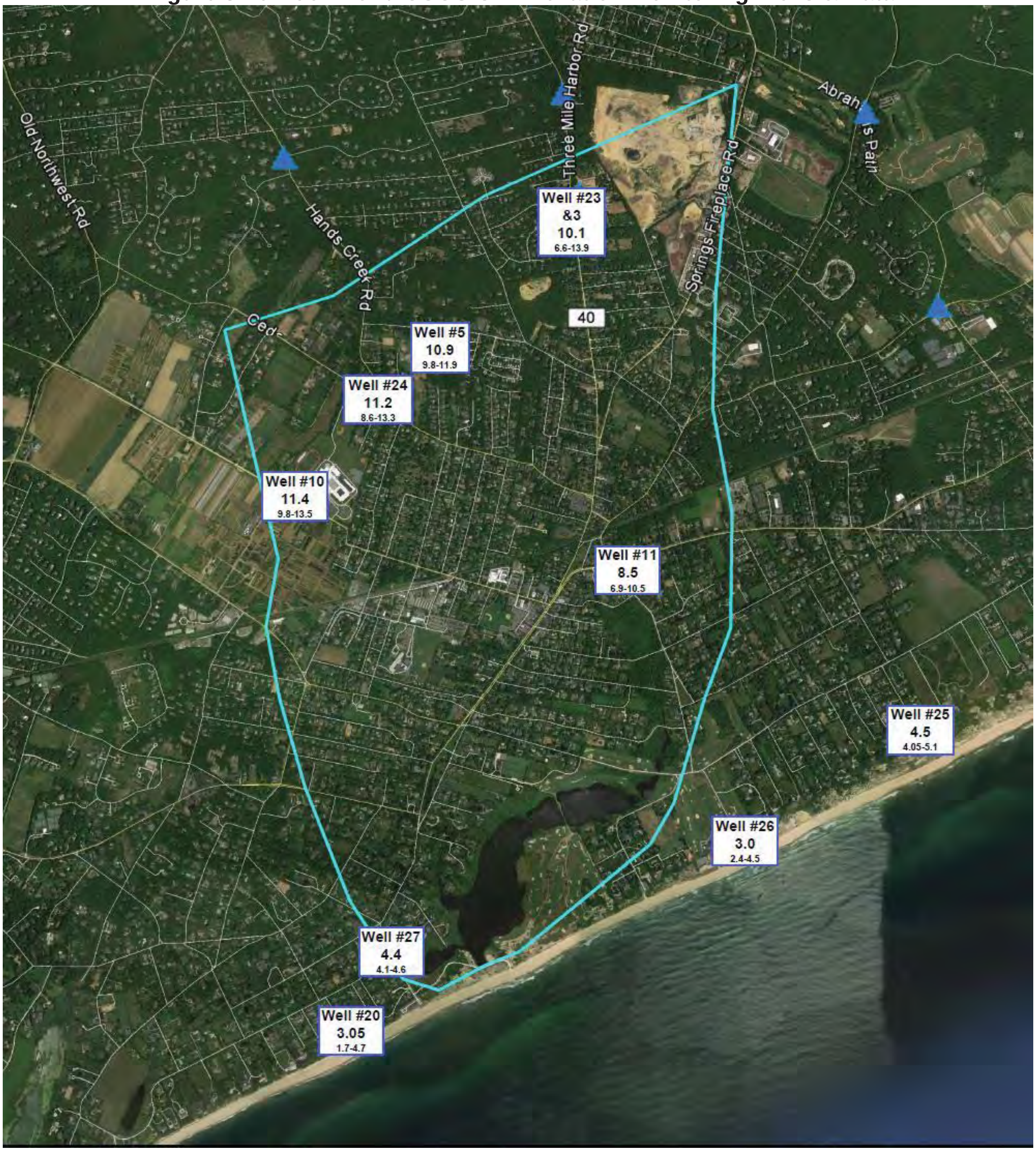


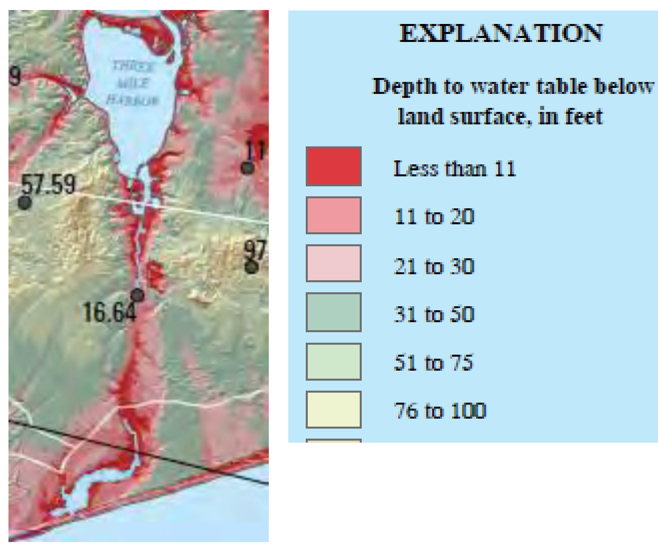
Table 3-8 USGS Wells and Data Summary – Hook Pond Watershed

Groundwater Elevation Data														
Project Well #	Site Number	Site Name	Min. (ft)	Max. (ft)	Range (ft)	Avg. (ft)	Well Surface Elev. feet above NGVD29	Well depth	Aquifer	Elevation			
										From	To	# Years	Data Points
Within Hook Pond Watershed														
23	405908072110001	S 8843. 1	6.59	12.75	6.2	10	32.5	25	Glacial Aquifer, Upper	7/28/1950	5/24/2000	49.9	298
3	405906072110102	S 8843. 2	8.15	13.86	5.7	10.2	32.5	35		6/22/2000	1/16/2015	14.6	163
5	405840072114501	S 7570. 1	9.81	11.92	2.1	10.9	70	162		4/14/1984	3/27/1985	1.0	2
24	405828072115101	S 46523. 1	8.62	13.3	4.7	11.2	64.5	97		11/20/1972	3/25/1999	26.4	68
10	405807072121001	S 48429. 1	9.81	13.47	3.7	11.4	50	66		1/8/1974	5/27/2009	35.4	78
11	405756072104901	S 8837. 1	6.92	10.53	3.6	8.47	20	35		8/1/1950	3/10/1994	43.6	109
25	405726072093701	S 1512. 1	4.05	5.13	1.1	4.47		31		3/29/1974	3/10/1994	20.0	18
Outside Hook Pond Watershed														
26	405706072102101	S 52691. 1	2.41	4.49	2.1	3.01		46	Glacial Aquifer, Upper	3/29/1974	10/6/1976	2.5	13
27	405646072114601	S 52687. 1	4.07	4.59	0.5	4.38		33		3/28/1974	10/6/1976	2.5	6
20	405632072115601	S 52686. 1	1.68	4.73	3.1	3.05		45		3/28/1974	3/10/1994	20.0	27

Figure 3-17 presents the groundwater contour elevations for the Upper Glacial and Upper Magothy aquifers as prepared by USGS (2013). Figure 3-18 presents the depth to groundwater as prepared by USGS (2013).

Figure 3-17 Area Groundwater Elevations

Figure 3-18 Hook Pond Area Depth to GW



3.6 STORMWATER & POND OUTFLOW STRUCTURE MANAGEMENT

Stormwater in the Hook Pond watershed enter the ponds predominately via groundwater or through the existing storm drain networks that discharge to Town Pond and the tributary discharging to Duck Pond, see Figure 3-4 which was produced in the 2003 Hook Pond Drainage Study. Overland flow is not considered a significant source of stormwater to Hook Pond due to the watershed's sandy soils. No information was provided in the 2003 Drainage Study on the catchment areas for the sub-areas of the storm drain system. The following sections describe the stormwater runoff calculations and outfall/discharge structure.

The purpose of the 2003 Study was to determine the cause of the higher Pond surface water elevation as compared to the weir chamber of the outfall structure, which has caused localized flooding. The drainage study performed the following analysis:

- Determined the storm water runoff rates for various storm events, including storage capacity of Hook Pond
- Hydraulic analysis of the outfall structure and 20 inch pipe

The study concluded that the higher Pond elevation was due to outfall pipe obstructions. The study recommended:

- ✓ Install a screen upstream of the gate valve
- ✓ Clean and assess the 20 inch HDPE outfall pipe
- ✓ Replace 12" x 12" gate valve as it is not functioning properly
- ✓ Remove excess concrete at bottom of outlet chamber
- ✓ Remove weir to elevation 1.2 – which are the inverts of both the tide gate and outfall pipe openings
- ✓ Dredge in front of gate valve

Following completion of above and its evaluation,

- ✓ Replace 80 foot section of 20' pipe if needed
- ✓ Measure Pond levels to determine if improvements are effective
- ✓ Stormwater model assumption of groundwater at 3.0 feet elevation needs to be verified by installation and monitoring of three groundwater observation wells

It is understood that none of these recommendations have been implemented.

Based upon discussions with the Village of East Hampton DPW, only catch basins exist in the stormwater network – i.e. no piping between catch basins. Consequently stormwater flow to the Pond is via curb flow.

3.6.1 STORMWATER RUNOFF RATES

The 2003 Drainage Study divided the surface watershed area into two categories; see Figure 3-4, with the LIRR ROW being the dividing line between the upper and lower drainage areas.

- Lower Drainage Area = 1,526-acres
- Upper Drainage Area = 1,060-acres
- Total Surface Watershed Area = 2,586-acres

Stormwater runoff and pond elevations were modeled in the 2003 Drainage Study. Table 3-9 presents the runoff rates and pond surface elevations for Hook Pond under the 2, 5, 10 and 100-year 24 hour rainfall rates. The storm frequencies correspond to a storm event duration of a 24-hour rainfall for Suffolk County. As stated in the 2003 Study, the amount of rainfall occurring during each particular year storm event, resulting runoff volume and Hook Pond water surface elevation is presented on Table 3-9.

Table 3-9 Stormwater Runoff and Pond Surface Elevations

Frequency (Years)	Rainfall (inches)	Lower Watershed Drainage Area	Upper Watershed Drainage Area	Total to Hook Pond	Hook Pond Water Surface Elevation (ft above NV 29)
	Acres	1,526	1,060	2,586	
	CN	72	70		
		Runoff Rates (cfs)			
Assumed 2003 Study Hook Pond Water Surface Base Elevation					3.00
2	3.5	790	311	1,101	4.68
5	4.5	1,279	544	1,823	5.61
10	5.0	1,537	672	2,209	6.08
100	7.5	2,901	1,374	4,275	8.65

3.6.2 Hook Pond Outflow

Outflow from Hook Pond is via the outfall structure and groundwater to the ocean. The outflow structure, Figure 3-19, is a 3-chambered unit that consists of:

- Inflow channel with 12-in x 12-in gate valve
- Weir Chamber with a rectangular 9-ft weir
- 24" tide gate that conveys flow from both the gate valve and the weir to the outlet chamber
- Outlet chamber with a 20-in HDPE pipe discharging to the Atlantic Ocean.

The 2003 Drainage Study observed two major issues affecting the flow through this structure:

- Excess concrete on the bottom of the outlet chamber was restricting flow through the tide gate on the inlet and the 20-in HPDE pipe on the outlet
- The slope of the outlet pipe was determined to be .38% rather than the .89% indicated on the construction documents

As can be seen from Figure 3-18, invert elevation of the outlet structure is 1.2 feet. Recommendations were made to remove the excess concrete, clean debris out of the outlet pipe, dredge the area in front of the gate valve and assess the effects of these efforts. Replacing the outlet pipe was not recommended until the effects of these remedial actions were determined. The stage-discharge relationship for Hook Pond is presented on Table 3-109 – assuming no flow restrictions in the outlet structure.

The Pond elevation is managed by the Village and Maidstone Club, with the Club actually controlling the outfall structure. According to Maidstone, the preferred Pond elevation is 18" above the outlet invert, which would be approximately elevation 2.7 feet. The discharge valve (see Figure 3-19) is opened when the Pond gets above 2.7 feet, in anticipation of large rain events and in preparation for phragmites cutting.

Table 3-10 Stage Discharge Relationship for Outfall Structure & Time Required for Stormwater Discharge

Water Level Above Invert (ft)	Pond Stage Elevation (ft)	Outlet Discharge		Hook Pond Volume (gal) above invert elevation	Time (days) to discharge to next lower level	Cum Time (days) to discharge to lower levels
		(CFS)	gpd			
0	1.2	0	0			
0.3	1.5	0.53	343,000	10,752,350	62.70	
0.8	2	2.30	1,486,000	28,672,934	19.60	63.38
1.3	2.5	4.23	2,734,000	46,593,518	8.49	43.79
1.8	3	5.46	3,529,000	64,514,102	5.72	35.29
2.3	3.5	6.44	4,162,000	82,434,686	4.66	29.57
2.8	4	7.29	4,711,000	100,355,270	4.04	24.91
3.3	4.5	8.05	5,202,000	118,275,854	3.62	20.87
3.8	5	9.84	6,359,000	136,196,438	3.10	17.26
4.3	5.5	10.20	6,592,000	154,117,022	2.77	14.16
4.8	6	11.46	7,406,000	172,037,606	2.56	11.39
5.8	7	12.6	8,143,000	207,878,774	4.61	8.83
6.8	8	13.7	8,854,000	243,719,942	4.22	4.22

#	Routing	Invert	Outlet Devices
1	Primary	1.20'	**Special (user-defined)** Head (feet) 0.00 0.30 0.80 1.30 1.80 2.30 2.80 3.30 3.55 3.80 4.80 5.80 6.80 Disch. (cfs) 0.00 0.53 2.30 4.23 5.46 6.44 7.29 8.05 9.84 10.20 11.46 12 ´ 1.

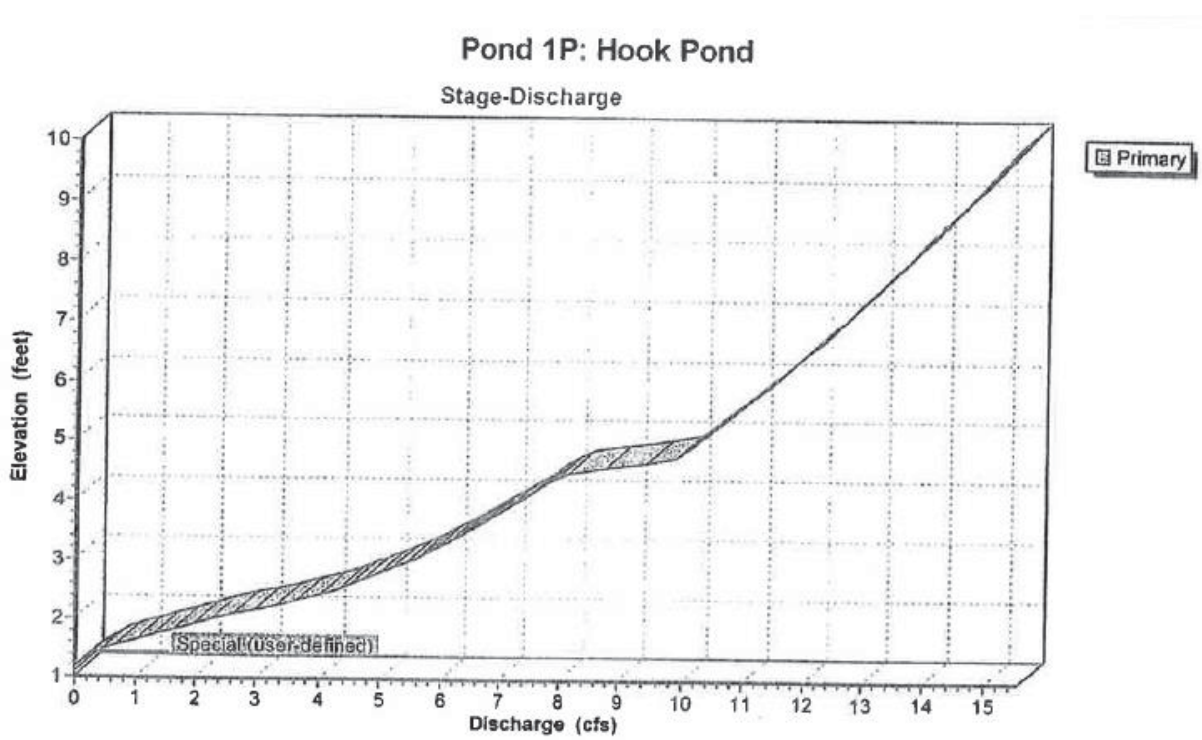
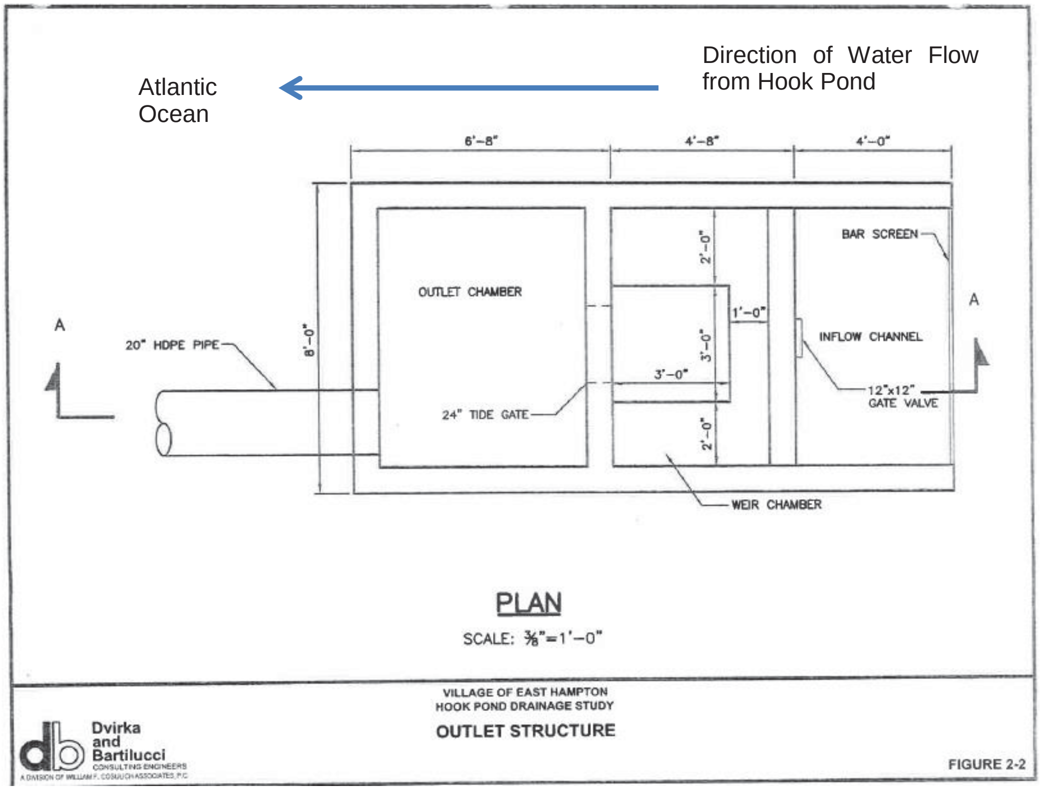
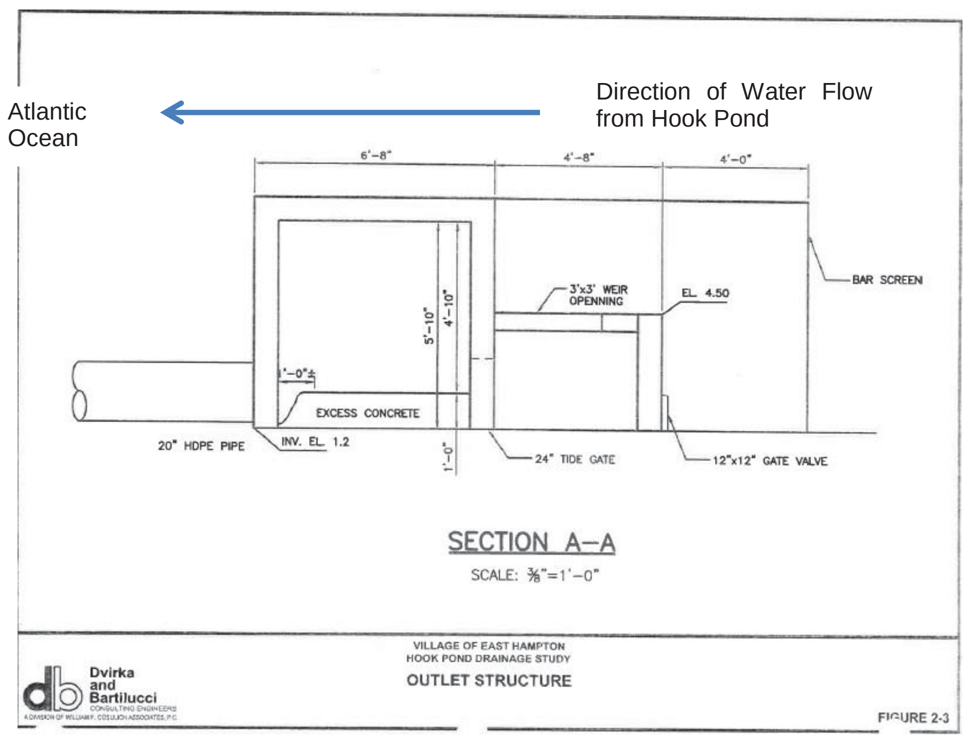


Figure 3-19 Plan and Profile for Hook Pond Outflow Structure





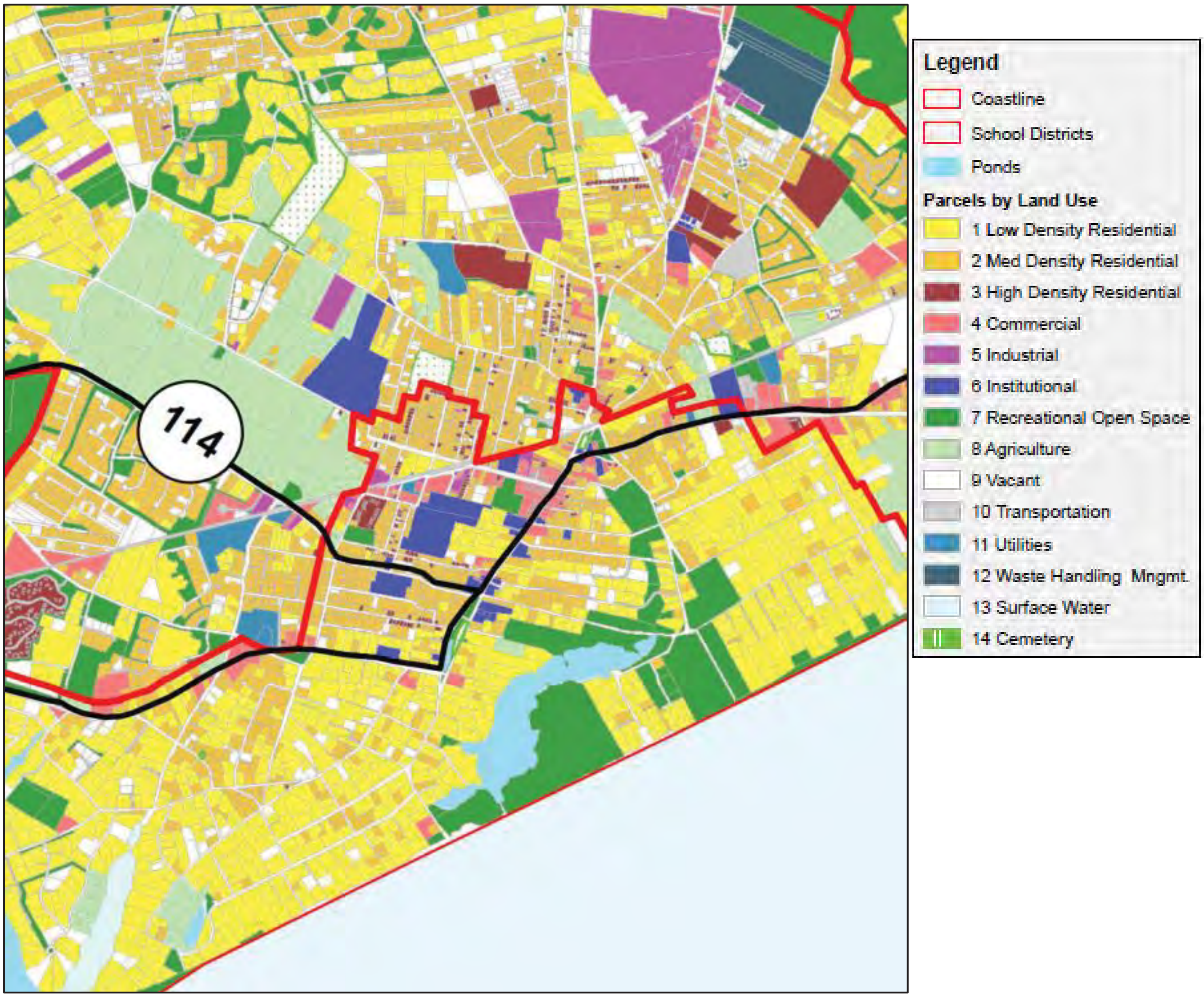
3.7 WATERSHED LAND USE

Land use for the Hook Pond watershed. The Hook Pond watershed predominant land use, as presented on Figure 3-20, is residential with some commercial / industrial and parks / open space. The number of properties in each land use type within the Hook Pond watershed and the associated wasewater flow is presented on Table 3-11.

Table 3-11 Hook Pond Watershed Land Use and Wastewater Data

Land Use Type	# of Parcels	Waste Water Data					
		Flow		N Load		P Load	
		(gpd)	% of Tot.	(lb/yr)	% of Tot.	(lb/yr)	% of Tot.
Agriculture	28	17,507	2.0%	4.75	2.0%	0.58	2.0%
Cemetary	4	668	0.1%	0.18	0.1%	0.02	0.1%
Commercial	232	113,260	13.0%	30.72	13.0%	3.78	13.0%
High Density Residential	284	136,282	15.7%	36.96	15.7%	4.55	15.7%
Industrial	48	10,039	1.2%	2.72	1.2%	0.34	1.2%
Institutional	36	64,388	7.4%	17.46	7.4%	2.15	7.4%
Low Density Residential	300	94,310	10.9%	25.58	10.9%	3.15	10.9%
Med Density Residential	1,430	408,012	47.0%	110.66	47.0%	13.62	47.0%
Recreation Open Space	57	6,863	0.8%	1.86	0.8%	0.23	0.8%
Transportation	14	2,284	0.3%	0.62	0.3%	0.08	0.3%
Utilities	4	544	0.1%	0.15	0.1%	0.02	0.1%
Vacant	207	14,760	1.7%	4.00	1.7%	0.49	1.7%
Lake Bottom	2	0	0.0%	0.00	0.0%	0.00	0.0%
Total	**2,646**	**868,916**	**100.0%**	**236**	**100.0%**	**29**	**100.0%**

Figure 3-20 Hook Pond Watershed 2010 Land Use



3.8 WASTEWATER MANAGEMENT PRACTICES

Wastewater management practices in the Hook Pond groundwater watershed consist exclusively of onsite systems. For systems that were installed prior to 1978 and for which no record of an upgraded system exists, the assumption is that the system is a cesspool. The remaining systems are assumed to be conventional septic systems with septic tanks and leaching pools. Systems over 1,000-gpd require a SPDES permit and may require a treatment system. Table 3-12 presents the number of developed properties in the Hook Pond groundwater watershed and the type of wastewater system assumed to exist (cesspool or conventional). The Town of East Hampton CWMP lot by lot needs analysis identified the type of system that is required for each property. Table 3-12 also presents the number of properties that are required to have a modified subsurface sewage disposal system (MSSDS), for sites with a design flow between 1,000 and 15,000 gpd, or a wastewater treatment facility (WWTF), for sites with flows > 15,000 gpd.

Table 3-12 Wastewater System Types in Hook Pond Groundwater Watershed

Type of System Required	# of Dev. Prop	System Type	
		Cesspool	Conventional
Assumed Existing	2,285	1,535	750
MSSDS Required	169	136	33
WWTF Required	1	0	1

From Table 3-12, a total of 170 properties require an advanced wastewater treatment system - in addition to a septic tank and leaching pools.

Table 3-13 presents the number of developed properties in the Hook Pond groundwater watershed with Village and Town properties disaggregated. The total wastewater design flow, rainfall volume reaching groundwater and the percent of groundwater recharge that comes from wastewater is also presented on Table 3-13.

Table 3-13 Wastewater as a Percent of Groundwater Recharge to Hook Pond

Hook Pond Watershed											
Area	No. of Properties & % of Total			Total Area (acres) & % of Total				Design Waste water Flow (gpd)	Ground water from rain (gpd)	Rain On Pond Surface (gpd)	Waste water as % of Total Ground water Flow
	Dev.	Undev.	Total	Dev.	Undev.	Water	Total				
Town	1,114	252	1,366	901	302	0	1,203				
Village	1,171	109	1,280	953	213	110	1,276				
Total	**2,285**	**361**	**2,646**	**1,854**	**515**	**110**	**2,479**	868,916	4,574,830	212,428	**7.98%**
	86%	14%		75%	21%	4%					

3.9 Pond Maintenance

The Maidstone Club performs the following activities on the Pond:

- Phragmites are cut 3-4 times per year on the Club's side of the property – see Figure 3-21. NYSDEC periodically inspects the cutting.

- Pond elevations – The Pond elevation is managed by the Village and Maidstone Club, with the Club actually controlling the outfall structure. According to Maidstone, the preferred Pond elevation is 18" above the outlet invert, which would be approximately elevation 2.7 feet. The discharge valve (see Figure 3-19) is opened when the Pond gets above 2.7 feet, in anticipation of large rain events and in preparation for phragmites cutting

Figure 3-21 Hook Pond Area of Phragmites Removal Areas

4. WATER QUALITY DATA

The following sections present Hook Pond water quality data in chronological order as collected and published by the various entities that have examined the quality of the Pond and its watershed's waters.

4.1 1981 LIMNOLOGICAL SURVEY DATA

Water and sediment nutrient data was collected as part of the 1981 Limnological Survey. Figure 4-1 presents the locations at which nutrient samples were taken. Tables 4-1 and 4-2 present the water and sediment nutrient data respectively. Sediment thickness is illustrated on Figure 3-12.

Nitrogen in the form of Total Kjeldahl Nitrogen (TKN) as nitrate and nitrite were below detection limits or at a very low level. The nitrogen levels ranged from 1.28 – 1.89 mg/L with the concentration decreasing between the upgradient (station 3) and downgradient (station 1) ends of the pond. The opposite trend was observed with phosphorus. Total phosphate levels at stations 2 and 3 were 0.12 and 0.13 mg/L respectively. At the outlet station (station 1), the total phosphate level was 1.67-mg/L – extremely high value. Orthophosphates were not detected in any of the samples. The high concentration of phosphorus near the outlet pipe was theorized to have been due to golf course fertilization and a family of geese that were observed in that area.

Sediment samples were taken at stations 2 and 3. At both locations, high levels of nitrogen and phosphorus were detected. Nitrogen was again in the form of TKN, with levels of 275 and 197.5 mg/L measured at stations 2 and 3 respectively. Total phosphate was measured at levels of 11 and 25 mg/L at stations 2 and 3 respectively. Orthophosphate were 8.75 and 5.0 mg/L at stations 2 and 3 respectively.

The total phosphorus data suggests that the Pond was highly eutrophic in 1981, as the P levels are significantly above the 0.020 mg/l maximum for non-eutrophic conditions.

Figure 4-1 1981 Limnological Survey Nutrient Sampling Locations

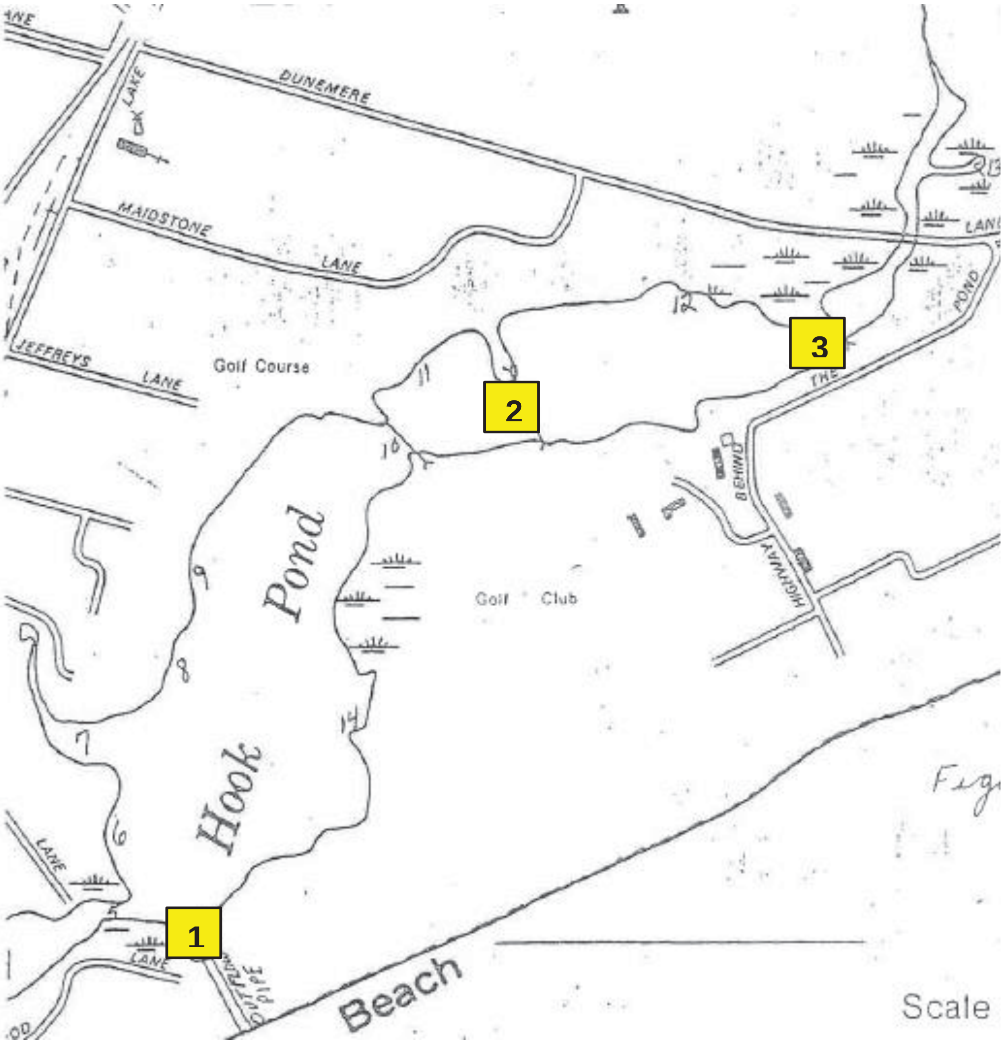


Table 4-1 1981 Limnological Survey Water Nutrient Sampling Data

TABLE 4 WATER COLUMN ANALYSES OF SAMPLES COLLECTED 30 JULY 1981 FROM HOOK POND, EAST HAMPTON, NEW YORK

Analysis	Station 1	Station 2	Station 3
Organic Nitrogen (mg/ℓ Organic-N)	0.91	0.91	0.67
Tot. Kjeldahl Nitrogen (mg/ℓ TKN-N)	1.28	1.50	1.89
Ammonia (mg/ℓ Ammonia-N)	0.37	0.59	1.22
Nitrite (mg/ℓ Nitrite-N)	<0.01	<0.01	0.02
Nitrate (mg/ℓ Nitrate-N)	<0.01	<0.01	<0.01
Tot. Phosphate Phosphorous (mg/ℓ Phosphate-P)	1.67	0.12	0.13
Ortho Phosphate Phosphorous (mg/ℓ Phosphate-P)	<0.01	<0.01	<0.01
Alkalinity (mg/ℓ $CaCO_3$)	36.0	37.0	31.0
Tot. Suspended Solids (mg/ℓ)	5.5	3.3	6.1
Total coliform (colonies/100 mℓ.)	>800	>800	>800
Fecal coliform (colonies/100 mℓ.)	350	758	170
Fecal Strept. (colonies/100 mℓ.)	1710	248	67.5
Fecal Coliform . Fecal Strept	1:5	3:1	3:1

Table 4-2 1981 Limnological Survey Sediment Nutrient Sampling Data

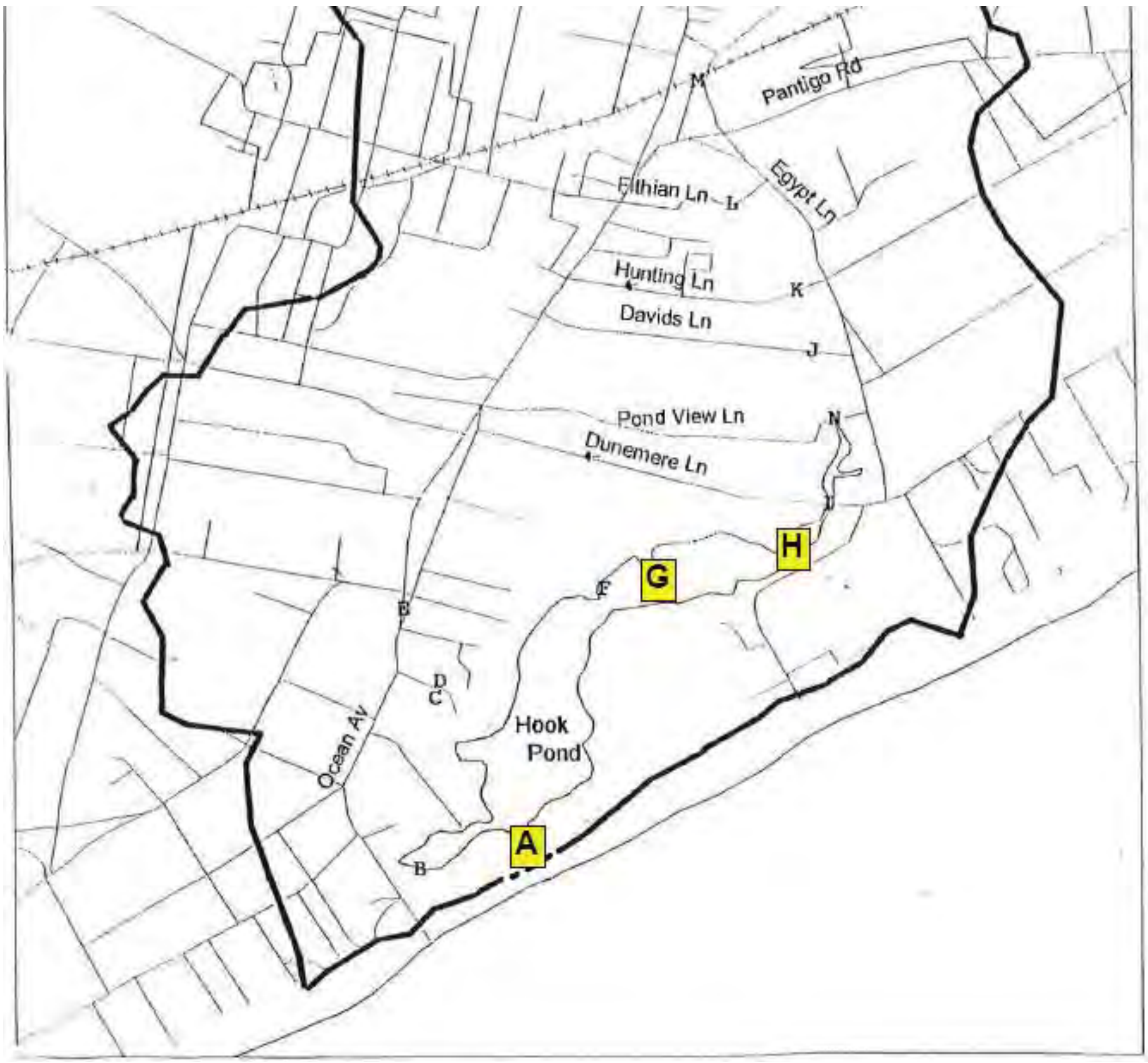
TABLE 5 SEDIMENT ANALYSES OF SAMPLES COLLECTED 30 JULY 1981 FROM HOOK POND, EAST HAMPTON, NEW YORK

Analysis	Station 2	Station 3
Organic Nitrogen (mg/kg Organic-N)	170.0	75.0
Tot. Kjeldahl Nitrogen (mg/kg TKN-N)	275.0	197.5
Ammonia (mg/kg Ammonia-N)	105.0	122.5
Nitrite (mg/kg Nitrite-N)	<0.25	<0.25
Nitrate (mg/kg Nitrate-N)	1.5	2.5
Tot. Phosphate Phosphorous (mg/kg Phosphate-P)	11.0	25.0
Ortho Phosphate Phosphorous (mg/kg Phosphate-P)	8.75	5.0
Percent Solids (%)	57	66
Halogenated hydrocarbons (pesticides)		
Chlordane (μg/kg)	27	29
DDE (μg/kg)	>50	>50
DDD (μg/kg)	>50	>50
Aldrin (μg/kg)	<0.2	<0.2
Lindane (μg/kg)	<0.1	<0.1
αBHC (μg/kg)	<0.1	<0.1
BHC (μg/kg)	<0.2	<0.2
Heptachlor epoxide (μg/kg)	<0.3	<0.3

4.2 1997 EAST HAMPTON DEPARTMENT OF NATURAL RESOURCES DATA

The East Hampton Department of Natural Resources (EHDNR) collected water quality data in Hook Pond in 1997. The complete data set is included in Appendix A of this report. The data is not in electronic form and consists of handwritten field data taken at numerous locations in the Hook Pond watershed. For comparison purposes, LAI selected the three locations that are closest to the locations presented on Figure 4-1. Figure 4-2 presents the locations that were sampled in 1997 with the three selected locations (A, G and H) highlighted. Table 4-3 presents a summary of the nitrogen, phosphorus, TDS and conductivity (which does not appear correct as it suggests a salty water) for the selected locations. As the analytical methods used for the phosphorus data in particular is not described in the project report and data sheets (Appendix B) and it is unclear if data is as PO_4 or P (and limits of detection being a concern), we have examined the pH data of sites A, G, H, I and N on Table 4-4 for the summer-early fall months when eutrophication would be most manifested. As Hook Pond watershed waters are expected to be low in alkalinity (as the entire Long Island aquifers), in our opinion it is reasonable to deduce that the high pH values of the open waters of Hook Pond was likely due to algal growth. Although we cannot correlate pH values with algae-chlorophyll a concentrations, we can expect the Pond's pH to be reflecting algae productivity, i.e. pH will rise as more algae growth occurs. Please note the Table 4-4 data for the period August – November 1997.

Figure 4-2 EHDNR 1997 Sampling Locations



The lack of chlorophyll a and total phosphorus / total nitrogen data does not allow enable understanding of nutrient budgets. That is, inorganic forms of phosphorus and nitrogen as measured are insufficient for a nutrient budget. Total nutrients = Organic + inorganic forms.

Table 4-3 Representative EHDNR Water Quality Data

Sampling Location A - Pond Discharge									
Date	TEMP	Sp. Cond. µs/cm	TDS (mg/L)	pH	NH_3-N mg/L	NO_2-N mg/L	NO_3-N mg/L	PO_4 -3 mg/L	PO_4 -3 - P mg/L
1/31/1997	34	2,400	1,300	6.95					
2/14/1997	38	2,400	1,200	7.37					
2/27/1997	49	2,600	1,300	6.20					
3/20/1997	42	2,700	1,300	7.60					
4/17/1997	52	2,600	1,300	7.55					
4/18/1997	52	2,300	1,300	7.60					
5/19/1997	60	2,900	1,400	7.40	0.02	0.033	0.2	0.1435	0.048
6/2/1997	64	6,200	3,100	7.75	0.16	0	0.5	0.0261	0.009
7/9/1997	78	3,000	1,500	7.60	0.03	0	0.2	0.2544	0.085
8/6/1997	74	3,600	1,800	8.00					
8/18/1997	74	2,800	1,900	9.10	0.01	0.5	0.002	0	
9/29/1997	66	2,500	1,400	8.10	0.03	0.002	0	0.0033	0.001
11/13/1997	46	2,700	1,400	8.20			0.5		
Min	**34**	**2,300**	**1,200**	**6.2**	**0.01**	**0**	**0**	**0**	**0.001**
Max	**78**	**6,200**	**3,100**	**9.1**	**0.16**	**0.5**	**0.5**	**0.2544**	**0.085**
Avg	**56.08**	**2,977**	**1,554**	**7.65**	**0.05**	**0.107**	**0.2337**	**0.0854**	**0.036**

Sampling Location G - Mid Pond									
Date	TEMP	Sp. Cond. µs/cm	TDS (mg/L)	pH	NH_3-N mg/L	NO_2-N mg/L	NO_3-N mg/L	PO_4 -3 mg/L	PO_4 -3 - P mg/L
1/31/1997	35	5,800	2,900	6.95					
2/14/1997									
2/27/1997	46	4,300	2,100	7					
3/20/1997	40	2,600	1,200	6.6					
4/17/1997	52	2,500	1,200	6.9					
4/18/1997	50	2,500	1,200	7.1					
5/19/1997	60	2,700	1,300	7.6	0.01	0.005	0	0.0522	0.017
6/2/1997	62	6,000	3,100	8.75	0.03	0	0.6	0.0457	0.015
7/9/1997	80	2,700	1,900	6.8	0.27	0.011	0.4	0.0489	0.016
8/6/1997	76	2,500	1,800	7.6					
8/18/1997	72	3,300	1,600	7.1					
9/29/1997	64	2,400	1,200	8.3					
11/13/1997	44	2,300	1,200	7			0.8		
Min	**35**	**2,300**	**1,200**	**6.6**	**0.01**	**0**	**0**	**0.0457**	**0.015**
Max	**80**	**6,000**	**3,100**	**8.75**	**0.27**	**0.011**	**0.8**	**0.0522**	**0.017**
Avg	**56.75**	**3,300**	**1,725**	**7.31**	**0.1033**	**0.0053**	**0.45**	**0.0489**	**0.016**

Sampling Location H - Pond Eastern End									
Date	TEMP	Sp. Cond.	TDS	pH	NH_3-N	NO_2-N	NO_3-N	PO_4 -3	PO_4 -3 - P
		µs/cm	(mg/L)		mg/L	mg/L	mg/L	mg/L	mg/L
1/31/1997	38	3,300	1,600	6.4					
2/14/1997									
2/27/1997	50	2,700	1,300	7.1					
3/20/1997	53	2,500	1,200	6.75					
4/17/1997	53	2,500	1,200	6.75					
4/18/1997	49	2,500	1,100	6.9					
5/19/1997	60	2,700	1,300	7.6	0.01	0.019	2	0.0196	0.007
6/2/1997	58	2,400	1,200	8.55	0.14	0.012	2.2	0.0685	0.023
7/9/1997	80	2,600	1,900	6.8					
8/6/1997	76	2,300	1,100	9.1					
8/18/1997		2,000	1,000	6.9					
9/29/1997	65	2,200	1,200	7.6					
11/13/1997	44	2,400	1,300	6.9			2.1		
Min	**38**	**2,000**	**1,000**	**6.4**	**0.01**	**0.012**	**2**	**0.0196**	**0.007**
Max	**80**	**3,300**	**1,900**	**9.1**	**0.14**	**0.019**	**2.2**	**0.0685**	**0.023**
Avg	**56.91**	**2,508**	**1,283**	**7.28**	**0.075**	**0.0155**	**2.1**	**0.044**	**0.015**

Table 4-4 EHDNR pH Water Quality Data

Date	pH				
	Hook Pond Open Water			Tributary Area	
	A	G	H	I	N
1/31/1997	6.95	6.95	6.40	6.35	
2/14/1997	7.37			6.60	
2/27/1997	6.20	7.00	7.10	6.60	6.50
3/20/1997	7.60	6.60	6.75	6.40	6.60
4/17/1997	7.55	6.90	6.75	6.35	6.15
4/18/1997	7.60	7.10	6.90	6.40	6.30
5/19/1997	7.40	7.60	7.60	6.60	6.20
6/2/1997	7.75	8.75	8.55	7.25	6.50
7/9/1997	7.60	6.80	6.80	6.20	6.00
8/6/1997	8.00	7.60	9.10	7.00	6.00
8/18/1997	9.10	7.10	6.90	6.60	6.30
9/29/1997	8.10	8.30	7.60	6.90	6.40
11/13/1997	8.20	7.00	6.90	6.50	6.40
Min	**6.20**	**6.60**	**6.40**	**6.20**	**6.00**
Max	**9.10**	**8.75**	**9.10**	**7.25**	**6.60**
Avg	**7.65**	**7.31**	**7.28**	**6.60**	**6.30**

The Report states the following regarding submerged aquatic vegetation, macrofauna and fish:

“The aquatic vegetation is of high quality, particularly that vegetation, or submerged aquatic vegetation (SAV), which is rooted to the pond floor. Water celery, elodea, and leafy pondweed comprise the bulk of this SAV. In the summer of 1997 the sampling shows that it covered about 90% of the bottom. Not only does this SAV remove nutrients and sediments from the water column, it is used as cover by a large number of pond species (fish, frogs, etc.) and used as food by many waterfowl species (e.g., mute swan, Canada goose, coot, mallard, black duck, canvasback, gadwall, widgeon, and others).”

“The Hook Pond system has a comparatively rich macrofauna, the major elements of which are birds and fish. The waterfowl that use the pond in the fall, winter and spring is the most diverse assemblage of waterfowl in any one water body on the South Fork. This assemblage includes at least one species, the tundra swan, which is found nowhere else on Long Island every winter except as an ephemeral visitor during migration. Other unusual waterfowl which frequent the pond are Eurasian widgeon, common merganser and pied-billed grebe. As part of the Hook Pond study, Marvin Kuhn has compiled a list of more than 20 waterfowl species that use the pond based on a year and-a-half of weekly observations.”

“The fish fauna is of interest in that there are very few sizeable freshwater ponds on eastern Long Island. Long Island freshwater fish faunas are characteristically thin. Hook Pond is thicker than most. Seining studies in 1997 and 1998 conducted by our department have revealed the presence of at least eight species of freshwater fish. The same studies reveal that there is no apparent imbalance in these populations; there is no obvious stunting or dominance of one species over another. There is an abundant supply of banded killifish, a small baitfish, which serves as food for top predators, such as the largemouth bass.”

The EHDNR report concluded the following:

1. The runoff flowing into Hook Pond is rich in nutrients which could lead to damaging eutrophication (e.g., severe phytoplankton blooms) in the future. It needs to be caught upgradient in LCB's and perked into the groundwater before it reaches the pond.

2. Phragmites and purple loosestrife are rapidly overtaking the other wetland species comprising Hook Pond's wetland edges and pockets and need to be controlled.

3. Wetlands consisting of high quality native marsh species should be replanted in several spots around the pond that will accommodate them and which is lacking in them now.

4. The aquatic vegetation, particularly, the rooted subaquatic vegetation (SAV), is in good shape and covers most of the pond's bottom. Present pond management practices appear to be favorable to the growth and distribution of this habitat type.

5. The fish and waterfowl fauna is rich in species and in apparent good health.

4.3 USGS Groundwater Quality Data

Water quality and water level data was compiled from the USGS database for the Hook Pond watershed and surrounding areas. Figure 4-3 presents the sampling locations, Table 4-5 presents the sampling results and Table 4-5 a presents the results for the in Pond location – see Figure 4-3. The Redfield TN:TP ratios have been used as a basis for estimating which nutrient limits algal growth. Low TN:TP ratios (less than about 7:1) are generally indicative of nitrogen limitation, whereas ratios greater than 10:1 are increasingly indicative of phosphorus limitation. As can be seen from the N:P ratios for the USGS data, Table 4-5a, the data suggests that Hook Pond is phosphorus limited.

Table 4-5 USGS Water Quality Sampling Data

USGS Groundwater & Tributary N & P Quality Data (mg/L)													
								Quality					
Project Well #	Site Name	NO_3 Min	NO_3 Max	NO_3 Avg	P Min	P Max	P Avg	From	To	# Years	All Data Points	Phos Data Points
3	S 8843. 2*	0.68	6.88	3.60	0.004	0.006	0.0048	9/25/2003	6/12/2008	4.7	5	4
5	S 7570. 1	<0.90	3.30	1.66	0.01	0.1	0.0065	6/10/1963	2/26/1987	23.7	63	1
10	S 48429. 1	0.49	6.49	3.59	<0.01	0.01	0.0067	8/7/1973	9/8/2008	35.1	22	2
11	S 8837. 1	0.87	2.30	1.63	0.01	0.04	0.0233	4/10/1974	4/26/1977	3.0	9	6
12	Hook Pond Tributary	1.40	4.79	3.22	0.03	0.05	0.04	2/27/1974	4/5/1995	21.1	13	4
19**	N 40 56 50.3; W 072 11 23.7	0.02	1.95	0.63	0.017	0.13	0.0756	8/6/2001	7/11/2008	6.9	62	11
19A**	Hook Pond At 3rd Hole Bridge	0.02	1.95	0.63	0.017	0.13	0.0756	8/6/2001	7/11/2008	6.9	62	11

Minimum P value was estimated

*****USGS data was from 2 locations - 19A only had one data point, 19 is only identified by lattitude and longitude***

Table 4-5a USGS Water Quality Sampling Data – Location #19

Date	TEMP	Sp. Cond. µs/cm	DO mg/L	pH mg/L	NH3-N mg/L	NO2-N mg/L	NO3-N mg/L	TKN mg/L	TN mg/L	P mg/L	N:P Ratio	ORTHO-PO4 mg/L
4/23/2002	11.2	263	11.5	7.5	0.09	0.023	0.604	0.88	1.51	0.058	58	0.01
6/7/2002					0.16	0.012	1.83	0.47	2.31	0.026	197	0
7/19/2003					0.24	0.037	1.95	1.4	3.39	0.097	77	0.01
9/16/2003	23.3	250	10.9	9.1	0	0.006	0.063	1.8	1.87	0.13	32	0
7/13/2004					0.13	0.022	0.756	3.2	3.98	0.017	518	0.02
9/2/2004	24.1	246	8.2	7.4	0.09	0.01	0.198	1.3	1.51	0.078	43	0
7/14/2005	23.8	296	9.2	7.8	0.03	0.008	0.171			0.089		0
7/20/2006	26.2	247	9.1	7.5	0.047	0.016	0.338			0.12		0.003
8/28/2007	24.9	286	10.5	8.7	0.05	0.017	0.371			0.05		0.006
7/11/2008	25.9	319	9.4	7.8	0.02	0.002	0.023			0.091		0.008
Min	**11.2**	**246**	**8.2**	**7.4**	**0**	**0.002**	**0.023**	**0.47**	**1.51**	**0.017**		**0**
Max	**26.2**	**319**	**11.5**	**9.1**	**0.24**	**0.037**	**1.95**	**3.2**	**3.98**	**0.130**		**0.02**
Avg	**22.77**	**272.4286**	**9.83**	**7.97**	**0.0857**	**0.0153**	**0.6304**	**1.51**	**2.43**	**0.076**		**0.006**

4.4 Maidstone Club DEIS Data

As part of the December 2013 DEIS for the Maidstone Golf Course Irrigation Improvement Project, a review of historical water quality data was presented along with:

3. Groundwater sampling at 6 locations on January 29, 2013

4. Surface water sampling at 6 locations on January 30, 2013

for the locations illustrated on Figure 4-4. The surface water sampling results are presented on Table 4-6 and the groundwater sampling results on Table 4-7.

Table 4-6 Maidstone 2013 Surface Water Sampling Results

Sample ID	Sampling Date	Sampling Time	Temperature (°C)	Specific Conductance (mS/cm)	pH	Dissolved Oxygen (ppm)
SW-1	1/30/13	0850	6.97	0.411	6.12	12.60
SW-2	1/30/13	0950	6.80	0.364	6.40	11.44
SW-3	1/30/13	1015	2.45	0.326	6.51	16.36*
SW-4	1/30/13	1035	3.92	0.400	6.54	15.80*
SW-5	1/30/13	1130	1.72	0.240	4.73	14.72*
SW-6	1/30/13	1230	7.32	0.333	5.65	22.76*

*Dissolved oxygen results are not valid (too high) due to likely equipment failure; i.e., the DO measurements for the last four locations sampled exceed the DO solubility limits for the respective combinations of specific conductance and temperature.

Parameters	Analytical Method	MRLs‡ (MPN/100 mL)	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
Total Coliform	9221B	2	140	23	240	7	<2	4
Fecal Coliform	9221E	2	140	23	240*	<2	<2	<2
Enterococci	Enterolert	2	<2	<2	<2	<2	<2	<2

‡ MRL = minimum reporting limit. MPN = most probable number.

* This result would exceed the New York State standard if it were a monthly geometric mean based on a minimum of five monthly sample results, but this result is from one sampling event.

Parameters* (units)	MRLs	SW-1/DUP FS†	SW-2 HP†	SW-3 HP†	SW-4 HP†	SW-5 HP†	SW-6 TP†	SW Criteria
Turbidity (NTU)	1.0	3.0/3.1	6.2	5.5	2.5	3.0	4.2	3.04** Rivers/streams only)
TDS (mg/L)	10	190/200	180	230	180	140	150	NA
Chloride (mg/L)	2.0	71/68	64	93	62	54	65	230††
Nitrate (mg/L)	0.1	2.7/2.8	2.5	2.2	2.6	1.7	0.8	0.71/0.32**
Nitrite (mg/L)	0.01	0.01/<0.01	0.02	0.02	0.02	0.03	<0.01	‡
TP (mg/L)	0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.031/0.008**
TKN (mg/L)	1.0	<1.0/<1.0	<1.0	1.4	<1.0	<1.0	1.2	‡

*See Appendix F of the ETS Report for analytical methods used for each parameter.
NA = not applicable (also see Section VI of the ETS Report).
DUP: Duplicate Sample
† FS = feeder stream; HP = Hook Pond; and TP = Town Pond
** Ecoregion criteria for rivers and streams/lakes and reservoirs for the Eastern Coastal Plan (Level III).
†† US EPA, 2009 (for indefinite aquatic exposure)
‡ The ecoregional criteria is for total nitrogen, which includes nitrite and TKN.

Analytical Methods*	Number of Pesticides Analyzed	MRL (ppb)	SW-1/Dup	SW-2	SW-3	SW-4	SW-5	SW-6
525.2	3	0.1/0.5	ND/ND	ND	ND	ND	ND	ND
L302	10	0.5	ND/ND	ND	ND	ND	ND	ND
S150	13	0.1/0.5/1.0	ND/ND	ND	ND	ND	ND	ND
515.3	4	0.1/0.5	TCPA: 1.7/1.7 (ND/ND all others)	TCPA: 0.8 (ND all others)	TCPA: 0.7 (ND all others)	TCPA: 1.1 (ND all others	ND	ND

‡"ND" = not detected.
*A complete list of pesticides submitted for analyses is provided in the Water Quality Sampling Report (included in Appendix E of this DEIS). MS/MSD samples were collected from SW-1.

The locations of the existing Maidstone irrigation wells # 1 & # 2 and the proposed new well # 3 are illustrated on Figure 4-5.

Figure 4-3 USGS Groundwater Sampling Locations

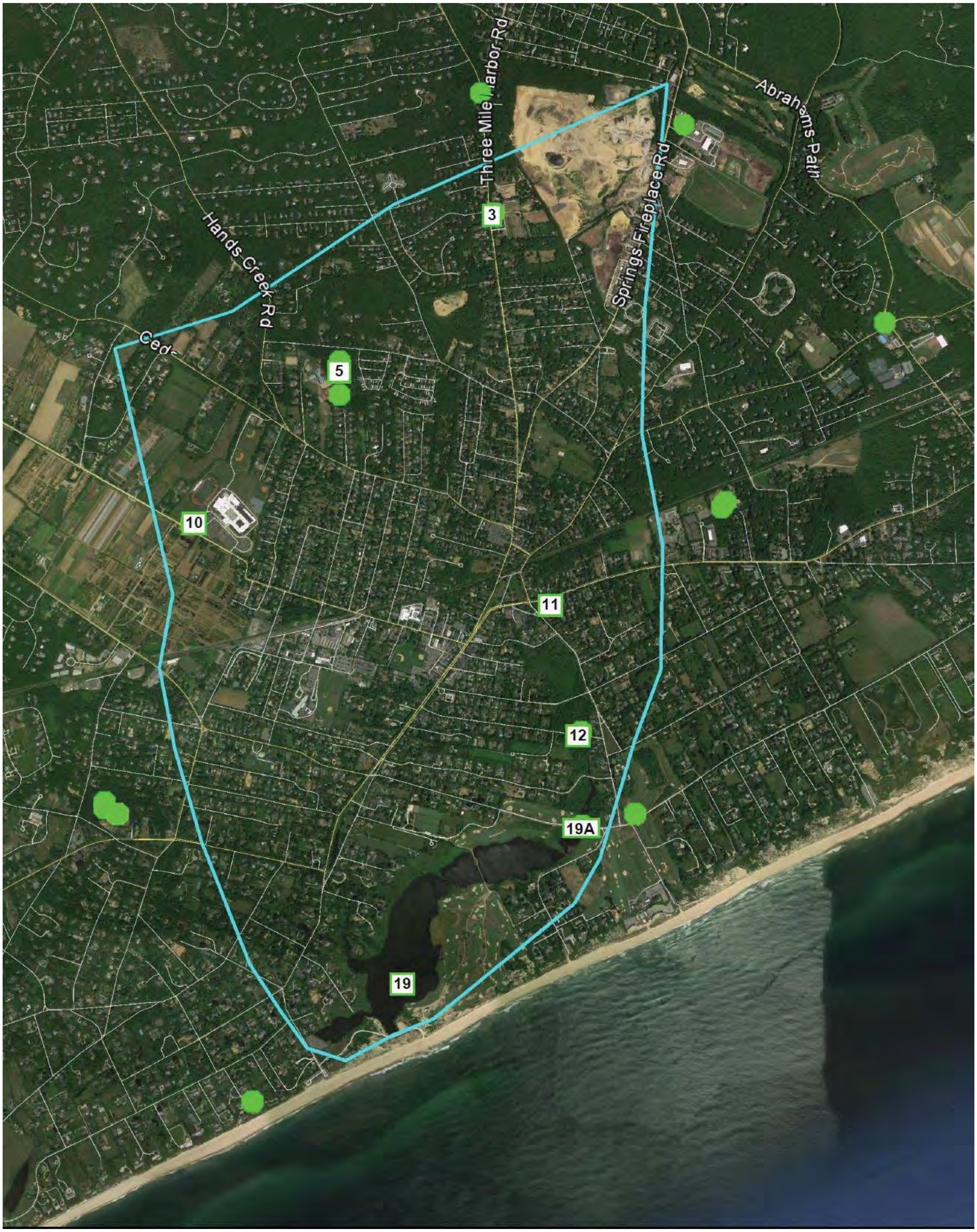


Figure 4-4 Maidstone DEIS Water Quality Sampling Locations

FIGURE 11 – 2013 SURFACE WATER AND GROUNDWATER SAMPLING LOCATIONS

SITE NAME: Maidstone Club Irrigation Improvement Project
LOCATION: 50 Old Beach Lane
MUNICIPALITY, STATE, ZIP: East Hampton, Suffolk County, New York, 11937
SCALE: Not to Scale
SOURCE: The Maidstone Club Water Quality Sampling Results (Environmental & Turf Services, Inc., March 20, 2013)

Figure 4-5 Maidstone Irrigation Well Locations (#1 & #2 exisiting, #3 proposed)

Environmental Engineers/ Consultants
LOMBARDO ASSOCIATES, INC.

Table 4-7 Maidstone 2013 Groundwater Sampling Results

Sample ID	Sampling Date	Sampling Time	Temperature (°C)	Specific Conductance (mS/cm)	pH	Dissolved Oxygen (ppm)	DTGW* (ft. bgs)
GP-1	1/29/13	1030	11.45	0.234	5.57	7.61	23
GP-2	1/29/13	1140	9.91	0.287	5.71	9.37	9.7
GP-3	1/29/13	1230	11.39	0.433	5.78	7.42	17
GP-4	1/29/13	1330	10.44	0.316	6.16	8.22	10.2
GP-5	1/29/13	1416	9.07	0.107	6.36	10.33	8.3
GP-6	1/29/13	1515	7.87	0.384	6.07	6.72	3.4

*DTGW = Depth to Groundwater

Parameters	Analytical Methods	MRLs‡ (MPN/100 mL)	GP-1	GP-2	GP-3	GP-4	GP-5	GP-6/Dup
Total Coliform	9221B	2	<2	<2	<2	<2	<2	50/80*
Fecal Coliform	9221E	2	<2	<2	<2	<2	<2	22/50
Enterococci	Enterolert	2	<2	<2	<2	<2	<2	<2/<2

‡MRL = Minimum Reporting Limit. MPN = Most Probable Number.
* Exceeds the New York State groundwater standard of 50 MPN/100 ml (Section VI(C) of the Water Quality Sampling Report in Appendix D of the ETS Report).

Parameters* (units)	MRLs	GP-1	GP-2	GP-3	GP-4	GP-5	GP-6/Dup	Standards
Turbidity (NTU)	1.0	<1.0	65	25	35	44	42/28	NA
TDS (mg/L)	10	120	150	220	170	57	170/160	500†
Chloride (mg/L)	2.0	28	39	59	54	16	62/61	250†
Nitrate-N (mg/L)	0.1	3.0	5.4	8.5	1.1	1.9	<0.1/<0.1	10‡
Nitrite-N (mg/L)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01/0.01	1‡
TP (mg/L)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	NA
TKN (mg/L)	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0/<1.0	NA

*See Appendix F of ETS Report (included in Appendix E of this DEIS) for analytical methods used for each parameter.
NA = not applicable (also see section VI).
† These are Secondary Maximum Contaminant Levels (SMCL) in drinking water standards (not enforceable).
‡ These parameters are Maximum Contaminant Levels (MCL; enforceable).

4.5 SCDHS Groundwater Data

The Suffolk County Department of Health Services (SCDHS) has monitored the quality of groundwater wells and surface water locations in or near Hook Pond for the following programs:

- Maidstone Club, East Hampton Well Number S-115135

- For the period July 2009 through May 2010 as part of an investigation into contamination caused by a dry cleaner formerly on Newtown Lane.

- Water supply wells

4.5.1 Maidstone Club Golf Course Well

- Maidstone Club, East Hampton Well Number S-115135 (depth of 50 – 60 feet below grade), since 1999, annual sampling of inorganics (not including phosphorus), metals, volatile organic compounds, semi-volatile compounds and herbicides

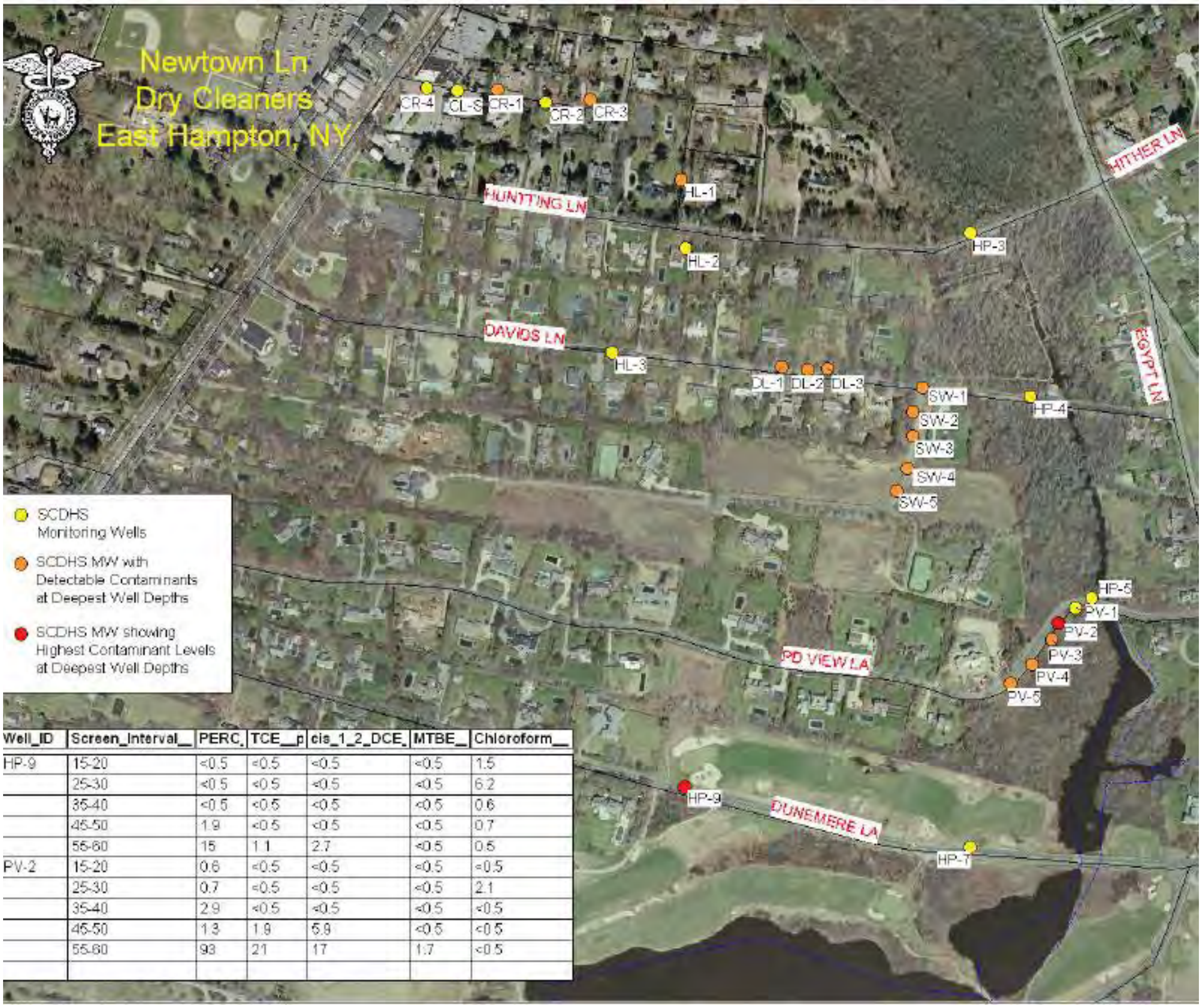
Figure 12 - SCDHS Monitoring Well Location

4.5.2 Newtown Lane Dry Cleaner Plume Monitoring

- 26 wells were each sampled in 2009 – 2010 on one occasion at various depths for temperature, dissolved oxygen, pH, conductivity, 6 metals, inorganic nitrogen and volatile organic compounds.

- The contaminant plume has been monitored at the locations presented on Figure 4-6. In Pond monitoring by SCDHS is presented on Figure 4-7.

Figure 4-6 SCDHS VOC Groundwater Sampling Locations July 2009 – May 2010.



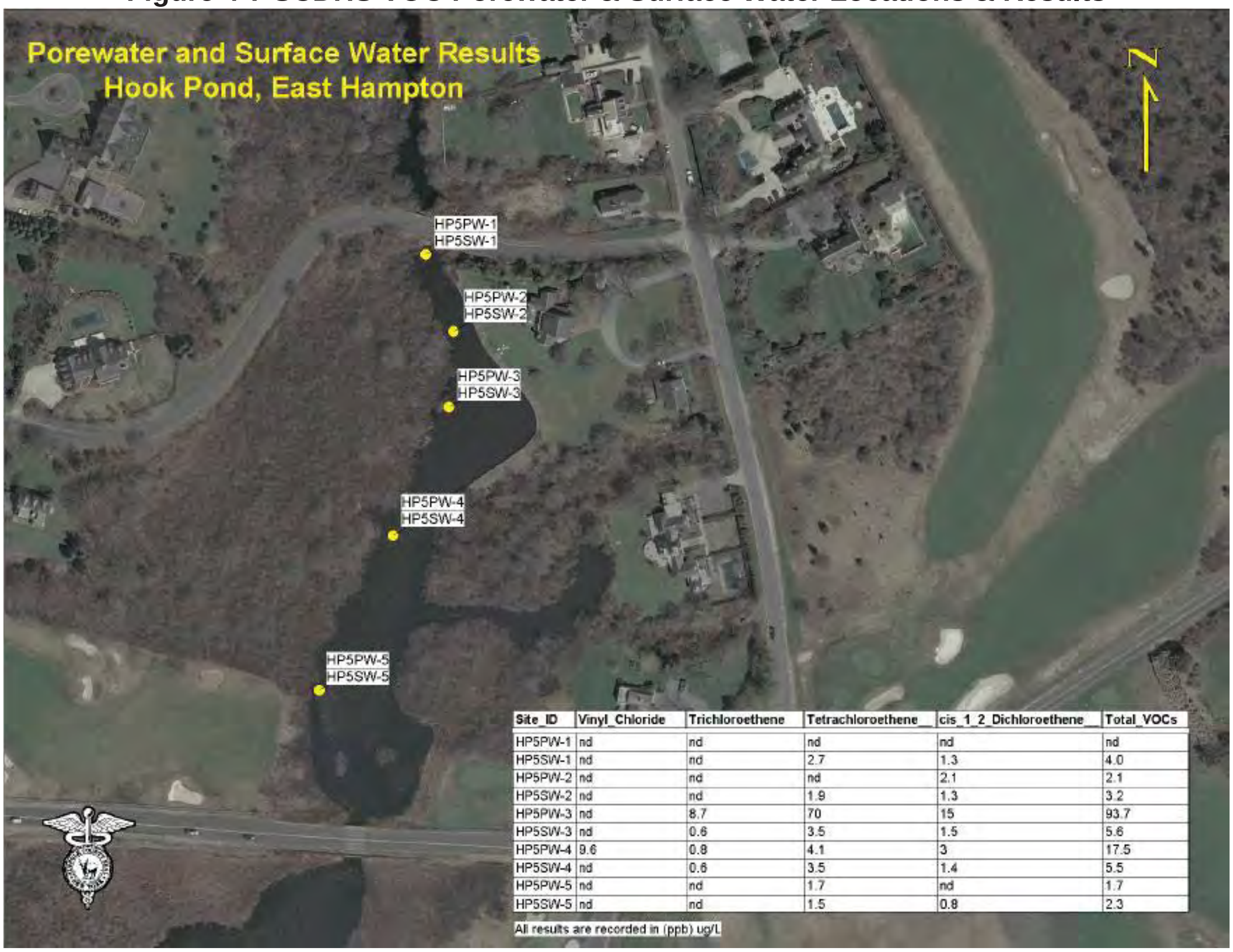
Well_ID	Screen_Interval__	PERC_	TCE__p	cis_1_2_DCE_	MTBE__	Chloroform__
HP-9	15-20	<0.5	<0.5	<0.5	<0.5	1.5
	25-30	<0.5	<0.5	<0.5	<0.5	6.2
	35-40	<0.5	<0.5	<0.5	<0.5	0.6
	45-50	1.9	<0.5	<0.5	<0.5	0.7
	55-60	15	1.1	2.7	<0.5	0.5
PV-2	15-20	0.6	<0.5	<0.5	<0.5	<0.5
	25-30	0.7	<0.5	<0.5	<0.5	2.1
	35-40	2.9	<0.5	<0.5	<0.5	<0.5
	45-50	1.3	1.9	5.9	<0.5	<0.5
	55-60	93	21	17	1.7	<0.5

4.6 Town Trustees - Gobler Data – Section provided by Professor Gobler

Hook Pond was sampled by the Gobler Laboratory in 2013 and 2014 as part of the lab's comprehensive assessment of East Hampton Town Trustee waters. The sampling effort has been largely focused on harmful algae, and other basic water quality criteria including dissolved oxygen and temperature. There has been a singular sampling site for Hook Pond, located in a cove on the Southwestern side, at the end of Terbell Lane in East Hampton, Figure 4-8. The site is fairly shallow, with a predominantly muddy bottom, and a partially suspended layer of solids. "EH17" represents a small area of a much larger water body, and may not wholly represent the status of the pond but was the site designated by the Trustees for sampling by the Gobler laboratory.

Parameters were measured once in early April of 2013, then bi-weekly from July through September of the same year, and again bi-weekly between June and September in 2014. Measurements of physical properties of the water body including temperature, salinity, and dissolved oxygen were made using a handheld YSI 556 sonde. Chlorophyll a, a pigment produced by all algae, was measured as an analog for algal biomass. It was collected onto glass fiber filters, extracted with acetone, and measured with a Turner Designs Trilogy fluorometer. Blue green algal fluorescence was measured from whole water samples using a BBE Fluoroprobe. This same device provided fluorescence of green algae, cryptophytes, and diatoms. In 2013, whole water samples were also collected and preserved in Lugol's iodine solution for cell identification and counting. Cell counts were performed using a Sedgewick rafter slide, and a microscope. Phycocyanin is yet another fluorescent-pigment-analog for cyanobacterial biomass, and was measured with whole water samples in a Turner Designs TD-700 fluorometer during the 2013 sampling season.

Figure 4-7 SCDHS VOC Porewater & Surface Water Locations & Results



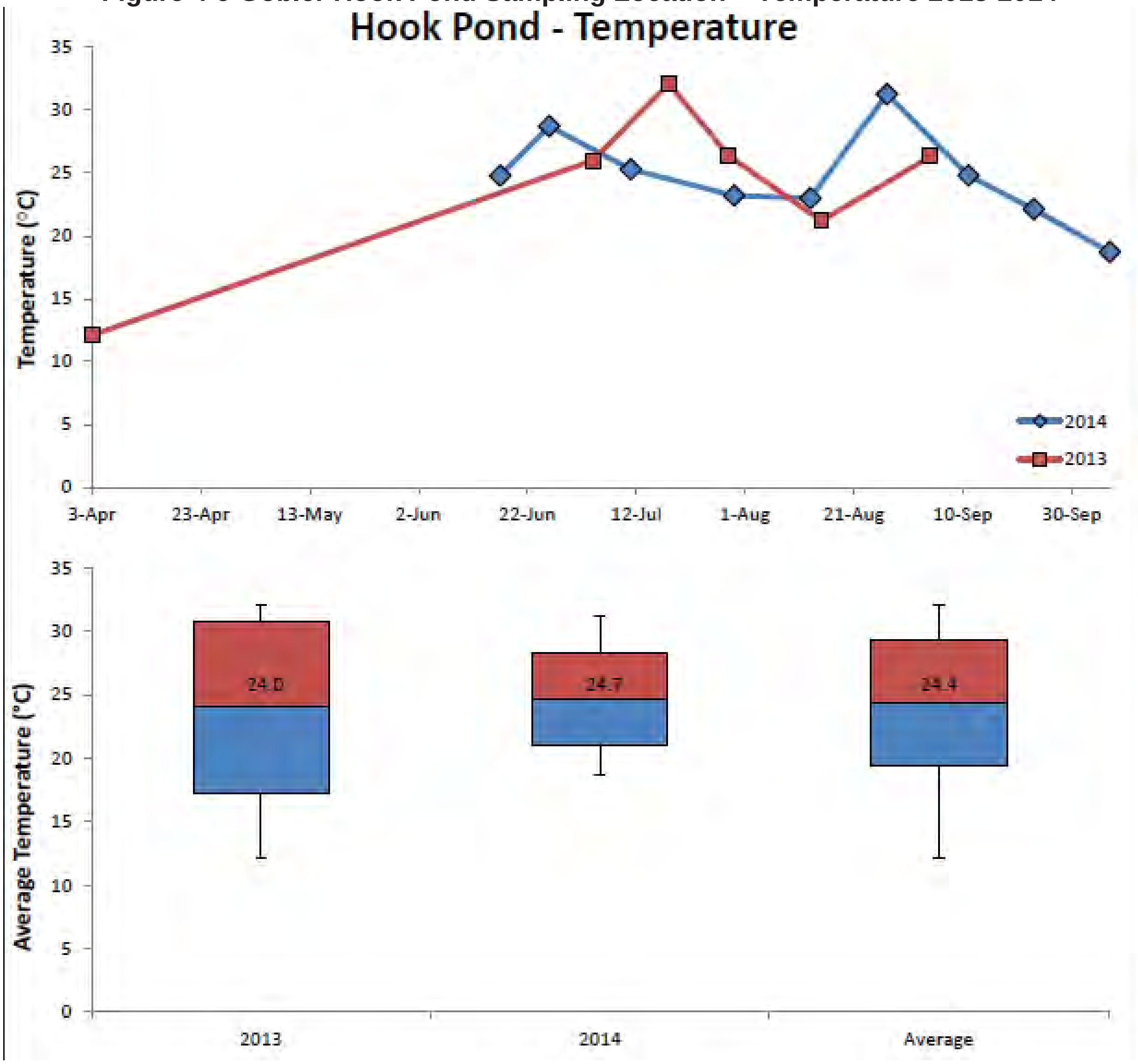
Site_ID	Vinyl_Chloride	Trichloroethene	Tetrachloroethene	cis_1_2_Dichloroethene	Total_VOCs
HP5PW-1	nd	nd	nd	nd	nd
HP5SW-1	nd	nd	2.7	1.3	4.0
HP5PW-2	nd	nd	nd	2.1	2.1
HP5SW-2	nd	nd	1.9	1.3	3.2
HP5PW-3	nd	8.7	70	15	93.7
HP5SW-3	nd	0.6	3.5	1.5	5.6
HP5PW-4	9.6	0.8	4.1	3	17.5
HP5SW-4	nd	0.6	3.5	1.4	5.5
HP5PW-5	nd	nd	1.7	nd	1.7
HP5SW-5	nd	nd	1.5	0.8	2.3

All results are recorded in (ppb) ug/L

Figure 4-8 Trustees-Gobler Hook Pond Sampling Location

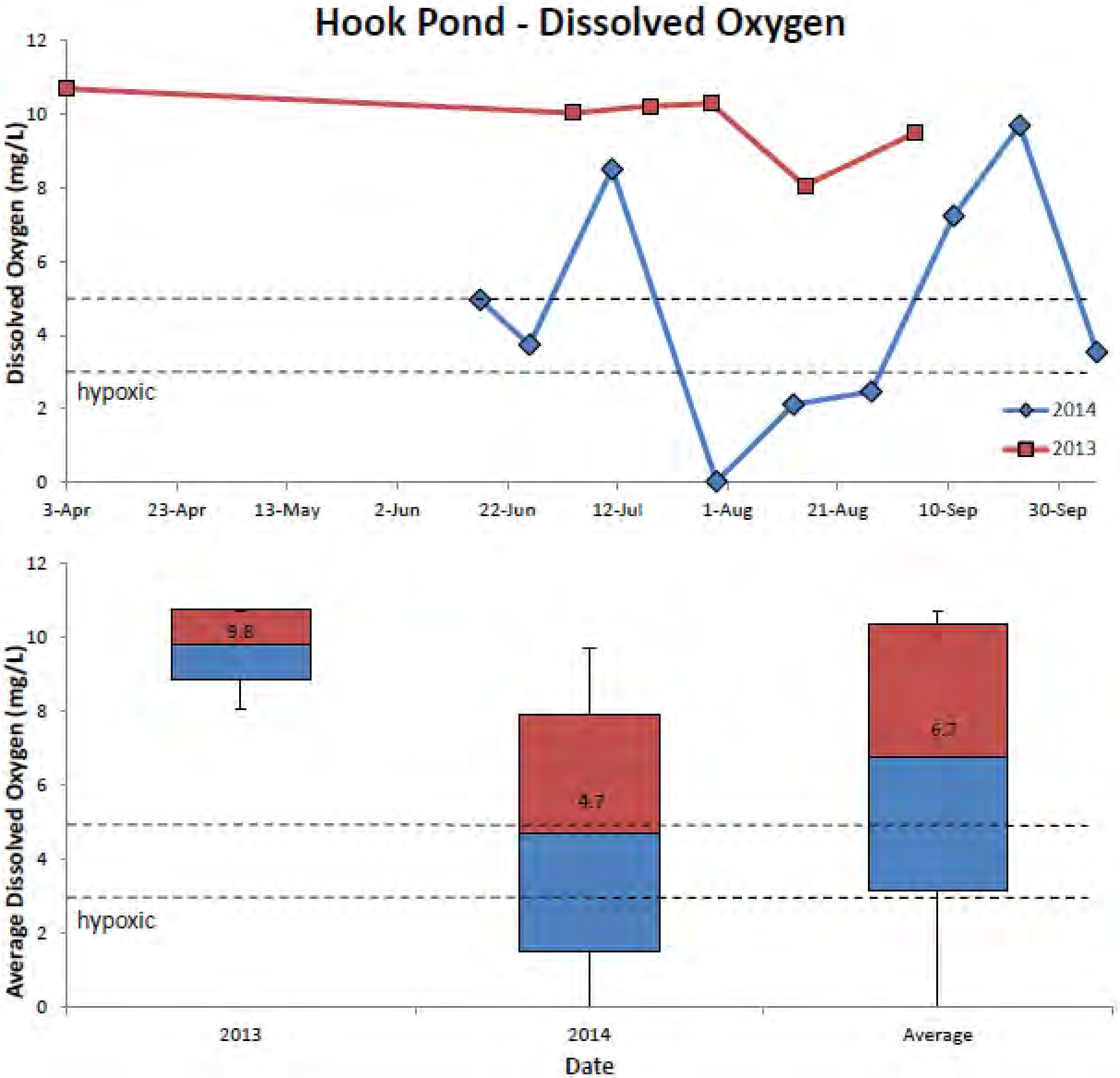
Temperature patterns were fairly consistent between 2013 and 2014, particularly in July and into September. The average temperatures were close to 24°C during this time, with maximum values of 32 and 31°C each year, respectively (Figure 4-9). Minimum values during the summer stayed above 21°C for both years. Salinities too were consistent. Hook Pond is a freshwater system, and sees little to no influence from the nearby Atlantic Ocean. Salinity was low, and ranged between 0.1 and 0.3 PSU, with an average value close to 0.2 PSU.

Figure 4-9 Gobler Hook Pond Sampling Location – Temperature 2013-2014



Dissolved oxygen is a vital factor the health and survival of aquatic life. The average dissolved oxygen level in 2013 was 9.8 mg/L, and stayed within the safe range of 8.1 to 10.7 mg/L for that year (Figure 4-10). The levels during 2014 were significantly lower. The average dissolved oxygen value was 4.7 mg/L. That value lies below the minimum daily average of 5.0 mg/L suggested by the NYSDEC to support fish, shellfish, and wildlife propagation and survival (class C waters; http://www.dec.ny.gov/regs/4592.html). Furthermore, values reached as low as 0.3 mg/L, with a total of three dates measuring below 3 mg/L which the NYSDEC states oxygen levels should at no point fall below to support wildlife survival. Given the similarity in temperatures, chlorophyll levels, and blue green algae levels between the two years, it is difficult to ascribe a singular factor to the lower dissolved oxygen reading in 2014, although the multiple observations indicates it was not a singular event. Certainly, more data is needed to better decipher trends in dissolved oxygen in Hook Pond.

Figure 4-10 Gobler Hook Pond Sampling Location – Dissolved Oxygen 2013-2014



Chlorophyll a values in 2013 ranged from 4.5 to 9.9 µg/L, whereas in 2014 the chlorophyll a values ranged from 2.9 to 9.7 µg/L, with mean values being slightly lower in 2014 than they were in 2013, dropping from a value of 7.1 µg/L to 5.9 µg/L (Figure 4-11). Freshwater bodies in excess of 8µg/L of chlorophyll a are considered eutrophic, or over enriched in phytoplankton and nutrients, by the US EPA (2000). The average values for Hook Pond between both years were generally below this level, but both years saw a similar peak in the middle of August where values peaked above this level. There was one other date in 2013, in mid-July, that experienced a value over this limit.

Figure 4-11 Gobler Hook Pond Sampling Location – Chlorophyll a 2013-2014

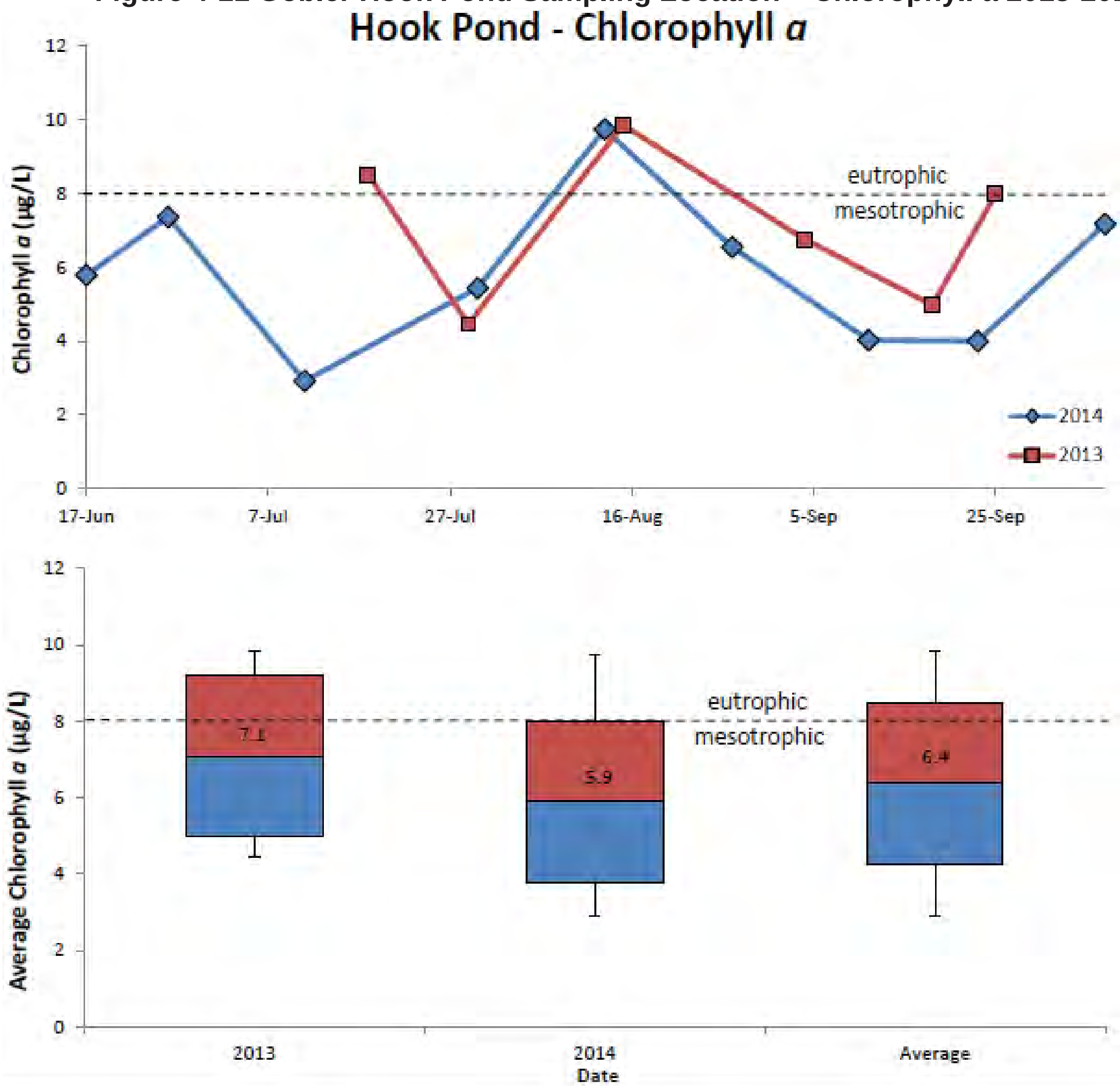


Figure 4-11x Hook Pond Chlorophyll a 2013 Data

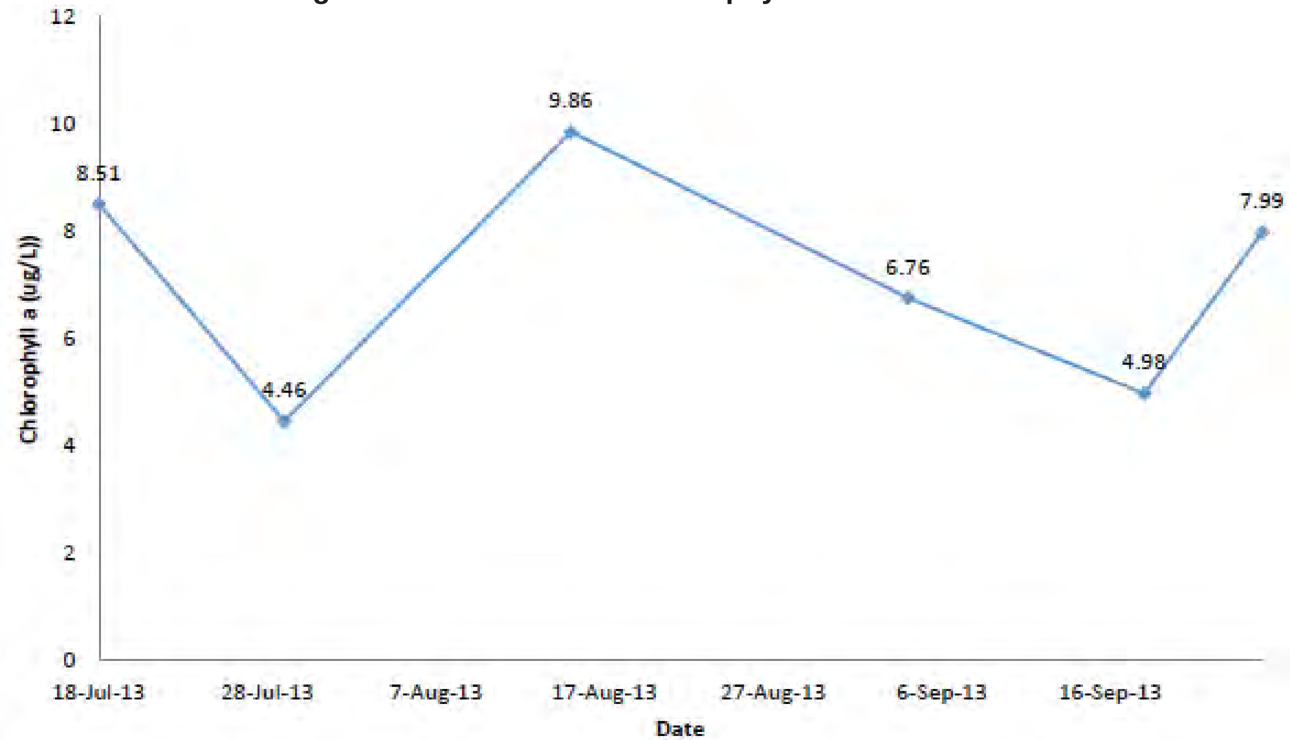
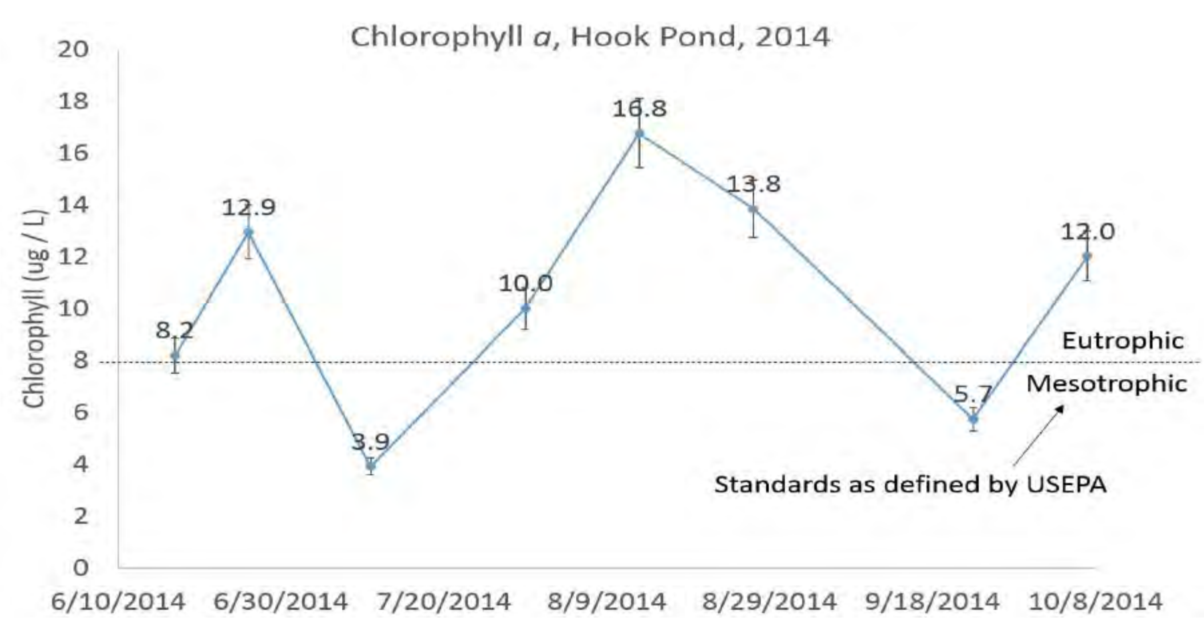


Figure 4-11y Hook Pond Chlorophyll-a 2014 Data



Blue green algal fluorescence values displayed similar trend in both years. The average value in 2013 was 3.5 µg/L, with a maximum value of 6.2 µg/L in late summer (Figure 4-12). The mean value for 2014 was 1.6 µg/L, and only peaked as high as 3.2 µg/L. These levels were well below the limit of 20 µg/L. Both years saw an increase in fluorescence from the end of July to the middle of August, where both years saw their maximal peak, which then declined thereafter. This peak coincides with the peak in chlorophyll a values (Figure 4-11). In 2013, the densities of multiple groups of phytoplankton were quantified. Hook Pond had low-to-moderate densities of cyanobacteria genera that are known to cause toxic blue green algae blooms including Microcystis and Anabaena (Figure 4-13). In addition, densities of dinoflagellates reached levels that can be problematic in some ecosystems (i.e. >500 cells/ml) (Gobler et al, 2012).

Figure 4-12 Gobler Hook Pond Sampling Location – Bluegreen Fluorescence 2013-2014

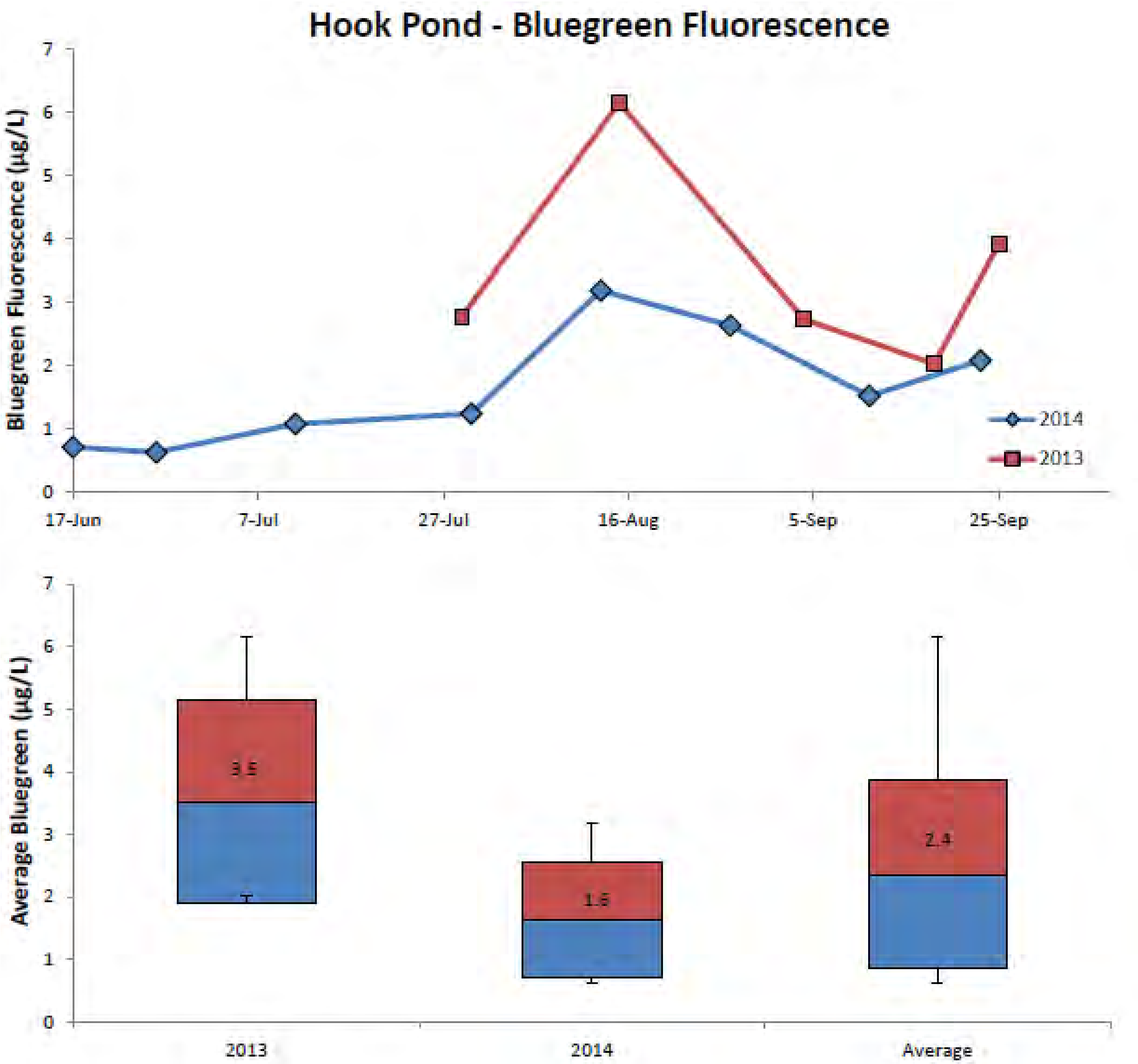
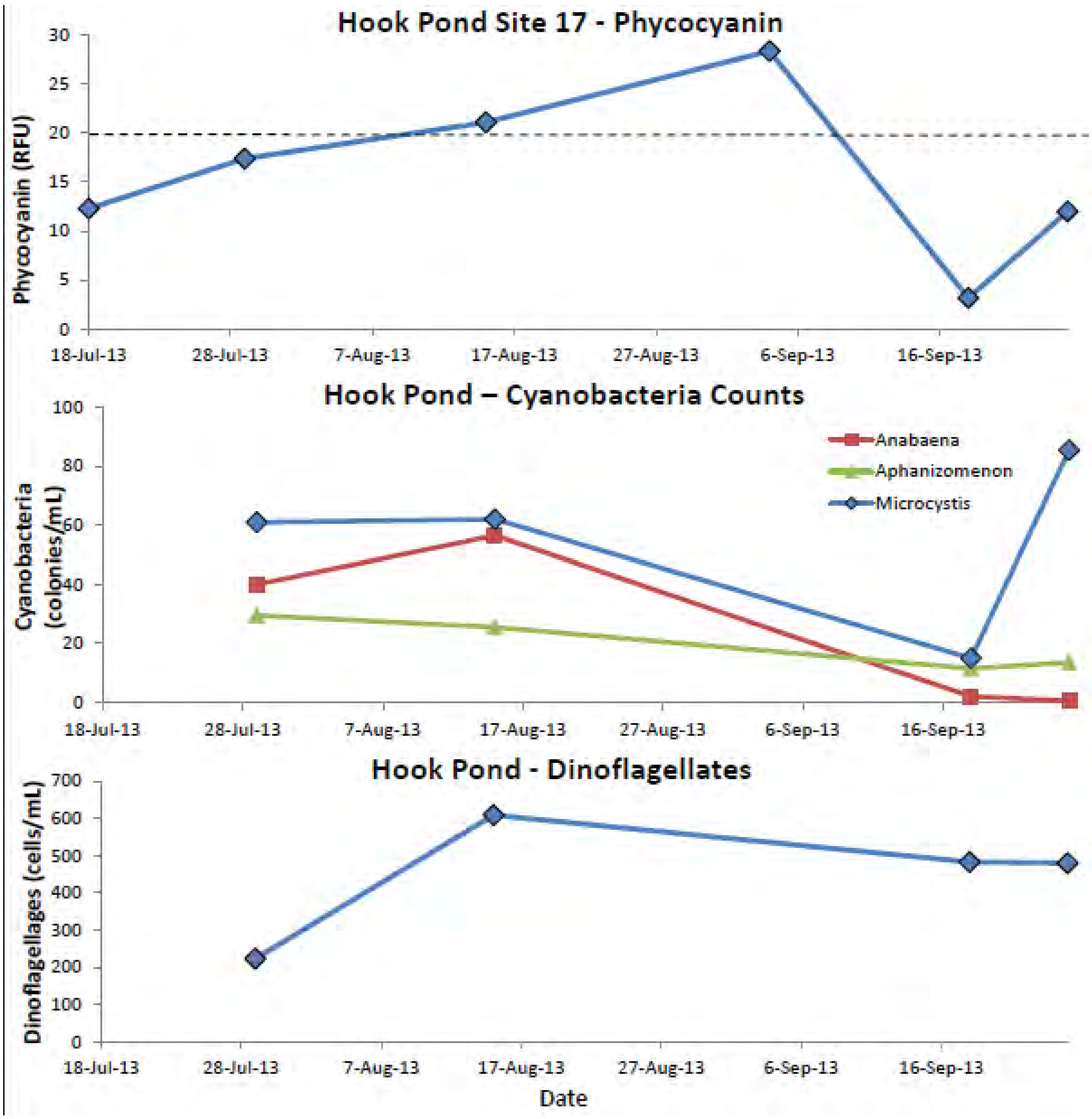


Figure 4-13 Gobler Hook Pond Sampling Location – Bluegreen Fluorescence 2013-2014



In 2013 and 2014, phytoplankton community diversity was assessed via analysis of pigment fluorescence of multiple phytoplankton groups using a Fluoroprobe which distinguished the relative abundance of four majors phytoplankton groups based on the fluorescence signatures: Blue green algae, green algae, diatoms, and cryotophytes. These analyses revealed that in both years, green algae were the dominate group of phytoplankton while diatoms and blue green algae maintained similar densities and cryptophytes were a very small component of the total phytoplankton community (Figure 4-14). Green algae were by far the dominant group in 2013, while in 2014 there were some dates in which the relative abundance of most groups was relatively equal (Figure 4-14). These trends are in contrast to more eutrophic locations in East Hampton such as Georgica Pond and on the South Fork such as Lake Agawam, where blue green algae dominate and bloom to the exclusion of other phytoplankton groups.

Figure 4-14 Gobler Hook Pond Sampling Location – Phytoplankton Diversity 2013-2014

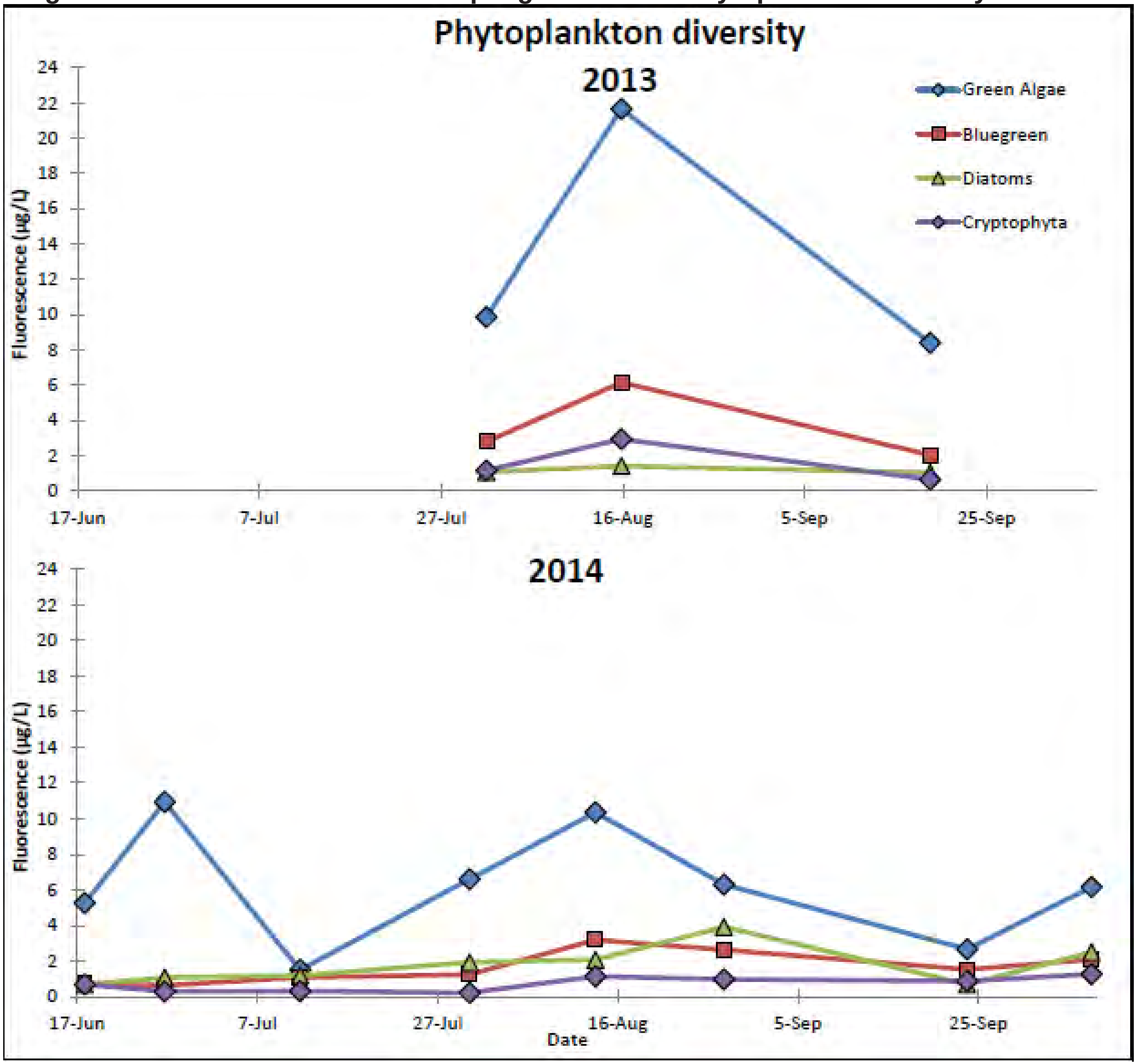
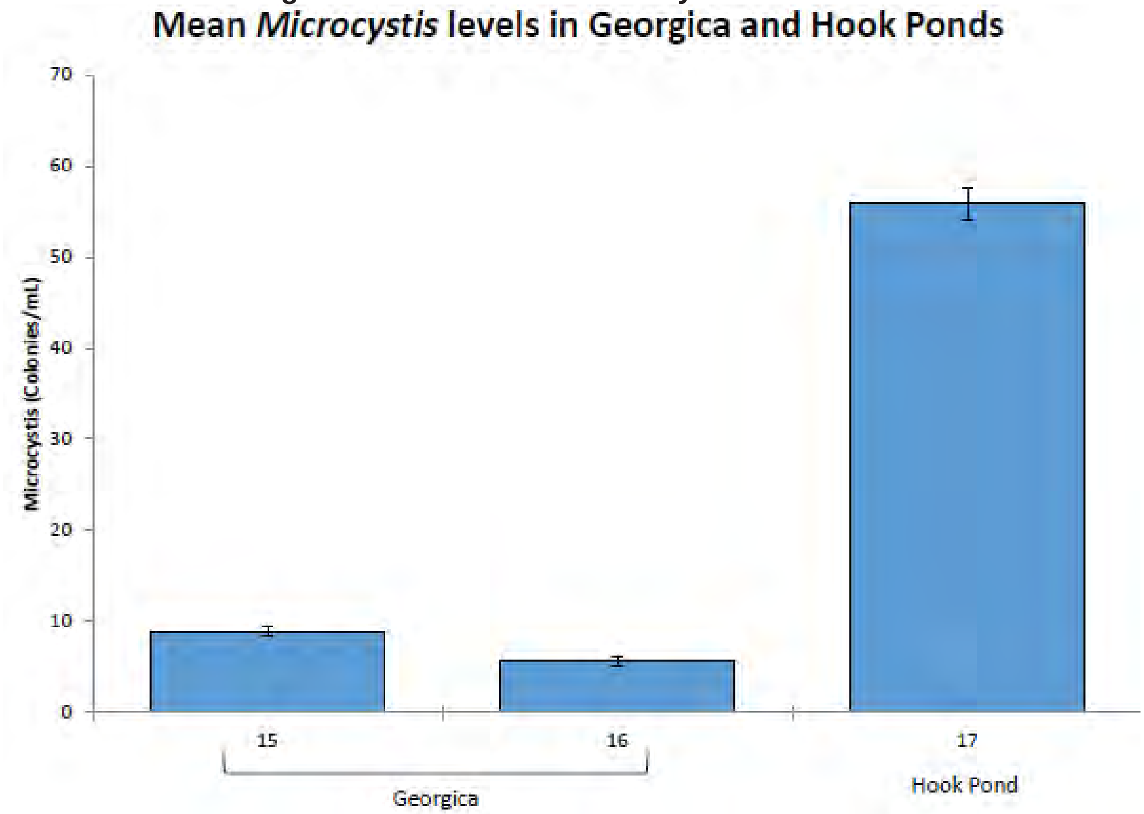


Figure 4-15 presents microcystis levels in Georgica and Hook Pond, as collected by Gobler in 2013. Microcystis is a toxic blue green algae that makes the toxin, microcystin. The 2013 Microcystis levels in Hook Pond greatly exceed those present in Georgica Pond which is known to have problems with toxic blue green algae.

Figure 4-15 Hook Pond Microcystis 2013 Data



4.7 Observations by James, High School, Miscellaneous Items

4.7.1 Linda James Photos – May 27, 2013

Pond photos taken on May 27, 2013 by Linda James are presented on Figures 4-16. The location is on the east side of Hook Pond near the discharge outlet – see LJ noted location on Figure 4-6. The materials in the photographs were not laboratory identified. Material could be cyanobacteria and/or pollen.

4.7.2 High School Studies - 2012

In the spring of 2012 members of the East Hampton High School Environmental Awareness Club began four months of testing of the waters of Hook Pond. The water quality was tested by Mr. Minardi and, two students of the Environmental Awareness Club. The group collected water samples from six selected entry points, once per month. The samples were tested at Mr. Minardi's lab for total nitrogen, phosphates, pH, dissolved oxygen, and temperature. Analysis of the data indicates a low oxygen concentration and the Pond is close to an anaerobic phase – similar findings as Prof. Gobler.

Figure 4-16 May 2013 Photos of Algae

Walking this AM on the MC Golf course I saw this yellow slick on the shoreline between the 6th and 7th hole. The photos were taken from my kyack. I found a second slick in the reeds just north of the first one. Fortunately the slick that is on my paddle has not affected any birds.

4.8 PHRAGMITES REMOVAL

Phragmites removal project was performed in 2006 – 2007 as is described in Appendix G, and illustrated on Figures 4-17 and 4-18. NYSDEC has permitted the phragmites removal through September 2016 for the Village and June 2015 for the Maidstone Club.

4.9 PROPOSED STORMWATER IMPROVEMENTS

As described in Appendix F, in February 2014, the Village submitted grant applications to Suffolk County for:

- Project 1: North Hook Mill Green: Design and implementation of Bioswale/Shallow Wetland:
- Project 2: Village Green at Town Pond: Design and implementation of micropools/swales.
- Drain inserts in both project areas

Figure 4-17 2007 Phragmites Removal Area

Figure 4-18 2007 Phragmites Removal Area

LITTLE HOOK POND - HYDRO-RAKE WITH FULL LOAD OF PHRAGMITES ROOTS AND RHIZOMES (LEFT); AND THEN TRANSFERRING DUG MATERIAL TO TRANSPORTER (RIGHT). 12/2006

LITTLE HOOK POND, LOOKING NORTH FROM VILLAGE PARKING LOT, BEFORE HYDRO-RAKING, 11/2006 (LEFT); AND AFTER HYDRO-RAKING, 12/2006 (RIGHT)

4.10 DATA SUMMARY

While there is very limited chlorophyll a data and, in general, the limits of detection of the phosphorus data (i.e. 0.050 mg/l) is greater than values of interest (i.e. 0.005 - 0.050 mg/l), based upon the Gobler 2013 and 2014 chlorophyll a data, and as a preliminary assessment only, Hook Pond is at times eutrophic and efforts to improve the Pond's water quality need to focus on reducing phosphorus levels discharging to and within the Pond.

Following is a summary of the water quality data collected by the various researchers.

4.10.1 GROUNDWATER

The groundwater quality data that could provide information on groundwater discharges to Hook Pond consists of:

1. **USGS groundwater wells** – of the six (6) USGS sampling locations in Hook Pond (see Section 4.3 and Appendix C);

    - ✓ only four locations are groundwater wells
    - ✓ 3 of the 4 groundwater wells are located at the most upgradient areas in the Hook Pond watershed so that they would not show much anthropogenic influence
    - ✓ Much of the data is 30+ years old
    - ✓ Few data points exist for each well – typically 4 – 6 datapoints, all showing low phosphorus concentrations

2. **EHDNR Groundwater Sampling** - the EHDNR 1997 Sampling report states that groundwater monitoring wells were installed and monitored, however the limited data that was published only presents nitrate-N data.

3. **Maidstone Irrigation DEIS** - Groundwater sampling at 6 locations on only one date, January 29, 2013, see Section 4.4 – all with total phosphorus below the reporting limit of 0.05 mg/l. Well depth stated as top of water table.

4. **SCDHS Data**

    a. Maidstone Club groundwater well monitoring - yearly data does not include phosphorus. Average nitrate-N concentration was 5.4 mg/l.
    b. Private well water quality data - data does not include phosphorus
    c. Dry Cleaner Plume Monitoring - data does not include phosphorus

As can be discerned the groundwater quality data to quantify phosphorus groundwater delivery to Hook Pond is very thin, and in our opinion, insufficient to determine the degree to which wastewater and fertilizer phosphorus, in particular, is reaching Hook Pond. Alternately stated, with the limited existing data, we cannot confidently determine attenuation of wastewater and fertilizer phosphorus discharged in the Hook Pond watershed. The very limited data suggests that significant wastewater phosphorus attenuation may be occurring. Detailed monitoring of septic plumes needs to be performed to address this question.

4.10.2 STORMWATER

No Hook Pond watershed stormwater quality data has been collected and published.

4.10.3 TRIBUTARIES TO POND

Only the eastern tributary was monitored. No water quality data has been collected on Town Pond, which is visually observed to be highly eutrophic in the summer.

1. USGS monitoring locations

The USGS monitored Pond surface water quality near the outfall (see Figure 4-3) from 2001 through 2008 with eleven phosphorus datapoints. The ortho-phosphorus data is extremely low, typically <= 0.010 mg/l, whereas total phosphorus (TP) averaged 0.0.076 mg/l.

2. EHDNR Sampling

Sample locations H (Maidstone short bridge), I (Dunemere Lane) and N (Pond View Lane bridge) (See Appendix B) have 2, 3 and 5 data points, respectively, on ortho-phosphate with values averaging 0.015, 0.069 and 0.049 mg/L PO_4-P respectively. Total phosphorus and TKN were not measured and is needed for phosphorus budgets.

3. Maidstone Irrigation DEIS

Sample locations SW-3 (Maidstone short bridge), SW-2 (Dunemere Lane) and SW-1 (Davids Lane bridge) (See Figure 4-4), were sampled on January 30, 2013 and total phosphorus was measured at below the reporting limit of 0.050 mg/L.

4.10.4 POND WATER QUALITY

1. EHDNR Sampling

Two in pond sampling locations – one at the outlet and one at mid Pond – see Figure 4-2, were sampled for ortho-phosphate for 4 and 3 datapoints respectively with values averaging 0.036 and 0.015 mg/L PO_4-P respectively. Total phosphorus was not measured and is needed for phosphorus budgets. Low PO_4-P and high pH values are indicative of likely high algal productivity.

2. Maidstone Irrigation DEIS

Sample locations SW-4 (Maidstone long bridge) and SW-5 (near outlet near eastern shore) (See Figure 4-4), were sampled on January 30, 2013 and total phosphorus was measured at below the reporting limit of 0.050 mg/L.

3. Trustee – Gobler Data

Although the sample location may not be representative of the Pond's water quality, Gobler measured the chlorophyll a concentration at 7.1 and 5.9 ug/L for 2014 and 2014 respectively. Using relationship between chlorophyll a and TP, one would expect TP values of Gobler's samples to be 0.020 – 0.025 mg/L.

4.10.5 POND SEDIMENTS

The Hook Pond sediments were measured by the 1981 limnological survey and the EHDNR 1997 investigations and limited data by Bennett in 2014 with only the 1981 study providing sediment quality information.

4.10.6 SUBMERGED AQUATIC VEGETATION (SAV)

The 1997 EHDNR suggests that SAV have an important influence on Hook Pond water quality, is widespread (in 19997 covered 90% of the bottom) throughout the Pond and consists primarily of water celery, elodea and leafy pond weed.

Seven (7) major SAV species were identified in the 1981 study.

4.10.7 WATERFOWL

Although waterfowl are suspected to influence water quality, limited quantitative information is provided on the number of waterfowl inhabiting the Pond area. In the 1963 – 1964, NYSDEC measured the number and types of waterfowl with the data appended to the 1981 limnological study.

As part of the Hook Pond study, Marvin Kuhn has compiled a list of more than 20 waterfowl species that use the pond based on a year and-a-half of weekly observations.

5. POND QUALITY CRITERIA AND NUTRIENT BUDGETS

5.1 WATER QUALITY CRITERIA

The NYSDEDC metrics for characterizing the health of a Pond are presented on Table 5-1.

Table 5-1 NYDEC Lake Trophic Status Classification

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Transparency (Secci Disk) (m)	> 5	2 - 5	< 2	
Total Phosphorus (μg/L)	< 10	10 - 20	> 20	
Chlorophyll-α (μg/L)	< 2	2 - 8	> 8	
Predominant Algae Type	Diatoms	Green Algae	Blue-green algae	Blue-green algae - especially cynobacteria toxins producing blue-green algae

It is understood that Hook Pond is classified as "Class C" based on the New York State surface water classification system (Maidstone DEIS, 2013). Per §701.8, the best usage of Class C waters is fishing. "These waters shall be suitable for fish, shellfish, and wildlife 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."

The US EPA recently (February 2015) recommended use of dual nutrient (phosphorus and nitrogen) criteria for prevention of eutrophication. US EPA (2001) ecoregion values for Lakes in East Hampton are presented on Table 5-1b.

Table 5-1b US EPA Lake Ecoregion Nutrient Guidelines

Nutrient Parameters	Aggregate Nutrient Ecoregion XIV Reference Conditions
Total phosphorus (μg/L)	8
Total nitrogen (mg/L) (reported)	0.32
Chlorophyll *a* (μg/L) (fluorometric method)	2.9
Secchi (m)	4.5

US EPA states that currently there are no U.S. federal guidelines, water quality criteria and standards, or regulations concerning the management of harmful algal blooms in drinking water under the Safe Drinking Water Act (SDWA) or in ambient waters under the Clean Water Act (CWA), http://www2.epa.gov/nutrient-policy-data/policies-and-guidelines.

EPA (2010) recommends three types of scientifically defensible empirical approaches for setting numeric criteria to address nitrogen/phosphorus pollution: reference condition approaches, mechanistic modeling, and stressor-response analysis. Insufficient data exists for stressor-response analysis; reference conditions use the ecoregion criteria and mechanistic modeling, albeit a simplified model, is performed in this chapter.

The WHO (2003) guidance values for the relative probability of acute health effects during recreational exposure to cyanobacteria and microcystin are presented on Table 5-1c.

Table 5-1c WHO Cyanobacteria and Microcystins Recreational Water Guidance

Relative Probability of Acute Health Effects	Cyanobacteria (cells/mL)	Microcystin–LR (µg/L)	Chlorophyll–a (µg/L)
Low	< 20,000	<10	<10
Moderate	20,000-100,000	10-20	10-50
High	100,000-10,000,000	20-2,000	50-5,000
Very High	> 10,000,000	>2,000	>5,000

Per US EPA (http://www2.epa.gov/nutrient-policy-data/policies-and-guidelines), the guidance values for recreational waterways that have been adopted by twenty states are presented in Appendix H and generally require monitoring of:

- Microcystin-LR
- Anatoxin-a
- Cylindrospermopsin:
- Saxitoxin

The US EPA, http://water.epa.gov/scitech/swguidance/standards/criteria/health/recreation/, recreational water quality criteria are described by both a geometric mean (GM) and a statistical threshold value (STV) for the bacteria samples. The STV approximates the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded by more than 10 percent of the samples taken. Table 5-1d summarizes the US EPA recommended criteria.

Table 5-1d US EPA Recreational Water Quality Criteria

Indicator	GM (cfu/100 mL)	STV (cfu/100 mL)
Enteroccocci (marine & fresh)	35	130
E. coli (fresh)	126	410

5.2 TMDL PROCESS

The scientific & legal process for water quality maintenance /restoration is described on Table 5-1e. When a water body is not achieving its water quality standards, scientific studies are performed to determine the Total Maximum Daily Load (TMDL), which is the maximum amount of phosphorus/nitrogen that a waterbody is capable of assimilating while continuing to meet water quality standards. In other words more phosphorus than the TMDL will cause water quality standard violation. ***The objective of a phosphorus TMDL is also to provide a basis for allocating acceptable loads among all of the known phosphorus sources so that appropriate control measures can be implemented and water quality standards achieved.***

Table 5-1e Water Quality Maintenance /Restoration – Scientific & Legal Process

➢ **Water Use/Body - Water Quality Standards**
Based upon data/ / analysis
➢ **Water Quality Impairment Designation - US EPA 303(d) list**
State is required to prepare TMDL
➢ **Total Maximum Daily Loads (TMDL) Determination**
✓ Budget is established of max. amounts of pollutants that can be discharged & still maintain standards.
✓ Specifies amount of pollutants that must be removed quantified.
➢ **Municipality Required to Develop & Implement Plan to Achieve TMDL Requirements**

5.3 NUTRIENT BUDGETS BASIS

Nutrient budgets of existing conditions are developed to determine, as best as possible, quantitatively the contributions of the various components.

Nutrient budgets need to be calibrated prior to be relied upon. With little calibration data, the nutrient budgets of this report should be viewed as only a skeleton 1st draft and as a framework for analysis and contributing to the identification of key data gaps.

The components of phosphorus and nitrogen nutrient budgets for Hook Pond are:

1. Wastewater – via groundwater
2. Stormwater runoff
3. Fertilizer
4. Agriculture
5. Atmospheric Deposition
6. Benthic Flux
7. Waterfowl
8. In-situ nutrient removal – either along the riparian and hyporheic zones or in Pond

Nitrogen and phosphorus loadings within the Hook Pond watershed were calculated using literature-based values for each of the above listed sources. The following sections provide details on the assumptions used to calculate nutrient loadings to Hook Pond for each of the components.

GROUNDWATER DISCHARGES

5.3.1 WASTEWATER FLOW

Wastewater flow and the associated wastewater nutrient loads for each parcel were estimated based upon the following assumptions:

- For residential properties with living area assessor's data available, the SCDHS design flows based on the square footage of the house were used.
- For commercial properties that had water use data but had no building data, 90% of the average summer water use was used
- For commercial properties, the building area and 0.03 gpd/ft^2 was used. This is for retail establishments. SCDHS restaurant and transient lodging data was used as available.

Table 5-2 presents the various SCDHS wastewater system design flow rates for different establishments and was used to the maximum extent practicable to estimate wastewater flows when reliable water use data was not available. For reference purposes, wastewater generation generally averages 50% of code design flows, however East Hampton commercial establishments may have higher flows due to their increased seasonal intensity of use. For the purpose of calculating nutrient loadings and water budgets for Hook Pond, 50% of the full SCDHS design flow is assumed.

Wastewater nitrogen contributions were calculated using

- Septic Tank Effluent Nitrogen Concentration = 65-mg/L
- 25% attenuation between the bottom of the disposal system and the receiving groundwater table
- No attenuation between the groundwater to the receiving water body

Wastewater phosphorus contributions were calculated using

- Septic Tank Effluent Phosphorus Concentration = 5-mg/L
- 99.0 - 99.99 % attenuation between the bottom of the disposal system and the receiving groundwater. Please note that this assumption should be field verified due to its importance in the overall phosphorus budget.
- No attenuation between the groundwater to the receiving water body

Wastewater P Load to GW				Avg. Rainfall Recharge Rate (gpd)	Incremental GW P Conc. (mg/L)
Avg. Flow (gpd)	STE P (mg/L)	Atten. Factor	P Mass (lb/day)		
434,458	5.0	99.0%	0.2	4,090,000	0.0053

Table 5-2 SCDHS Wastewater Design Flow Rates

Suffolk County Department of Health Services (2009) design flows rates			
Structure / Use	**Design Flow Rate (gpd/unit)**	**Design Basis**	**Units / EDU**
Single family residence	300	unit	1
Apartment/condo < 600 sf	150	unit	2
Apartment/condo 601 - 1,200 sf	225	unit	1.33
Apartment/condo > 1,200 sf	300	unit	1
Motel unit < 400 sf w/o kitchenette*	100	unit	3
Motel unit > 400 sf w/o kitchenette*	150	unit	2
Restaurant	30	seats	10
Wet Store	0.15	sf gross floor area	2,000
Dry Store	0.03	sf gross floor area	10,000
Wet Store (no Food)	0.10	sf gross floor area	3,000
Theater	3.00	seats	100
General Industrial	0.04	sf gross floor area	7,500
Non Medical Offcie Space	0.06	sf gross floor area	5,000
Medical Arts Space	0.10	sf gross floor area	3,000
* with kitchenette see apartment			

Groundwater sampling data has shown very low levels of phosphorus despite the number of onsite systems in the watershed. This indicates that favorable conditions likely exist for phosphorus removal in the soil. When favorable conditions exist, soils can remove nearly all of the phosphorus from septic tank effluent wastewater. We expect phosphorus removal is occurring by mineralization with iron and possibly aluminum. However sorption of phosphorus by sands also removes phosphorus but sands have limited capacity and sorption is reversible.

5.3.2 FERTILIZER NUTRIENT CONTRIBUTIONS

Fertilizer nutrient loadings are presented on Table 5-3 and were calculated based upon:

- 33% of lot area is landscaped on average
- 50% of properties use fertilizer on landscape areas
- Residential fertilizer application rate
    - o Nitrogen = 1.0 lb/100ft^2
    - o Phosphorus = 0.15-lb/1000ft^2
- 80% of fertilizer nitrogen and 90% of fertilizer phosphorus applied is either taken up by vegetation and removed offsite or otherwise attenuated prior to reaching groundwater

Table 5-3 Fertilizer Nutrient Loads to Hook Pond

Fertilizer Load to GW							
% Area Landscaped	*% Fert.*	N		P		Avg. Rainfall Recharge Vol. (gpd)	Incremental GW P Conc. (mg/L)
		lb/1000ft^3	*Atten.*	*lb/1000ft^3*	*Atten.*		
33%	*50%*	*1.00*	*80%*	0.15	*90%*		
Watershed Name		Landscape Area		N Load to GW (lb/day)	P Load to GW (lb/day)		
		# of Parcels	Acres				
Hook Pond		**2,409**	**1,956**	**8**	**0.58**	**4,090,000**	**0.017**

5.3.3 Agricultural nutrient contributions were calculated using:

Agriculture nutrient loadings are presented on Table 5-4 and were calculated based upon:

- Land use data was used to identify potential agriculture areas
- 50% of agricultural land is assumed to be fertilized at a rate of 1.1 lbs. Nitrogen / 1,000-ft^2 and .07 lbs. Phosphorus / 1,000-ft^2
- 80% of fertilizer nitrogen and 90% of fertilizer phosphorus applied is either taken up by crops or otherwise attenuated prior to reaching groundwater

There are 28 agricultural parcels with a total area of 182 acres in the Hook Pond watershed.

Table 5-4 Agricultural Nitrogen and Phosphorus Load to Groundwater

Agriculture Load to Groundwater							
	% Fert.	N		P		Avg. Rainfall Recharge Rate (gpd)	Incremental GW P Conc. (mg/L)
		lb/1000ft^2	*Atten.*	*lb/1000ft^2*	*Atten.*		
	50%	*3.0*	*80%*	0.1875	*90%*		
Watershed Name		Agriculture Area		N Load to GW	P Load to GW		
		# Parcels	Acres				
Hook Pond		**28**	182	**7**	**0.20**	**4,090,000**	**0.006**

5.3.4 Atmospheric Deposition

Atmospheric deposition onto natural surfaces (excluding impervious and fertilized areas) is a continuous process that is evenly spread over the surface of the watershed. According to the Peconic TMDL report for nitrogen, atmospheric deposition is estimated at 18.37 lb./acre, with a 31.3% reduction expected as a result of the Clean Air Act, which reduces the deposition rate to 12.62 lb./acre. Phosphorus atmospheric deposition is assumed to be at a rate of 0.057 kg/hectare/yr (Eichner et al, 2012). Similar to fertilizer contributions, it is assumed that 20% of nitrogen and 10% of phosphorus deposited onto natural surfaces (dry atmospheric deposition) reaches groundwater. 100% of nitrogen and phosphorus deposited directly onto the Hook Pond surface contributes to the pond nutrient load.

Table 5-5 Atmospheric Deposition Nutrient Loading

Direct ATM Deposition	Deposition Area* (acres)	Phos. ATM Dep. to Surface		Atten	P Load to Receiving Water (lb/day)	Avg. Rainfall Recharge Rate (gpd)	Incremental GW P Conc. (mg/L)
		(kg/acre)	(lb/day)				
Wet - to Pond	**110**	**0.057**	**0.038**	**0%**	**0.038**	**360,000**	**0.013**
Dry - to GW	**2,497**		**0.85**	**90%**	**0.09**	**4,090,000**	**0.0025**

**20% impervious assumed for dry deposition area*

GROUNDWATER SUMMARY

Phosphorus Loading to Hook Pond Watershed Groundwater			
Source	**P Load (lb/Day)**	**P Load (g/m^2w-shed/yr)**	**P Load (g/m^2-pond/yr)**
Wastewater	0.18	0.003	0.067
Atm. Dep. Dry	0.09	0.001	0.032
Agriculture	0.20	0.003	0.076
Fertilizer	0.58	0.01	0.21
Total P Load to GW	1.05	0.02	0.39
GW P Conc (mg/L)	**0.034**		

5.3.5 STORMWATER RUNOFF

Nutrient loadings calculated based upon:

Quantities – see Table 3-1 and 3-2

- 44-inches of rainfall per year, with 90-day summer period having total of 12-inches
- 80% of watershed area is open space and 20% of watershed area is hardscape
- For pervious areas, 0% of rainfall runoff reaches Hook Pond as stormwater runoff
- For impervious areas, during 90-day summer period, 80% of the rainfall runoff reaches Hook Pond whereas 95% of rainfall runoff reaches Hook Pond during the other times.

Nutrient quality NYSDEC, New York State Stormwater Management Design Manual January 2015, with blended roof runoff / highway runoff concentrations of:

Nitrogen = 2.0-mg/L
Phosphorus = 0.26-mg/L

Stormwater Annual Vol. (gpy)	Stormwater P Conc. (mg/L)	Stormwater Annual Load (lb/yr)	Stormwater Daily Load (lb/day)	Flushing Volume (gpd)	Incremental Pond P Conc. (mg/L)
566,800,000	0.26	1,230	3.37	5,337,000	0.08

5.3.6 Benthic Flux

Benthic flux is a site specific variable, as described in the 1998 Report "Oxygen Uptake and Nutrient Regeneration in The Peconic Estuary" by the Center for Marine Science and Technology, University of Massachusetts, Dartmouth and Aubrey Consulting, Inc. The report stated that regeneration of inorganic nitrogen and phosphorus was related to the distribution of phytoplankton and organic matter deposition to the sediments.

No data is available on benthic flux for Hook Pond.

We are using, per Welch and Jacoby, 2001, an average phosphorus benthic flux contribution of 210 mg/m^2 per year during summer in 11 shallow western Washington lakes. This translates to 0.57-lb/day over the 110-acres for Hook Pond.

Benthic Flux Rate (mg/m^2/yr)	Benthic Flux Area (acres)	Benthic Flux Load (lb/day)	Flushing Volume (gpd)	Incremental Pond P Conc. (mg/L)
210	110	0.56	5,337,000	0.013

5.3.7 Waterfowl

Geese, ducks and other waterfowl reside on/visit East Hampton Lakes and Ponds and contribute nutrients to the Pond directly through discharge of their wastes into the Pond or on-land with surface/subsurface flow into the Pond. While the net impact of geese droppings needs to consider whether the geese are removing nutrients from the pond by eating Pond vegetation, for purposes of this analysis we are only considering net impact – i.e. all waterfowl droppings are onto Pond.

The nutrient content of Canadian geese droppings has been reported (Fleming and Fraser, 2001) as:

TN (mg)/goose/day 3,168
TP (mg)/goose/day 936

and for a variety of gulls, the daily total production per bird was:

TKN	608 mg to 1,819 mg.
Total phosphorus	38 mg to >115 mg

Table 5-5 presents the nitrogen and phosphorus contribution associated with geese/ducks, assuming 200 geese/ducks are present continuously on the Pond over a 90 day period in the summer and continuously on the water – so that there is no land attenuation. Table 5-5 provides estimates of the loadings and impacts of geese/ducks on Hook Pond water quality and can be prorated for different estimates of waterfowl populations. Please note Pond turnover during the summertime is estimated at 40 – 50 days, so that there would be ~2 turnovers during the summer.

Table 5-5 Waterfowl Nitrogen and Phosphorus Loading Calculation

Potential Impact of Geese / Waterfowl on Hook Pond				
Figures are for Geese. Other waterfowl could be 10% of geese impacts			mg N / goose droppings / day	mg P / goose droppings / day
			3,590	936
		Hook Pond volume	143,400,000	gallons
			542,769,000	liters
Increase in Lake water quality due to Geese / waterfowl without tunrover			Nitrogen	Phosphorus
mg/l per 1,000 geese days			0.007	0.002
	# Geese	Days	Increase due to Geese (mg/l)	
	200	90	0.119	0.031

lb N / goose droppings / day	lb P / goose droppings / day	# of Geese	Geese N Load (lb/day)	Geese P Load (lb/day)	Flushing Volume (gpd)	Incremental Pond P Conc. (mg/L)
0.00792	0.00206	200	1.58	0.41	**5,337,000**	**0.009**

5.4 Summary – Nitrogen Loading & TMDL Issues

Table 5-6 presents the nitrogen loading assumptions summary for Hook Pond. Based upon the Table 5-6 assumptions, Table 5-7 presents the result of the nitrogen loading analysis. The analysis identifies wastewater as the predominant source of nitrogen to Hook Pond, representing approximately 80% of the loads. The calculated average groundwater nitrogen concentration is 6.53-mg/L, which is within the range of measured groundwater quality data within the Hook Pond watershed. As nitrogen is not the controlling nutrient for Hook Pond, a nitrogen TMDL is not relevant at this time.

TMDL loadings for nitrogen have not been calculated due to the lack of specific standards that need to be achieved. However, given the high groundwater and

Table 5-6 Nitrogen Loading Assumptions Summary

Wastewater Assumptions	Wastewater Flow	50% SCDHS Design Flow
	Wastewater Nitrogen Concentration (mg/L)	65.0
	Nitrogen Attenuation in Drainfield (%)	25%
Stormwater Assumptions	% of total area impervious	*20.0%*
	Impervious area runoff % reaching Hook Pond-non summer	*95.0%*
	Impervious area runoff % reaching Hook Pond-summer	*80.0%*
	% of total area pervious surface	*80.0%*
	Pervious area rain % reaching Hook Pond via groundwater	*50.0%*
	Weighted average % of runoff reaching Hook Pond	*59%*
	Annual Rainfall (in/yr)	*44*
	Stormwater nitrogen concentration (mg/L)	*2.0*
Agriculture Assumptions	% of Agriculture Land that is fertilized	50%
	Nitrogen application rate (lb/1,000-ft^2/yr)	3.0
	% Uptake / Attenuated by Plants & Soils	80%
Landscape Fertilization Assumptions	% of developed lots that are landscaped	50%
	% of landscaped areas that are fertilized	33%
	% Uptake / Attenuated by Plants & Soils	1
	% Uptake / Attenuated in Soils	80%
Atmospheric Deposition Assumptions	Impervious area not included	
	Nitrogen deposition rate (kg/acre/yr)	4.05
	% Uptake / Attenuated by Plants & Soils	80%
	No attenuation for wet deposition on pond surface	
Geese Assumptions	# of Geese	200

Table 5-7 Hook Pond Simplified Nitrogen Budget

Base Conditions	
Pond Elevation (ft)	2.7
Volume (gal)	143,400,000
GW Recharge Vol. (gpd)	3,704,000
Analysis Period (days)	365.0
Flushing Time (days)	18
Flushing Volume (gpd)	5,337,000

Nitrogen Loading to Hook Pond					
Source	N Load (lb/Day)	N Load (g/m^{2}w-shed/yr)	N Load (g/m^2-pond/yr)	% Total Loadings	Marginal Increase in Pond N Conc. (mg/L)
Wastewater	176.8	2.9	65.7	163%	3.97
Atm. Dep. Dry	2.68	0.04	1.00	2.5%	0.06
Agriculture	6.50	0.11	2.42	6.0%	0.15
Fertilizer	7.70	0.13	2.86	7.1%	0.17
Total N Load to GW	193.64	3.17	72.02	179.0%	4.35
GW N Conc (mg/L)	**6.26**				
Stormwater	86.5	1.4	32.2	80.0%	1.94
Water fowl	0.09	0.00	0.03	0.08%	0.00
Atm. Dep. Wet	10.4	0.2	3.9	9.6%	0.23
Insitu Denitrification	-182.5	-3.0	-67.9	-168.7%	-4.10
SAV Removal	TBD	TBD	TBD	TBD	TBD
Benthic	0.10	0.00	0.04	0.09%	0.00
Total N Load to Hook Pond	108.2	1.8	40.2	100%	2.43
Pond N Conc. (mg/L)	**2.43**				

The in-situ denitrification is a calculated required valued for the estimated Pond N concentration to closely match the USGS data average TN of 2.43 mg/L – considered the most reliable. Unfortunately the EHDNR 1997 study did not measure TKN so model results comparison to that data is not possible. However the EHDNR inorganic nitrogen data is comparable to the USGS Pond inorganic nitrogen data.

5.4 Preliminary Phosphorus TMDL Estimates and Budget

Phosphorus loadings were calculated using the same procedure as the nitrogen loadings as described in Section 5.2. Table 5-8 presents the assumptions used to calculate the phosphorus loadings to Hook Pond for the summer period.

Tables 5-9 and 5-10 present the results of the phosphorus loading analysis for the critical summertime 90 day period and annual average, respectively. During the summertime 90 day period, it is assumed that groundwater recharge is zero, which means that the wastewater, fertilizer, agriculture and atmospheric deposition to land inputs are also zero, as there is no recharge water to carry them from the ground surface to the groundwater to Hook Pond. The calculated average groundwater phosphorus concentration is 0.05-mg/L for the 90-day period and 0.031-mg/L annual average. Please note this assumes the 99% wastewater P attenuation by soils.

Table 5-8 Phosphorus Loading Assumptions

Wastewater Assumptions	Wastewater Flow (gpd)	50% of Full Design Flow
	Wastewater Phosphorus Concentration (mg/L)	5.0
	Phosphorus Attenuation in Drainfield (%)	99.00%
Stormwater Assumptions	% of total area impervious	*20.0%*
	90-day Rainfall total (in)	*12*
	Impervious area runoff % reaching Hook Pond-summer	*80%*
	Stormwater phosphorus concentration (mg/L)	*0.26*
Agriculture Assumptions*	% of Agriculture Land that is fertilized	50%
	Phosphorus application rate (lb/1,000-ft^2/yr)	0.1875
	% Uptake / Attenuated by Plants and Soils	90%
Landscape Fertilization Assumptions*	% of developed lots that are landscaped	50%
	% of landscaped areas that are fertilized	33%
	Phosphorus application rate (lb/1,000-ft^2/yr)	0.15
	% Uptake / Attenuated by Plants and Soils	90%
Atmospheric Deposition Assumptions*	Impervious area not included	
	Phosphorus deposition rate (kg/acre/yr)	0.057
	% Uptake / Attenuated by Plants and Soils	90%
	No attenuation on water body surface (wet deposition)	
Benthic Flux Assumptions	Benthic Flux Rate (mg/m^2/yr)	*210*
Geese Assumptions	# of Geese	200

Due to negative evapotranspiration, it is assumed that no water falling on the surface reaches groundwater, therefore Agriculture, Fertilizer, Dry Atmospheric Deposition are zero

Based upon the Tables 5-9 and 5-10 analysis, a preliminary listing of the major sources of P loading to the Pond appear to be:

- Stormwater
- Benthic Release
- Waterfowl / Wastewater

However it needs to be again noted that the nutrient balances have not been calibrated to local data and until done so should not be relied upon.

Table 5-9 Hook Pond Simplified Phosphorus TMDL Estimate & Current Loadings – 90 Day

Phosphorus Loading to Hook Pond						
Source	**P Load (lb/Day)**	**P Load (g/m^2w-shed/yr)**	**P Load (g/m^2-pond/yr)**	**% Total Loadings**	**% TMDL**	**Marginal Increase in Pond P conc. (mg/L)**
Wastewater	0.18	0.003	0.067	12.6%	48%	0.010
Agriculture	0.00	0.000	0.000	0.0%	0.0%	0.000
Fertilizer	0.00	0.000	0.000	0.0%	0.0%	0.000
Atm. Dep. Dry	0.00	0.00	0.00	0.0%	0.0%	0.000
Total P Load to GW	0.18	0.00	0.07	12.6%	48%	0.010
Stormwater	0.99	0.02	0.37	69%	260%	0.052
Water fowl	0.19	0.00	0.07	13%	49%	0.010
Atm. Dep. Wet	0.04	0.001	0.014	3%	10%	0.002
Insitu P Removal	-0.52	-0.009	-0.193	-36%	-137%	-0.027
Benthic	0.56	0.01	0.21	39%	149%	0.030
Total P Load to Hook Pond	1.4	0.0	0.5	100%	521%	0.076
Pond P Conc, No Removal (mg/L)	**0.076**				**378%**	

Table 5-10 Hook Pond Simplified Phosphorus TMDL Estimate & Current Loadings – Annual Average

Phosphorus Loading to Hook Pond Watershed Groundwater						
Source	P Load (lb/Day)	P Load (g/m^2w-shed/yr)	P Load (g/m^2-pond/yr)	% Total Load	% TMDL	Marginal Increase in Pond P conc. (mg/L)
Wastewater	0.18	0.003	0.067	5.4%	20%	0.004
Atm. Dep. Dry	0.09	0.001	0.032	2.5%	9.6%	0.002
Agriculture	0.20	0.003	0.076	6.0%	22.8%	0.005
Fertilizer	0.58	0.01	0.21	17.1%	64.9%	0.013
Total P Load to GW	1.05	0.02	0.39	31.0%	118%	0.024
GW P Conc (mg/L)	**0.034**					
Stormwater	3.37	0.06	1.25	100%	378%	0.076
Water fowl	0.41	0.01	0.15	12%	46%	0.009
Atm. Dep. Wet	0.038	0.001	0.014	1%	4%	0.001
Insitu P Removal	-2.05	-0.034	-0.762	-61%	-230%	-0.046
Benthic	0.56	0.01	0.21	17%	63%	0.013
Total P Load to Hook Pond	3.4	0.1	1.3	100%	498%	0.076
Pond P Conc, No Removal (mg/L)	**0.076**					

The in-situ P removal is a calculated required valued for the estimated Pond P concentration to are comparable to the average USGS data of 0.076 mg/L – considered the most reliable. Unfortunately the EHDNR 1997 study did not measure TP so model results comparison to that data is not possible. However the EHDNR ortho-P data is comparable to the USGS Pond ortho-P data.

5.6 TMDL Analysis

The nutrient balance and TMDL analysis provides a framework for examining the sources of phosphorus and their estimated loadings to Hook Pond. It needs to be refined based upon local data to enhance its value. Based upon the preliminary analysis:

1. Stormwater loadings appear to be the significant (i.e. > 50%) contributor of phosphorus loadings and ~ 30% of nitrogen loadings.

2. Wastewater is the significant (i.e. > 60%) contributor of nitrogen.

3. Benthic may be a significant contributor, especially during the summer.

Should nitrogen need to be controlled, wastewater is a significant source that will need to be addressed.

6. WATER QUALITY DATA ANALYSIS & GAPS

6.1 DATA ANALYSIS

In summary the data suggests and previous investigators have opined that the Pond is eutrophic and phosphorus is the limiting nutrient. The EHDNR 1997 study claims submerged aquatic vegetation is having a positive impact on the Pond's water quality.

However, Hook Pond is not a typical enriched Lake/Pond. Despite apparently high nutrients, the algal situation is only moderate. This may be due to macrophytes / Submerged Aquatic Vegetation (SAV) producing algal inhibitors, as elodea is known to inhibit blue green algae, to explain the low chlorophyll a despite high nutrients. Macrophytes also limit sediment resuspension and tend to produce clear water situations. Without macrophytes, dense algae will likely result due to more resuspension and less blue green algae inhibition.

Several sets of water quality data suggest that the Pond may border on heterotrophic (dominated by bacterial decomposition) at times rather than always autotrophic (algae dominated metabolism). That prospect is indicated by the very low day-time dissolve oxygen in 2014, even zero on one date (see Figure 4-10). Also, chlorophyll a concentrations are quite low (5-6 μg/L) for a Pond seemingly productive. Dissolved oxygen (DO) was monitored by Gobler to be well below saturation during the day which means DO consumption exceeds reaeration from the atmosphere and algal (and plant) photosynthetic DO production. That situation characterizes a stabilization pond rather than an eutrophic lake.

While there are no methods given for phosphorus (P) analysis in past reports, there is a consistency in P data that point to very high concentrations, of even soluble P (i.e., PO_4-P). Soluble reactive P (SRP) is usually at very low concentrations in summer in the presence of dense algal concentrations, neither of which is apparently the case in Hook Pond. Also, USGS recorded "P" ranging from 0.017- 0.080 mg/L - consistent with EHDNR - and was probably soluble reactive phosphorus (SRP), because the data set was mostly ground water, which would be characterized by SRP that diffuses via ground water.

Dominance by green algae, as measured by Gobler, is characteristic of lagoons - another indication that Hook Pond tends to border on heterotrophy. The high ammonia (NH_3-N) concentrations (reported by EHDNR) of 0.010-0.270 mg/L (average 0.071±0.089), also indicate a very enriched system in which nutrients are underutilized, i.e. ammonia is a preferred N form for algae and should be very low or undetected with high algal production. That is consistent with relatively high SRP existing in the pond. Thus, algae production is apparently limited by some factor(s) prior to utilization of available nutrients. That factor(s) may be some form of toxicity of inhibition by macrophytes, which are reportedly abundant. Soluble N (ammonia + nitrate) is usually completely depleted if SRP still exists in relatively high concentrations in highly eutrophic lakes. Only about 0.020 mg/L of total P would usually be needed to produce a chlorophyll an average of 6 μg/L.

An examination of the nutrient balances indicates that riparian / in situ removal of nitrogen and phosphorus has a significant impact on the nutrient balances. Please note this observation is based upon limited water quality data for calibration and should be updated with more comprehensive information.

6.2 DATA GAPS

Following are Hook Pond data gaps that will be addressed by the recommended water quality data collection program:

1. Data quality and time/space coverage. There is no current data on the spatial distribution of phytoplankton or pathogenic bacteria. As many of the previous studies did not describe analytical methods and quality control procedures used as well having very limited sample locations, except for EHDNR study, future programs need to address these issues to enable a proper understanding of Pond quality and causes.

2. Dissolved oxygen (DO) levels need to be monitored throughout the Pond as low to zero dissolved oxygen levels are lethal to fish and such low DO conditions have been measured to occur.

3. Hook Pond appears to be receiving excess organic matter that is resulting in heterotrophic conditions. Unfortunately no BOD data has been collected that would support or refute this perception. These constituents need to be included in the Pond's future data collection program.

4. The role of macrophytes / Submerged Aquatic Vegetation (SAV) needs to be quantitatively understood by first mapping the SAV coverage and vegetation types and then monitoring light penetration as part of the Pond's future data collection program.

5. A Hook Pond water quality monitoring program is needed to update / improve understandings derived from a review of previous efforts. The components of the program are:

    a. Update bathymetry and sediment thickness/quality
    b. Periodic monitoring program of the suite of constituents at multiple locations with intensive, including diurnal, monitoring during the summer. Continued algal species identification.

6. Water and nutrient balances need to be performed with local data to better understand the importance of the various components. In particular the following components should be addressed:

    a. <u>Benthic Release - Internal Loading of phosphorus</u>

    Reliable data on internal loading (i.e. sediment release of nutrients) does not exist for Hook Pond. Benthic release can be a significant source of nutrients in Ponds. The best way to determine internal loading is to observe Pond Total Phosphorus (TP) levels during the summer (say June 15 through September 15), when external TP input is small. The rate of increase in Pond TP can be interpreted as internal loading, which in eutrophic Ponds is often 70-90% of total.

    As sediment resuspension in shallow ponds is important for P contributions to the water column, recent studies have shown that the more convincing process that releases P to the water column from sediment binding sites is due to high pH and exchange of OH^- for PO_4^{-2} attached to iron. High pH occurs with high algal productivity, but sediment resuspension occurs with high wind. Release of P from the resuspended particles occurs if resuspension coincides with algae - caused high pH. Other important processes are release from bottom sediments during anoxia, which likely is the case in Hook where DOs are often below 3 mg/L, meaning that anoxia probably exists in sediment over-lying water.

b. Stormwater quality

Measurements of stormwater quality should be taken as well as the two tributary flows to better understand nutrient contributions from this source – which can be a significant external source in the important summer period.

c. Wastewater N & P Removal by Soils

Due to the few data points for groundwater phosphorus quality and the importance of wastewater phosphorus removal, the degree to which wastewater phosphorus removal is occurring should be quantified. Studies should include nitrogen removal as well.

d. Waterfowl Population

Waterfowl surveys/estimates (number & types of birds & % of time on water) should be performed to enable a refined estimate of waterfowl impacts on Hook Pond water quality.

7. The role of nitrogen in Pond water quality needs to be addressed to determine any removal requirements. As this is a complex issue that requires extensive site specific analysis, it is recommended that it be addressed after the recommended 1st Year (i.e. 2015) data collection program is performed and results reviewed and interpreted.

7. RECOMMENDED IMMEDIATE WATER QUALITY MONITORING PROGRAM

The following immediate data collection program is recommended to establish an updated baseline of critical information on water volume in Hook Pond and sediment depths/quality.

1. Bathymetric (water depth) survey of Hook, Town and Duck Ponds
2. Measurement of mud thickness and analysis for total phosphorus and organic content.

It is recommended that a submerged aquatic vegetation (SAV) survey of Hook Pond be performed as soon as possible as well.

APPENDIX A REFERENCES

1. East Hampton Town Department of Natural Resources, 1997 Monthly data collected on Hook Pond watershed.

2. Ecological Analysts, Inc., "Findings of a Limnological Survey of Hook Pond, East Hampton, New York", 1981.

3. Dillon, D. J. and F. H. Rither, "The phosphorus-chlorophyll relationship in lakes, Limnology & Oceanography, 19(5), September 1974.

4. Eichner, E., B. Howes, and D. Schlezinger. 2012. Scargo Lake Water Quality Management Report. Coastal Systems Program, School for Marine Science and Technology, University of Massachusetts Dartmouth. New Bedford, MA. 65 pp.

5. Fleming, R. and H. Fraser, The Impact of Waterfowl on Water Quality - Literature Review, 2001, University of Guelph.

6. Gobler CJ, Burson, A., Koch, F., Tang, Y., Mulholland MR. 2012. The role of nitrogenous nutrients in the occurrence of harmful algal blooms caused by Cochlodinium polykrikoides in New York estuaries (USA). Harmful Algae. 17: 64-74

7. Monti, Jr. Jack, Michael Como, and Ronald Busciolano, 2013, Water-Table and Potentiometric-Surface Altitudes in the Upper Glacial, Magothy, and Lloyd Aquifers beneath Long Island, New York, April–May 2010, USGS Scientific Investigations Report 3270. http://pubs.usgs.gov/sim/3270/

8. Niemisto,J., Heidi Holmroos and Jukka Horppila, "Water pH and sediment resuspension regulating internal phosphorus loading in a shallow lake - field experiment on diurnal variation, J Limnol., 70(1): 3-10, 2011.

9. Peterson, D.S., 1987, Ground-water recharge rates in Nassau and Suffolk Counties, NY: U.S. Geological Survey Water-Resources Investigations Report 86-4181, 19 p.

10. Shubert, Christopher, 1998, Areas Contributing Ground Water to Peconic Estuary, and Ground-Water Budgets for North and South Forks and Shelter Island, U.S. Geological Survey Water-Resources Investigations Report 97-4136. http://ny.water.usgs.gov/pubs/wri/wri974136/WRIR97-4136toc.html

11. Shubert, Christopher, 1999, Ground-Water Flow Paths and Traveltime to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York, USGS, Water Resources Investigations Report 98-4181. http://ny.water.usgs.gov/pubs/wri/wri984181/WRIR98-4181.pdf

12. Steenhuis, T.S., Jackson, C.D., Kung, S.K.J., and Brutsaert, Wilfried, 1985, Measurement of groundwater recharge on eastern Long Island, New York, USA: Journal of Hydrology, v. 79, p. 145-169.

13. Suffolk County Department of Health Services (SCDHS), 2010, Suffolk County Comprehensive Water Resources Management Plan, 2010, Hauppauge, NY 11788,

http://www.suffolkcountyny.gov/Departments/HealthServices/EnvironmentalQuality/WaterResources/ComprehensiveWaterResourcesManagementPlan.aspx

14. US EPA, Gibson, George, et. al. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs. United States Environmental Protection Agency. April 2000.

15. US EPA, Ambient Water Quality Criteria Recommendations Information Supporting The Development Of State And Tribal Nutrient Criteria For Lakes And Reservoirs In Nutrient Ecoregion, Eastern Coastal Plain, December 2001, Document # EPA 822-B-01-011.

16. US EPA, "Using Stressor-response Relationships to Derive Numeric Nutrient Criteria, Washington, 820-S-10-001, 4304T, November 2010

17. US EPA, "2012 Recreational Water Quality Criteria, EPA", 820-F-12-061, 4305T December 2012

18. US EPA Fact Sheet, "Preventing Eutrophication: Scientific Support for Dual Nutrient Criteria", EPA - 820-S-15-001, MC 4304T February 2015

19. Valiela, I. G. Collins, J. Kremer, K. Lajtha, M. Geist, B. Seely, J. Brawley, and C. H. Sham "Nitrogen Loading From Coastal Watersheds To Receiving Estuaries: New Method And Application", Ecological Applications, 7(2), 1997, pp. 358–380.

20. Village of East Hampton Hook Pond Drainage Study", Dvirka and Bartilucci Consulting Engineers, October 2003

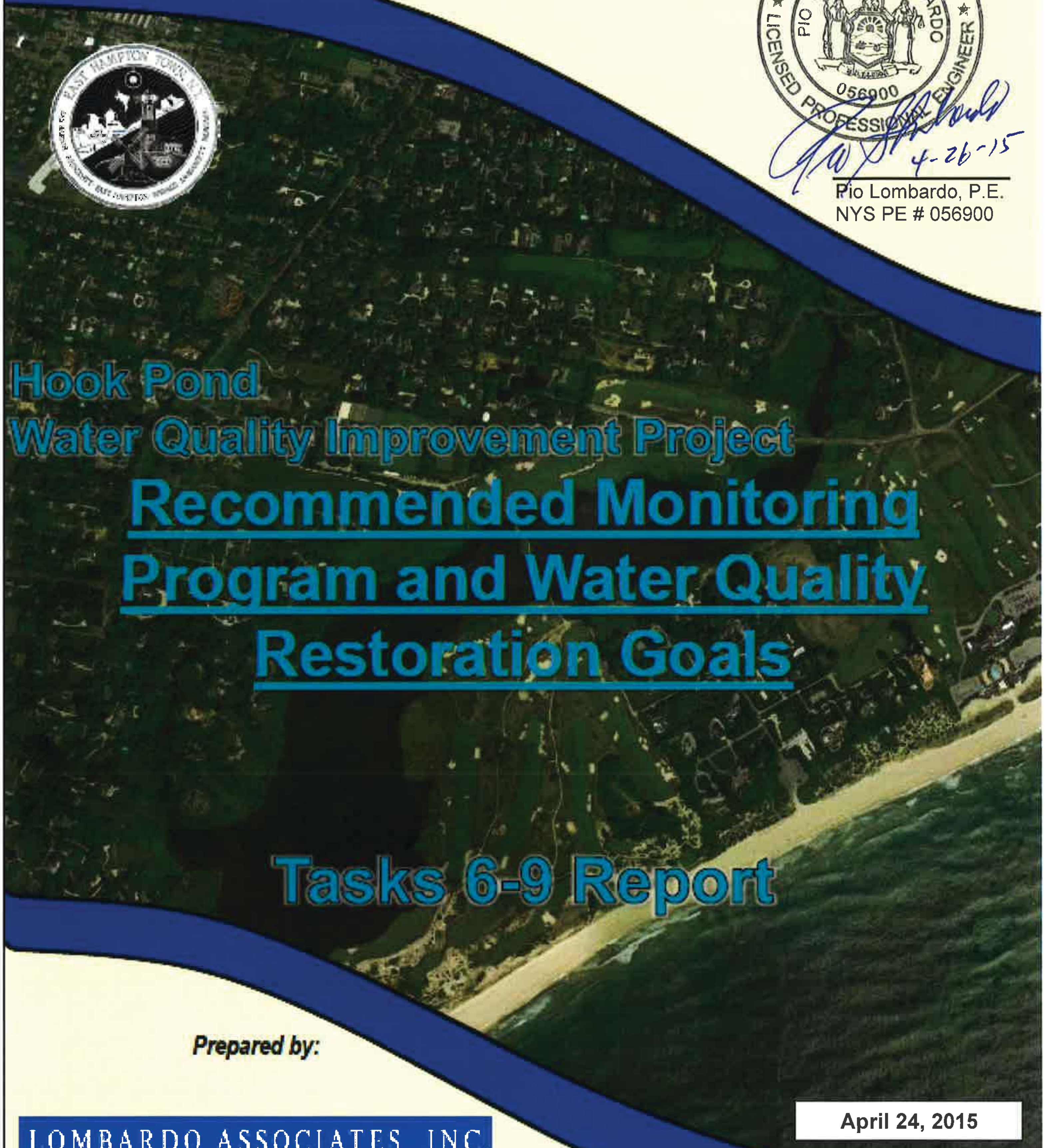
21. Village of East Hampton, "Maidstone Club Irrigation Improvement Project, Draft & Final Environmental Impact Statements", 2013 – 2014

22. Welch, Eugene B. and J. Jacoby, "On Determining the Principal Source of Phosphorus Causing Summer Algal Blooms in Western Washington Lakes, Journal of Lake and reservoir Management, 17(1):55-65, 2001.

23. World Health Organization, "Guidelines for safe recreational water environments. Volume 1, Coastal and fresh waters", 2003

Pio Lombardo, P.E.
NYS PE # 056900

4-26-15



Hook Pond Water Quality Improvement Project

Recommended Monitoring Program and Water Quality Restoration Goals

Tasks 6-9 Report

Prepared by:

April 24, 2015

LOMBARDO ASSOCIATES, INC.
188 Church Street
Newton, Massachusetts 02458

TABLE OF CONTENTS

List of Figures

List of Tables

1. PROJECT BACKGROUND

This Report presents the results of the performance of project tasks 6-9, which consist of:

<u>Recommended Monitoring Program and Water Quality Restoration Goals</u>

6. Water Quality Sampling Plan Design
7. Water Quality Sampling Plan Implementation
8. Final Water Quality Sampling and Recommendations
9. Water Quality Restoration and Protection Goals

The Tasks 1 – 4 Report identified the Hook Pond data gaps that are to be addressed by the recommended water quality data collection program as:

1. Data quality and time/space coverage. A Hook Pond water quality monitoring program is needed to update / improve understandings derived from a review of previous efforts. The components of the program are:

    a. Update bathymetry and sediment thickness/quality.

    b. The role of macrophytes / Submerged Aquatic Vegetation (SAV) needs to be quantitatively understood by first mapping the SAV coverage and vegetation types and then monitoring light penetration as part of the Pond's future data collection program.

    c. Periodic monitoring program of key constituents at multiple locations with intensive, including diurnal, monitoring during the summer.

    Many of the previous studies did not describe analytical methods and quality control procedures used as well having very limited sample locations. Future programs need to address these issues to enable a proper understanding of Pond quality and causes.

2. Dissolved oxygen (DO) levels need to be monitored throughout the Pond as low to zero dissolved oxygen levels are lethal to fish and such low DO conditions have been found to occur.

3. Hook Pond appears to be receiving excess organic matter that is resulting in heterotrophic conditions. Unfortunately no BOD data has been collected that would support or refute this perception. BOD measurement needs to be included in the Pond's future data collection program.

4. Water and nutrient balances need to be performed with current comprehensive data to better understand the importance of the various components. In particular the following components should be addressed:

    a. <u>Benthic Release - Internal Loading of Phosphorus</u>

    Reliable data on internal loading (i.e. sediment release of nutrients) does not exist for Hook Pond. Benthic release can be a significant source of nutrients in Ponds.

b. Stormwater quality

Measurements of stormwater quality should be taken for the two tributary flows to better understand nutrient contributions from this source – which can be a significant external source in the critical summer period.

c. Wastewater & Fertilizer N & P Removal by Soils

Due to the few data points for groundwater phosphorus quality and the importance of wastewater and fertilizer phosphorus removal, the degree to which wastewater and fertilizer phosphorus and nitrogen removal is occurring in soils should be quantified and the operative mechanisms understood.

d. Waterfowl Population

Waterfowl surveys/estimates (number & types of birds & % of time on water) should be performed to enable a refined estimate of waterfowl impacts on Hook Pond water quality.

5. The role of nitrogen in Pond water quality needs to be addressed to determine any removal requirements. As this is a complex issue that requires extensive site specific analysis, it is recommended that it be addressed after the recommended 1st Year (i.e. 2015) data collection program is performed and results reviewed. Laboratory studies and bioassays have limited value

2. WATER QUALITY SAMPLING PLAN DESIGN

The recommended data collection program to address the Hook Pond water quality data gaps in order of recommended priority are:

The following program would address the data gaps described in Section 1:

1. Bathymetric and sediment thickness/quality survey

2. Submerged aquatic vegetation (SAV) survey – which should include documentation of any shellfish and types of fish in the Pond.

3. Periodic monitoring program of key constituents with intensive, including diurnal, monitoring during the summer. If funding is available, one sampling location, i.e. Hook Pond #1 on Figure 2-1, could have a continuous monitoring station for temperature, pH, dissolved oxygen, chlorophyll a, blue green algae, depth and salinity. Continuous monitoring of nutrients is not recommended due to the high costs, however frequent nutrient measurements are critical.

The recommended sampling plan is presented on Table 2-1, with the recommended sampling locations presented on Figure 2-1. Location # 1 (preferably) should be used as a sentinel station.

4. Water and nutrient balances need to be performed with local data, in particular:

   a. Internal loading of phosphorus

It is recommended that this issue be addressed by observing Pond Total Phosphorus (TP) levels during the summer (say June 15 through September 15), when external TP input is small. This data is to be collected as part of the sampling program as described in 3 above. Consequently there would not be additional costs to address this issue.

Should uncertainty still exist after this effort, specific studies should be performed to measure sediment release rates under oxic and anoxic conditions.

   b. Stormwater quality

Stormwater quality should be measured at the discharge points to:

- Town Pond
- Town Pond's discharge to Hook Pond
- Eastern tributary at stormwater discharge location – in area behind Post Office prior to discharge to the tributary

for a variety of antecedent rain conditions. Sampling for the 1st flush and composite samples should be collected for constituents as presented on Table 2-2.

Table 2-1 Suggested Hook Pond Sampling Program

Water Quality & Sediment Constituents	Town Pond	Hook Pond #1	# 1 Diurnal sampling	Hook Pond #2	Hook Pond #3	Duck Pond	North of Duck Pond	Town Pond Muds	Hook Pond #2 Muds	Storm water Outfall Muds	Duck Pond Muds
Frequency	*(a)*	*(a),(c)*	*(d)*	*(a)*	*(a)*	*(a)*	*(a)*	*(b)*	*(b)*	*(b)*	*(b)*
Temperature	X	X	X	X	X	X	X				
Dissolved Oxygen	X	X	X	X	X	X	X				
pH	X	X	X	X	X	X	X				
BOD	X	X		X	X	X	X				
TSS	X	X		X	X	X	X				
Turbidity	X	X		X	X	X	X				
Color	X	X		X	X	X	X				
Secchi Disc	X	X	X	X	X	X	X				
Total Phosphorus	X	X	X	X	X	X	X	X	X	X	X
Ortho Phosphorus	X	X		X	X	X	X				
TKN	X	X		X	X	X	X	X	X	X	X
Ammonia	X	X		X	X	X	X	X	X	X	X
Nitrate	X	X		X	X	X	X	X	X	X	X
Nitrite	X	X		X	X	X	X	X	X	X	X
Chlorophyll-a	X	X	X	X	X	X	X				
Microcystin	X	X		X	X	X	X				
Differential phytoplankton	X	X		X	X	X	X				
Enterococci	X	X		X	X	X	X				
E. coli	X	X		X	X	X	X				
Total Iron								X	X	X	X
% Organic								X	X	X	X

(a) April - May & September -October, Bi-Weekly; June - August, weekly; November - March, Monthly
(b) Single grab sample to establish baseline conditions
(c) Recommended Continuous Monitoring Station
(d) Every three hours for 24 hours or with continuous monitoring sampler

c. Groundwater Quality – Wastewater & Fertilizer P Removal

The existing quantity of groundwater samples and data quality is insufficient to confidently determine the degree to which soils are removing wastewater, fertilizer and other sources of phosphorus that are discharged to groundwater. Also the limited data suggests that Hook Pond riparian areas are important in achieving significant nutrient removal.

It is recommended that the existing operational and new groundwater wells be monitored for phosphorus and nitrogen content and included as part of the Hook Pond Sampling Program to address this issue. Operational wells need to be identified from the candidate list on Table 2-3. A total of at least eight (8) groundwater monitoring wells are recommended. The suggested groundwater quality sampling program is presented on Table 2-4. Groundwater elevation monitoring will be performed to provide basis for groundwater flux estimates to be used in water and nutrient budget updates – see section d. below.

Detailed studies on wastewater septic system-soils removal of phosphorus should be performed to understand the degree to which phosphorus removal is currently occurring (estimated in the nutrient budgets at 99%) and the operative mechanisms

Figure 2-1 Potential WQMP Sampling Locations

Table 2-2 Suggested Stormwater Quality Sampling Program

Stormwater Sampling Constituents	SW Discharge to Town Pond	Town Pond Discharge to Hook	SW Discharge to Hook Pond eastern tributary
Frequency	*(a)*	*(a)*	*(a)*
Temperature	X	X	X
pH	X	X	X
BOD	X	X	X
TSS	X	X	X
Total Phosphorus	X	X	X
Ortho Phosphorus	X	X	X
TKN	X	X	X
Ammonia	X	X	X
Nitrate	X	X	X
Enterococci	X	X	X
E. coli	X	X	X

(a) Six storm events over year, measure 1st flush & storm composite. Include minimum of 2 events at each site where sw quality is measured every 15 minutes for 1 hour then every hour.

Table 2-3 Candidate Groundwater Monitoring Wells

Groundwater Wells - Candidate Locations		
Candidate Wells	**Location**	
SCDHS	Near corner of Egypt Lane & Dunemere Lane	Monitored yearly by SCDHS
SCDHS	Along Davids Lane, Sarah's Way & Pond View Lane	inactive since 2010
Maidstone	6 wells North & south of Hook Pond	Not usuable - abandoned direct push wells
EHDNR	no location map available	
USGS	only well # 3 operable - not desirable location	

Table 2-4 Suggested Groundwater Quality Sampling Program

Groundwater Sampling Constituents	Groundwater Wells
Frequency	*(a)*
Temperature	X
pH	X
Total Phosphorus	X
Ortho Phosphorus	X
TKN	X
Ammonia	X
Nitrate	X

(a) Monthly

d. Water Budget

Water budgets for the Pond should be prepared by collecting data on the following:

- Establish a Hook Pond elevation gauge at the discharge weir or footbridge. Establish elevation gauges in Town and Duck Ponds as well
- Obtain rainfall and climatological data from proposed Maidstone ET gauge
- Monitor groundwater elevations from USGS and other wells on north and south side of Pond to determine seepage rates to and from Pond
- Creation of a groundwater computer model and particle tracking using the USGS MODFLOW computer program. Modeling will provide groundwater flow patterns and provide valuable information for site evaluations for PRB applications.

e. Waterfowl

Documenting quantity / types of waterfowl and percent of time on water needs to be performed to determine waterfowl influence. Please note that per day Canadian geese produced ~ 10 +/- times as much phosphorus and 3 – 5 times as much nitrogen as other waterfowl – see Section 5.3.7 of Tasks 1 – 4 report.

5. Pond Reassessment & Determination of Nitrogen Removal Requirements

Following the completion of the above program and ideally after concurrent implementation of any immediate improvements, to be described in Tasks 10-13 Report, a Hook Pond Water Quality Reassessment Report should be prepared. The Report would address an assessment of any nitrogen removal requirements.

A preliminary Water Quality Sampling Plan Budget is presented on Table 2-5.

Table 2-5 Preliminary Water Quality Sampling Plan Budget

Hook Pond Monitoring Program Budget		
	Activity	Preliminary Budget
1	Bathymetric and sediment thickness/quality survey	$ 12,700
2	Submerged aquatic vegetation (SAV) survey	$ 5,000
3	Periodic monitoring program with intensive monitoring during the summer - 12 month program	$ 197,560
4	Water and nutrient balances	
a	Internal loading of phosphorus	$ 5,000
b	Stormwater quality	$ 74,400
c	Groundwater Quality - Soils P Removal	$ 58,600
d	Water Budget	$ 60,000
e	Waterfowl	$ 10,000
5	Pond Reassessment & Determination of Nitrogen Removal Requirements	$ 30,000
	Total	$ 453,260

3. WATER QUALITY SAMPLING PLAN IMPLEMENTATION

Task 7 Water Quality Sampling Plan Implementation will be performed as contract amendments, if any, are issued by the Village.

4. FINAL WATER QUALITY SAMPLING AND RECOMMENDATIONS

This activity will be performed after the collection of additional Hook Pond watershed water resources and quality data and is to include an updated diagnosis of the issues affecting water quality in Hook Pond, recommendations for remediation actions and an action plan for implementing the remediation actions.

5. WATER QUALITY RESTORATION AND PROTECTION GOALS

Following are water quality goals using metrics as developed by New York State, other States and the US EPA.

Hook Pond is classified as "Class C" based on the New York State surface water classification system (Maidstone DEIS, 2013). Per §701.8, the best usage of Class C waters is fishing. "These waters shall be suitable for fish, shellfish, and wildlife 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." ***The Village may wish to have additional water quality goals for Hook Pond.***

The NYSDEDC metrics for characterizing the health of a Pond are presented on Table 5-1.

Table 5-1 NYDEC Lake Trophic Status Classification

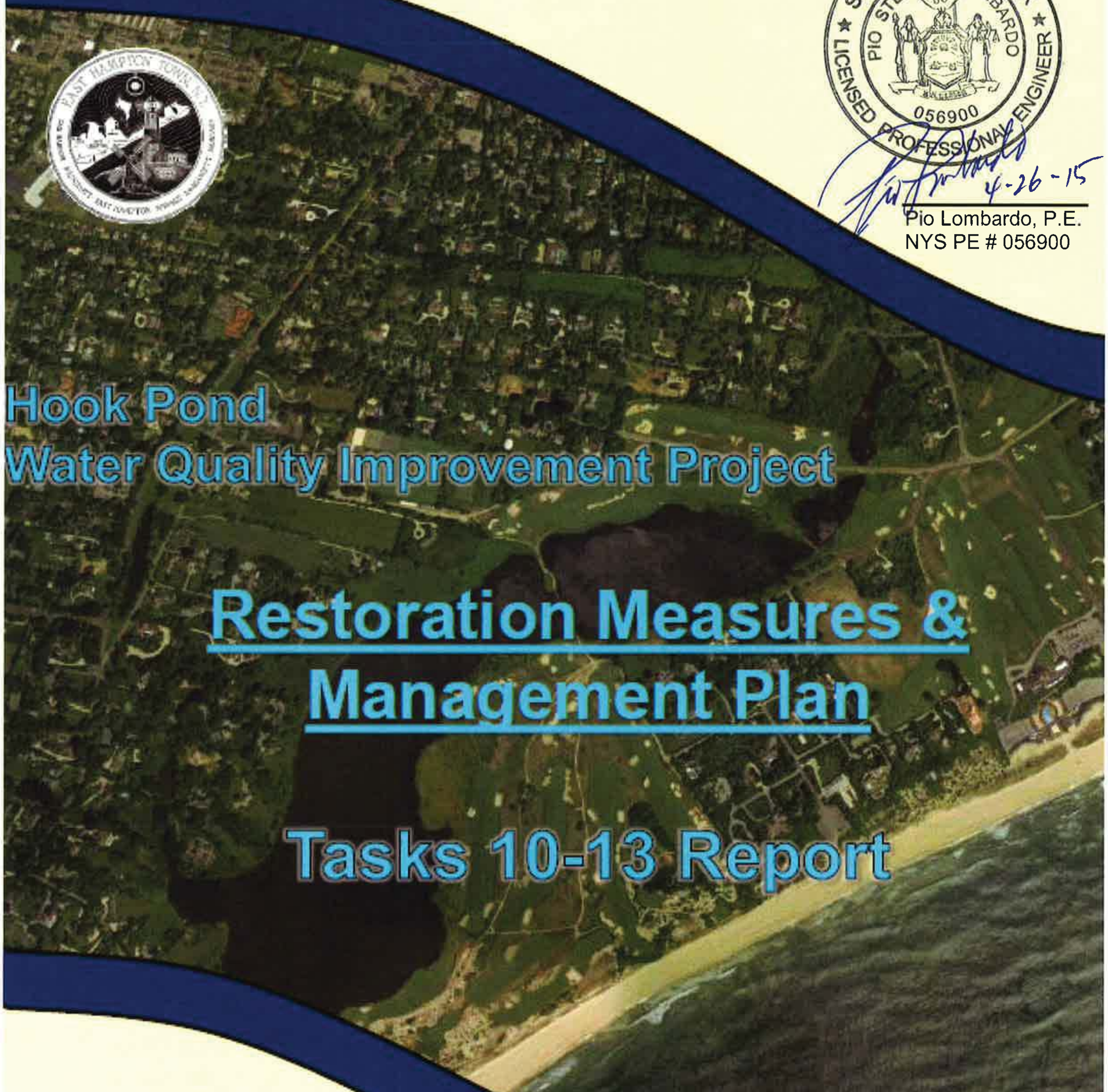
Parameter	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Transparency (Secci Disk) (m)	> 5	2 - 5	< 2	
Total Phosphorus (µg/L)	< 10	10 - 20	> 20	
Chlorophyll-α (µg/L)	< 2	2 - 8	> 8	
Predominant Algae Type	Diatoms	Green Algae	Blue-green algae	Blue-green algae - especially cynobacteria toxins producing blue-green algae

As the role of submerged aquatic vegetation may be important for controlling the Pond's water quality, maintenance of a diverse and healthy SAV may also be a desired water quality metric. Given the depressed dissolved oxygen levels, maintenance of minimum DO of 3 -5 mg/L is critical for a healthy fishery.

Bacterial standards are the US EPA Recreational Water Quality Criteria of:

Indicator	GM	STV
	(cfu/100 mL)	
Enteroccocci (marine & fresh)	35	130
E. coli (fresh)	126	410

Metrics for toxins produced during harmful algae blooms (HAB) are expected to be developed by the US EPA based upon pending legislation. For the time being, a microcystin standard of 1 – 6 ug/L is suggested. The World Health Organization's drinking water standard is 1 ug/L and many states recreational contact guidance are in that range.



Hook Pond Water Quality Improvement Project

Restoration Measures & Management Plan

Tasks 10-13 Report

Pio Lombardo, P.E.
NYS PE # 056900

April 24, 2015

Prepared by:

LOMBARDO ASSOCIATES, INC.
188 Church Street
Newton, Massachusetts 02458

TABLE OF CONTENTS

List of Figures

List of Tables

1. PROJECT BACKGROUND

SCOPE

This Report presents the results of the performance of project tasks 10-13, which consist of:

Problem Identification, Restoration Measures & Management Plan

10. Water Quality Impairment Source Identification & Quantification
11. Conceptual Development of Restoration Measures
12. Quantifiable Performance Metrics and Monitoring Requirements
13. Maintenance and Implementation Cost Estimates

2. WATER QUALITY IMPAIRMENT SOURCE IDENTIFICATION & QUANTIFICATION

In the Tasks 1 – 4 Report, Lombardo Associates, Inc. (LAI) identified and quantified sources of water quality problems using desktop analysis, literature values, and calibrating the analysis to the limited field data. Estimates of the following sources of nitrogen and phosphorus were made:

- Wastewater
- Agriculture
- Fertilizer
- Atmospheric Deposition (Dry & Wet)
- Stormwater Runoff
- Waterfowl
- Benthic Flux
- Insitu nutrient removal

and included consideration of nutrient attenuation (i.e. in-situ removal) prior to their reaching the Hook Pond watershed surface water bodies. Estimates of attenuation were based on techniques used and modeling work done in Suffolk County as well as other similar coastal communities, and calibration to the limited local data. The total loads were compared to preliminary estimates of acceptable TMDL loads and the need for phosphorus and, potentially nitrogen reductions. Phosphorus calculations are presented on Tables 2-1 and 2-2 for the summer and annual basis, respectively. Nitrogen calculations are presented on Table 2-3.

Total allowable loads (i.e. mass of nutrient discharges to Hook Pond) by the controllable and non-controllable sources (i.e. atmospheric deposition) were estimated based upon the below Pond nutrient targets and flushing volumes, from which mass loadings were calculated.

Phosphorus	0.020 mg/l
Tentative Nitrogen	0.350 mg/l

STRATEGY

The strategy for determining removal requirements is:

1. Phosphorus removal is the prioritized nutrient for near term action. It is recognized that nitrogen may need to be removed as well (US EPA, 2015)

2. Stormwater is a significant source of phosphorus with very high projected removal requirements. While one can debate the relative significance of stormwater (as well as the other factors), stormwater should not be directly discharged to a receiving water body. Consequently it is recommended that stormwater treatment / reuse program be pursued concurrently while the proposed Hook Pond water quality studies are performed so that an improved quantitative understanding of the various factors influencing Hook Pond water quality can be developed.

3. Wastewater phosphorus removal by soils is already considered high. Additional wastewater phosphorus removal as well as fertilizers and other phosphorus transported by groundwater could potentially be addressed by phosphorus removing permeable reactive barriers (PRB). However, at this time, groundwater data is insufficient to

understand this issue sufficient to confidently characterize the situation and, if needed, develop solutions.

4. Should nitrogen need to be managed, wastewater nitrogen removal will be needed. To address this issue, PRBs may be the most cost-effective restoration approach, perhaps in conjunction with limited, if any, on-site, cluster and/or neighborhood sewerage-denitrification systems.

Table 2-1 Hook Pond P Allocations & Removal Requirements - Summer

Phosphorus Loading to Hook Pond								
Source	P Load (lb/Day)	% Total Loadings	% TMDL	Marginal Increase in Pond P conc. (mg/L)	P Load Allocation	% of TMDL	% Reduction Required	At Reduced Loading, Marginal Increase in Pond P conc. (mg/L)
Wastewater	0.18	9.3%	48%	0.010	0.075	20%	59%	0.004
Agriculture	0.00	0.0%	0.0%	0.000	0.000	0.0%	0.0%	0.000
Fertilizer	0.00	0.0%	0.0%	0.000	0.000	0.0%	0.0%	0.000
Atm. Dep. Dry	0.00	0.0%	0.0%	0.000	0.000	0.0%	0.0%	0.000
Total P Load to GW	0.18	9.3%	48%	0.010	0.075	20%	59%	0.004
GW P Conc (mg/L)		**18.5%**	**95.4%**	0.000		**0.0%**		0.000
Stormwater	0.99	50%	260%	0.052	0.090	24%	91%	0.005
Water fowl	0.19	9%	49%	0.010	0.085	22%	54%	0.004
Atm. Dep. Wet	0.04	2%	10%	0.002	0.038	10%	0%	0.002
Benthic	0.56	29%	149%	0.030	0.090	24%	84%	0.005
Total P Load to Hook Pond, No Insitu Removal	2.0	100%	658%	0.103	0.38	99%	81%	0.020
Insitu P Removal	-0.52	-27%	-137%	-0.027	TBT	n/a	n/a	
Total P Load to Hook Pond	1.44	73%	378%	0.076	0.38	99%	74%	0.020
Pond P Conc (mg/L)	**0.103**		**514%**		**0.020**			

The recommended near term Hook Pond Water Quality Improvement efforts are:

- **Water quality data collection program – critical that it be performed for spring-summer-fall 2015 and nutrient budgets and issues prioritization be updated**

Initially stormwater and sediments are expected to be important issues to address. However from a practical matter, the stormwater and sediment issues are unlikely to be addressed until after the summer – so the issues should be re-examined in light of any new current data.

Additional efforts are expected to consist of:

- Stormwater treatment and potentially reuse program as described in Section 3, starting with pilot projects on Village property. It is noted that the recently Village obtained Gardiner property at the corner of James and Maidstone Lanes would be a good location for the pilot program and allow the collection of data to provide the needed assurances to the Maidstone Club regarding the environmental acceptability of a stormwater reuse program at the golf course.

- Early determination of sediment phosphorus loads to assess the degree to which sediments need to be addressed. If sediment phosphorus loads need to be reduced, which we suspect they will, a state of the art study of remediation techniques should be performed as emerging techniques hold promise for being more cost-effective and environmentally compatible than existing techniques. Sediment removal may be desired/appropriate.

Although it is recognized that the proposed stormwater treatment systems at North Hook Mill Green and the Village Green, see Appendix B, were not conceptualized to address all Pond stormwater requirements, based upon this preliminary analysis they are insufficient to address the Pond's stormwater treatment requirements due to:

1. For properly sized systems, phosphorus removal estimated at 40% whereas 70% - 90% required
2. North Hook Mill Green system does not treat flows from Newtown Lane and Fithian Lane and is not large enough for the contributing catchment area.
3. Village Green system does not include stormwater from other drainage areas around Town Pond – see Table 3-1.
4. Village Center stormwater flows not addressed

Table 2-2 Hook Pond P Allocations & Removal Requirements - Annual

Phosphorus Loading to Hook Pond Watershed Groundwater								
Source	P Load (lb/Day)	% Total Load	% TMDL	Marginal Increase in Pond P conc. (mg/L)	P Load Allocation	% of TMDL	% Reduction Required	At Reduced Loading, Marginal Increase in Pond P conc. (mg/L)
Wastewater	0.18	5.4%	20%	0.004	0.140	16%	23%	0.003
Atm. Dep. Dry	0.09	2.5%	9.6%	0.002	0.085	9.6%	0%	0.002
Agriculture	0.20	6.0%	22.8%	0.005	0.120	13.5%	41%	0.003
Fertilizer	0.58	17.1%	64.9%	0.013	0.200	22.5%	65%	0.004
Total P Load to GW	1.05	31.0%	118%	0.024	0.545	61%	48%	0.012
GW P Conc (mg/L)	**0.034**				**0.018**			
Stormwater	3.37	100%	378%	0.076	0.900	101.1%	73%	0.020
Water fowl	0.41	12%	46%	0.009	0.152	17.1%	63%	0.003
Atm. Dep. Wet	0.038	1%	4%	0.001	0.014	1.6%	63%	0.000
Insitu P Removal	-2.05	-61%	-230%	-0.046	-1.000	-112.3%	51%	-0.022
Benthic	0.56	17%	63%	0.013	0.280	31.5%	50%	0.006
Total P Load to Hook Pond	3.38	100%	498%	0.076	0.89		74%	
Pond P Conc. (mg/L)	**0.076**							0.020

Table 2-3 Hook Pond TN Allocations & Removal Requirements - Annual

Nitrogen Loading to Hook Pond						
Source	**N Load (lb/Day)**	**Marginal Increase in Pond N Conc. (mg/L)**	**N Load Allocation**	**% of TMDL**	**% Reduction Required**	**Marginal Increase in Pond N Conc.**
Wastewater	176.8	3.97	9.0	58%	95%	0.20
Atm. Dep. Dry	2.68	0.06	2.7	17.2%	0.0%	0.06
Agriculture	6.50	0.15	2.5	16.0%	61.5%	0.06
Fertilizer	7.70	0.17	2.5	16.0%	67.5%	0.06
Total N Load to GW	193.64	4.35	16.7	107%	91%	0.37
GW N Conc (mg/L)	**6.26**		**0.54**	**3.5%**	**91.4%**	
Stormwater	86.5	1.94	9.0	58%	90%	0.20
Water fowl	0.09	0.00	0.04	0%	54%	0.00
Atm. Dep. Wet	10.4	0.23	10.4	66%	0%	0.23
Insitu Denitrification	-182.5	-4.10	-20.5	-132%		
SAV Removal	TBD	TBD	n/a	n/a	n/a	
Benthic	0.10	0.00	0.05	0.3%	50%	0.00
Total N Load to Hook Pond	108.2	2.4	15.6	**100%**		0.8
Pond N Conc. (mg/L)	**2.43**		**0.35**			

3. CONCEPTUAL DEVELOPMENT OF RESTORATION MEASURES

Due to uncertainties regarding the relative significance of the various influencing factors, it is recommended that conceptual development of restoration measures focus only on stormwater treatment. According to the annual water balance, stormwater represents ~ 30% of the volumetric flow to Hook Pond and significantly more during the important summer period.

As described in Section 2, stormwater was identified as a significant source of nutrients to Hook Pond, for which high levels (70% - 90%) of phosphorus, and possibly nitrogen, removal is required. This Section presents the conceptual development of stormwater restoration measures that would be relevant for Hook Pond.

3.1 STORMWATER COLLECTION SYSTEM & QUANTITIES

The stormwater collection system that discharge directly to Hook Pond via Town Pond and Hook Pond Stream consists of the catchment areas as described on Table 3-1 and illustrated on Figure 3-1. Please note that uncertainty exists on contributing areas to the two Hook Pond tributaries.

Table 3-1 Stormwater Watersheds Discharging Directly to Hook Pond

Stormwater Watershed Discharging to Hook Pond			
Tributary	**Discharge Location**	**Contributing Watershed Area**	**Watershed Area (acres)**
Hook Pond Stream	North Hook Mill Green	North Hook Mill Green Catchment Area	65
	Fithian Lane at Nature Trail	Fithian Lane Catchment Area	70
		Subtotal	***135***
Town Pond	Village Green	Village Green Catchment Area	35
	Town Pond	South and East of Town Pond Catchment Area	12
	Town Pond	Main Street West Catchment Area	11
		Subtotal	***58***
Undefined	Unknown	Village Commercial Center	95
		Grand Total	**288**
Area	**% of catchment area**	**% of rainfall on this area reaches the Pond dischrage location**	
Impervious	70%	90%	63.0%
Pervious	30%	5%	1.5%
	Weighted Average Reaching Discharge Location		**64.5%**

Stormwater treatment systems are sized based on the catchment area they receive flow from and the design storm event. For the catchment areas discharging to Hook Pond, the volume of stormwater runoff generated from different storm events from each of the catchment areas is presented on Table 3-2. A 10 or 25 year 24 hour storm event is typically chosen for stormwater treatment purposes. Flows above those values then bypass the treatment/disposal system.

Figure 3-1 North Hook Mill Green and Village Green Stormwater Catchment Areas

Table 3-2 Stormwater Volumes by Catchment & Tributary Areas & Rainfall Frequency

Storm Event / Frequency			2-yr	5-yr	10-yr	25-yr	100-yr	Example
Precip. (in / 24 hours)			3.5	4.5	5.0	6.0	7.5	1.0
Tributary	Subwatershed	Area (acres)	Stormwater Volume (gal)					
Western Tributary - Village Green	Village Green (east)	35	2,145,000	2,758,000	3,065,000	3,678,000	4,597,000	613,000
	Town Pond - south & east	12	735,000	946,000	1,051,000	1,261,000	1,576,000	210,000
	Town Pond - west	11	231,000	297,000	330,000	396,000	495,000	66,000
	Total	58	3,111,000	4,001,000	4,446,000	5,335,000	6,668,000	889,000
Eastern Tributary - Hook Pond Stream	North Hook Mill Green	65	3,984,000	5,123,000	5,692,000	6,830,000	8,538,000	1,138,000
	Fithian Lane	70	4,290,000	5,517,000	6,130,000	7,355,000	9,195,000	1,226,000
	Total	135	8,274,000	10,640,000	11,822,000	14,185,000	17,733,000	2,364,000
Grand Total		193	11,385,000	14,641,000	16,268,000	19,520,000	24,401,000	3,253,000
	Village Center	95	5,604,000	7,207,000	8,008,000	9,609,000	12,012,000	1,601,000

Please note that catchment areas are initial estimates and need field verification. Volumes would be reduced by amount of stormwater infiltrated via catch basins.

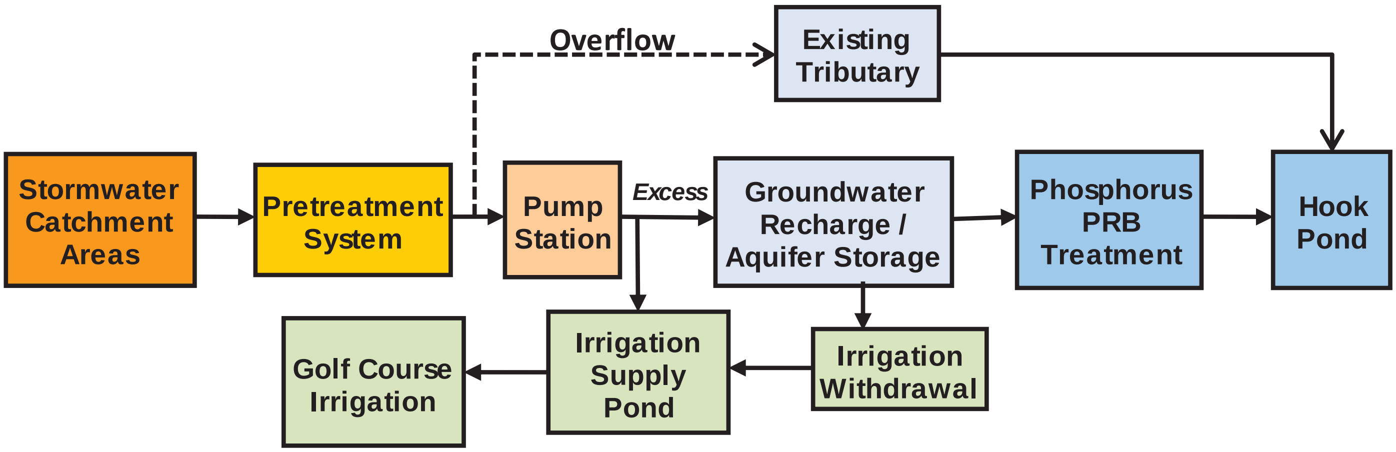
3.2 Proposed Stormwater Management System Systems

3.2.1 Preliminary Engineering - Stormwater Irrigation Reuse, Groundwater Recharge and Treatment

The stormwater discharging to the east (Nature Trail/Duck Pond) and west (Town Pond) tributaries is proposed to be treated using the process flow approach as illustrated on Figure 3-2, at sites as illustrated on Figure 3-3 and listed on Table 3-3, and as described below:

- Intercept two catchment areas stormwater flow with pretreatment systems to remove solids.
- Install a pump station directing up to the maximum design stormwater flow to the proposed treatment sites, see Figure 3-3. Excess pretreated stormwater flow will bypass the pump station and continue down the tributaries to Hook Pond.
- Stormwater groundwater recharge using infiltration systems
- Phosphorus removal PRB downgradient of infiltration systems
- Reuse pretreated stormwater prior to infiltration as needed to maintain water level in the Maidstone irrigation storage pond. Stormwater discharged to infiltration basins near the proposed Maidstone irrigation wells will also contribute to indirect reuse by partially supplying the well.

Figure 3-2 Process Flow Diagram for Proposed Stormwater Management Systems



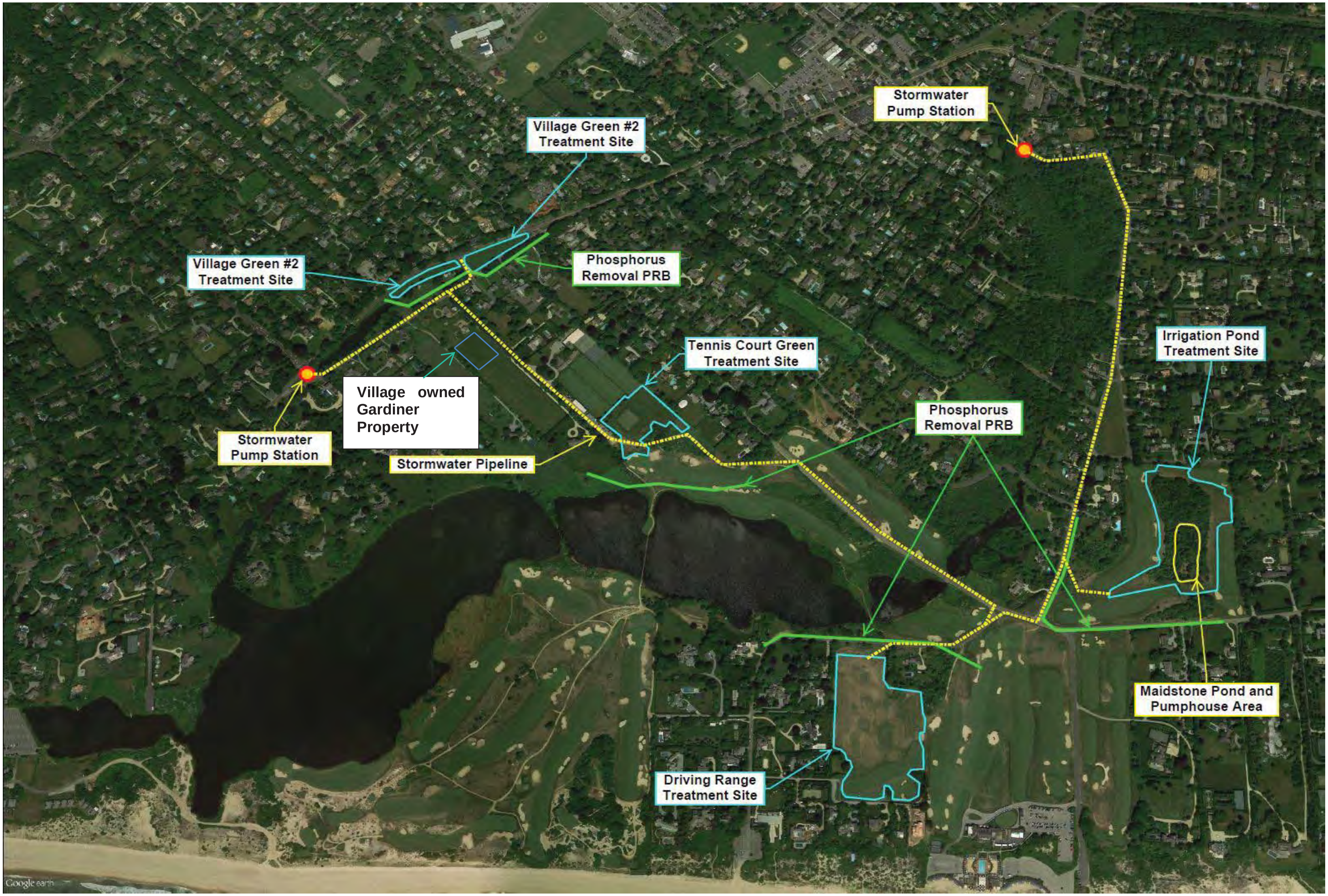
The proposed infiltration sites are sized based on NYSDEC Stormwater Management Design Manual guideline of the storm event volume storage within up to 4 foot depth. Using the above design criteria and the stormwater volumes presented in Table 3-2, the required infiltration basin volumes were calculated for each of the two tributaries. Figure 3-3 presents the locations of the proposed infiltration and phosphorus removal PRBs. Table 3-3 presents the preliminary capacity analysis for the proposed infiltration sites. Other locations on the golf course are technically viable. ***Also please note that design volumes may change as catchment areas are initial estimates and need field verification. Volumes would be reduced by amount of stormwater infiltrated via catch basins.***

Sufficient capacity exists for the total 25-year stormwater volume for the combined systems, however the Town Pond (west) tributary sites do not have sufficient capacity. Consequently it is initially proposed that the two stormwater systems are interconnected, i.e. excess flows from Town Pond tributary is to the irrigation Pond.

Table 3-3 Minimum Site Capacity Estimates for Infiltration Systems

Western Tributary - Town Pond Infiltration Sites				
Site #	Area (ft^2)	Average DGW (ft)	Infiltration Basin Capacity (gal)	25-year Storm Volume (gal)
Village Green #1	43,500	10.0	1,301,520	5,335,000
Village Green #2	28,000	7.0	837,760	
Tennis Court Green	130,000	19.0	3,889,600	
Total	71,500		2,139,280	
Eastern Tributary - Duck Pond Infiltration Sites				
Driving Range	400,000	13.0	11,968,000	14,185,000
Irrigation Pond	320,000	14.0	9,574,400	
Total	720,000		21,542,400	

Figure 3-3 Proposed Treatment Sites



As the future Maidstone Golf course irrigation demand is estimated at approximately 20 million gallons for the 23-to-27 week irrigation season (typically late-April through early-November) per Maidstone DEIS, approximately 7 inches of rain-stormwater can provide all of this demand through direct or indirect reuse. Please note average annual rain is 45 inches, relatively evenly spread over the year. The amount of direct indirect reuse can be estimated with the use of computer analysis of rainfall, aquifer storage and pond management analysis. Indirect reuse occurs by aquifer recharge/storage and extraction. Use of the infiltration system at the proposed new irrigation well would achieve indirect stormwater reuse.

Phosphorus Removal – Pilot Projects

Stormwater phosphorus at the projected needed levels is a challenge. As alternate approaches exists and to determine the optimal technical and financial method, pilot projects of the most promising techniques is recommended. Pilot project locations could be:

- ✓ At existing catch basins
- ✓ Town Pond site
- ✓ Fithian Way Near Nature Trail

3.2.2 Preliminary Engineering – Stormwater Runoff Reduction

Reduction of stormwater runoff would reduce the size of the any needed treatment systems, including the proposed concept of Stormwater Irrigation Reuse, Groundwater Recharge and Treatment. Stormwater runoff reduction and treatment can be achieved by a number of methods including:

- Addition of catch/infiltration basins in the catchment areas
- Localized recharge via infiltration basins near the area of runoff generation. It is understood that the stormwater generated at the large Village parking lot is directed to infiltration basins under the parking lot.
- Green roofs

Infiltrated stormwater may need to be treated for phosphorus removal as the phosphorus removal mechanisms that are suspected to be the method of wastewater phosphorus removal, would not function with stormwater, at a minimum due to the lack of sufficient organic matter in stormwater.

4. QUANTIFIABLE PERFORMANCE METRICS AND MONITORING REQUIREMENTS

The quantifiable performance metrics and performance monitoring requirements for the stormwater management system are:

- ✓ Effluent quality concentration – goal of < 0.026 mg/L
- ✓ Phosphorus removal – mass & percent - goal of 90% removal
- ✓ Gallons & percent of golf course irrigation provided by stormwater – directly and indirectly (i.e. from aquifer storage) – goal to achieve 100%
- ✓ Gallons & percent of stormwater recharged & treated – goal is 100%, except for storms greater than 25 year – 24 hour frequency

5. MAINTENANCE AND IMPLEMENTATION COST ESTIMATES

A **preliminary** estimate of stormwater management system construction costs is $4 - $8 million. Annual O&M costs are estimated at $80,000 - $100,000+/-. A preliminary schedule, assuming decision to proceed is made by June 1, 2015, is presented on Figure 5-1.

In general, the funding sources are:

- ✓ Private donations / grants
- ✓ Municipal donations / grants
- ✓ County funding
- ✓ EPA/State Revolving Fund (SRF) Program grants/loans. The SRF program as administered by the NYS Environmental Facilities Corporation (EFC) is by far the largest source of funding for Clean Water Projects with potential 90% grants for stormwater green projects.
- ✓ Establishment of Special District for Water Quality Improvement Projects
    - ➢ Special Village Districts, per Village Law, Section 22
        - ▪ Property assessments
        - ▪ Betterments

Figure 5-1 Stormwater Management System – Preliminary Implementation Schedule

Schedule for Hook Pond Water Quality Stormwater Remediation Plan

Number	Activity	Duration (months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
		Month of Year	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
			2015							2016												2017											
Stormwater Phosphorus Removal - PRB Pilot Projects																																	
1	Alternatives Evaluation & Engineering Plan with site studies	3	■	■	■																												
2	Pilot projects – design & permitting	4				■	■	■	■	■	■																						
3	Pilot construction	6								■	■	■	■	■	■																		
4	Pilot operation & evaluation	12														■	■	■	■	■	■	■	■	■	■	■							
	Total	25																															

Number	Activity	Duration (months)	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
		Month of Year	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
			2017							2018												2019											
Stormwater System - Pump Stations, Pipelines & Infiltration Systems																																	
1	Engineering Plan with site studies	7	■	■	■	■	■	■	■																								
2	Design	9								■	■	■	■	■	■	■	■	■															
3	Construction	15																	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Total	31																															

APPENDIX A REFERENCES

1. Bryan M. Spears,B. M, Bernard Dudley, Kasper Reitzel,and Emil Rydin, “Geo Engineering in Lakes A Call for Consensus’, Environ. Sci. Technol., 2013, 47 (9), pp 3953–3954.

2. Center for Watershed Protection, “The Next Generation of Stormwater Wetlands”, Ellicott City, MD, February 2008.

3. Geosyntec and Wright Water, “International Stormwater Best Management Practices (BMP) Database Pollutant Category Statistical Summary Report”, December 2014.

4. North Carolina Department of Environment and Natural Resources (NCDENR), “Stormwater BMP Manual”, 2015, http://portal.ncdenr.org/web/lr/bmp-manual

5. NYSDEC, New York State Stormwater Management Design Manual, January 2015.

6. US EPA Fact Sheet, “Preventing Eutrophication: Scientific Support for Dual Nutrient Criteria”, EPA - 820-S-15-001, MC 4304T February 2015

APPENDIX B EVALUATION OF PROPOSED STORMWATER TREATMENT IMPROVEMENTS

B.1 STORMWATER WETLAND DESIGN CRITERIA

The 2015 NYS Stormwater Manual stormwater wetlands design criteria are presented on Table B-1 with a typical plan and profile (NYSDEC, 2015) presented on Figure B-1

Figure B-1 NYSDEC Stormwater Wetland Plan & Profile

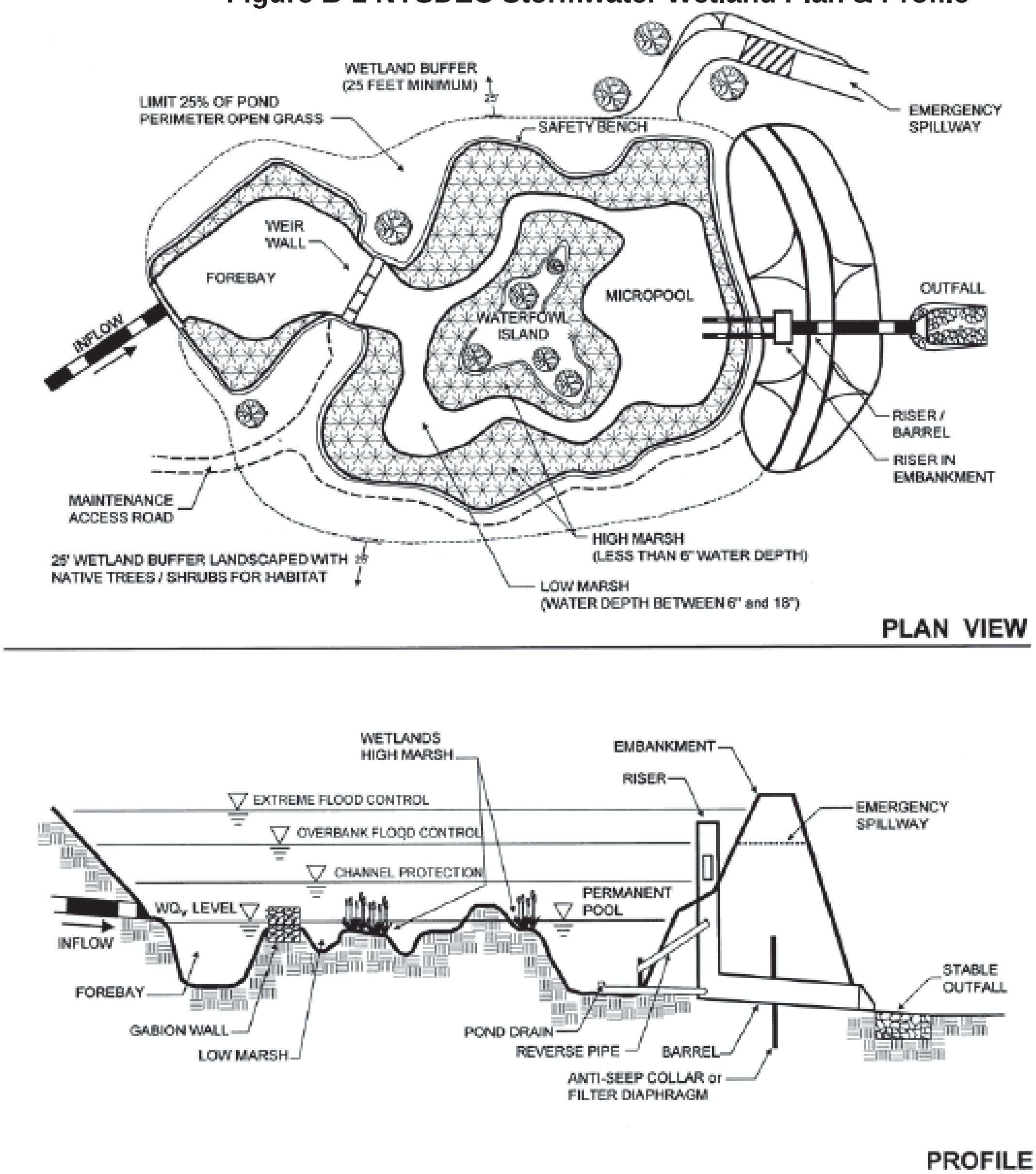


Table B-1 NYSDCE Stormwater Wetland Design Criteria

NYS Stormwater Wetland Design Criteria		
Component	**Depths**	**Criteria**
Wetland Surface Area (WSA) Size		1 % of the contributing drainage area with 1.5% for shallow marsh design
Wetland Volume	4+ feet	Min. 25% of the WQv shall be in deepwater zones
Forebay	4' - 6'	Forebay located at inlet & sized to contain 10% of the water quality volume (WQv)
Wetland Depths	6 " or less	Min. 35% of WSA
	18 " or less	Min. 65% of WSA
Micropool	4' - 6'	Stores ~ 10% of WQv & located at the outlet
Extended Detention		If used - min. 50% of WQv in permanent pool & max. water surface elev. not more than 3-ft above permanent pool elev.

B.2 North Hook Mill Green Catchment Area

The following stormwater treatment upgrades were proposed as part of a grant application for the North Hook Mill Green catchment area:

- Conversion of the existing open channel area to a bioswale / shallow wetland area, approximately 0.38-acres in size (text of grant application states 0.5-acres, however figure shows an area of approximately 0.38 acres)
- 2-ft deep forebay area
- Excavate 6" – 18" below existing grade
- 2-ft deep micropool near outlet structure
- Provide wetland plant buffer around perimeter

The system does not comply with the minimum surface area requirement of 0.65 and 0.98-acres for stormwater wetlands and shallow marshes respectively. The design does not appear to comply with the 4'-6' depth requirement for the forebay and micropool. In addition, the depth to groundwater at this location is less than 2-ft under seasonal high water conditions in this area.

As presented in Section 2, stormwater nutrient removal requirements are approximately 90% for nitrogen and phosphorus. Stormwater wetlands are typically credited with 40% - 50% removal (CWP, 2008; North Carolina Department of Environment and Natural Resources Stormwater BMP Manual, 2015). While these systems can be engineered to achieve higher levels, innovative techniques must be employed to achieve the water quality objectives for Hook Pond. The proposed bioswale / shallow wetland will not achieve the necessary nutrient removal. Table B-2 presents a comparison between the NYS Design Manual guidance for wetland design and the proposed design for the North Hook Mill Green catchment area stormwater wetland. As can be seen in Table B-2, the size of the proposed system is significantly smaller than required.

Table B-2 North Hook Mill Green Stormwater Wetland Design Criteria

Stormwater Wetland Design Criteria North Hook Mill Green Catchment Area			
Pond Area (acres)			110
Stormwater Catchment Area (acres)			65.0
Stormwater Generation			
	<u>% of Area</u>	<u>% Runoff</u>	<u>% to Pond</u>
Impervious	70%	90%	63%
Pervious	30%	5%	1.5%
		Weighted Average	***64.5%***
25-yr Storm Precipitation (inches)	6.0		
Weighted Avg. of Precip. as Runoff	64.5%		
Volume (gal)		**6,830,000**	

	WQv (gal)	Min. Surface Area (acre)		Min. Forebay Volume (gal)	Min Area w/ Depth <6-in. (acre)	Min Area w/ Depth <18-in. (acre)	Min Volume w/ Depth >4-ft. (gal)
		Shallow Marsh	Wetland				
NYS Design Manual	7,201,400	0.98	0.65	720,140	0.34	0.63	1,800,350
Proposed SW Treatment	7,201,400	0.38		27,230	0.34		0

B.3 VILLAGE GREEN CATCHMENT AREA

The following stormwater treatment upgrades were proposed as part of a grant application for the Village Green catchment area:

- Excavate 0.25-acres to a depth of 12"-18" and replant with turf grass
- 3 micropools are proposed near the 3 inlet culverts discharging to the site
- Swale is proposed to promote infiltration and attenuate peak flows during dry conditions and to function as a shallow wetland during wet conditions

No forebay is shown on the drawing, however there are micropools near each of the stormwater discharge points. Table B-3 presents the design criterial for the Village Green catchment area stormwater wetland. The area and depth requirements are not an issue for this site. Nutrient removal for this system is estimated to be 40% for both nitrogen and phosphorus. As such, these improvements will not provide the necessary removal for nitrogen and phosphorus to support the water quality objectives for Hook Pond

Table B-3 Village Green Stormwater Wetland Design Criteria

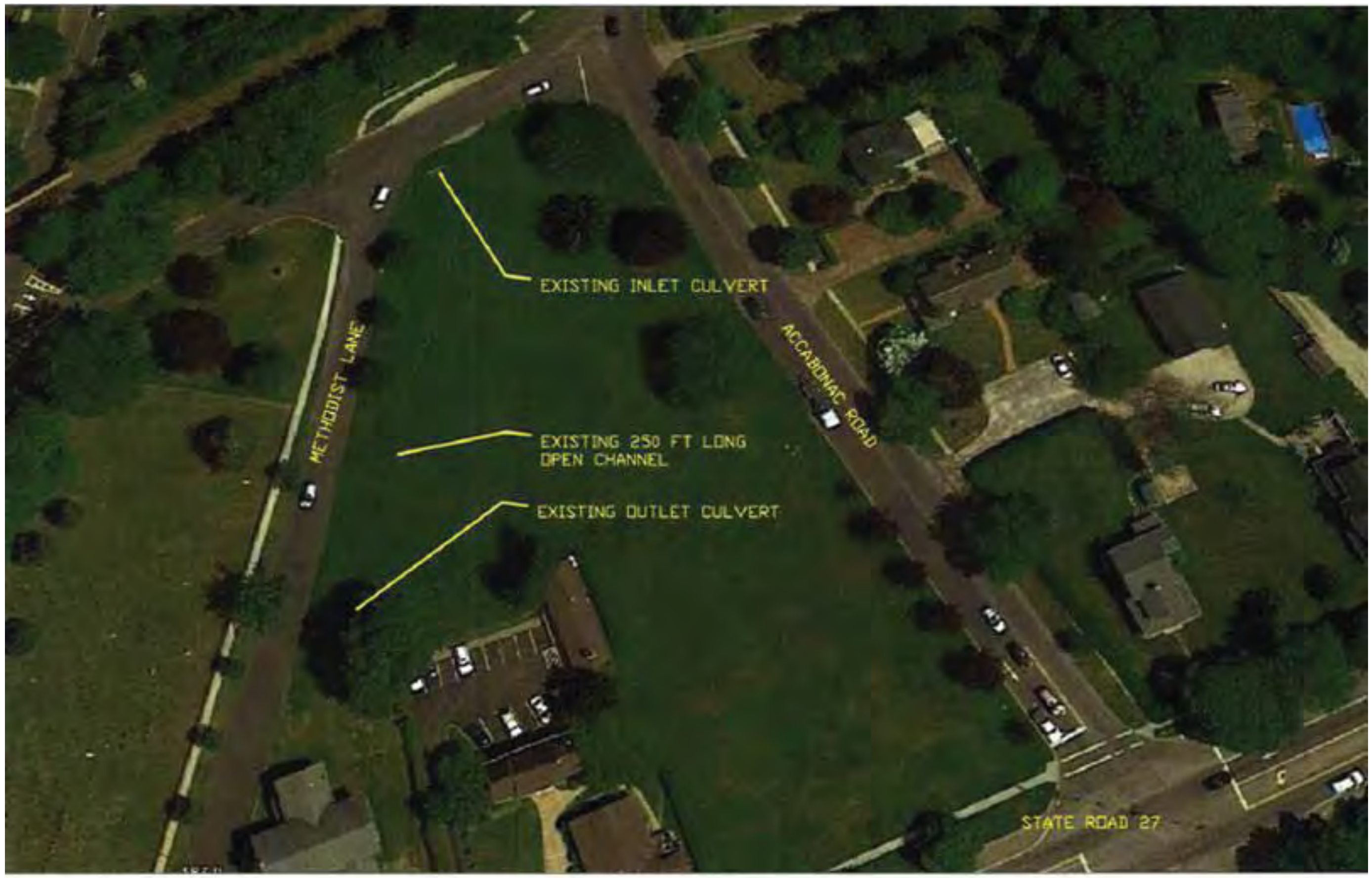
Stormwater Wetland Design Criteria - Village Green Catchment Area			
Pond Area (acres)			110
Stormwater Catchment Area (acres)			35.0
Stormwater Generation			
	% of Area	% Runoff	% to Pond
Impervious	70%	90%	63%
Pervious	30%	5%	1.5%
		Weighted Average	*64.5%*
25-yr Storm Precipitation (inches)	6.0		
Weighted Avg. of Precip. as Runoff	65%		
Volume (gal)		3,678,000	

	WQv (gal)	Min. Surface Area (acre)		Min. Forebay Volume (gal)	Min Area w/ Depth <6-in. (acre)	Min Area w/ Depth <18-in. (acre)	Min Volume w/ Depth >4-ft. (gal)
		Shallow Marsh	Wetland				
NYS Design Manual	3,877,700	0.53	0.35	387,770	0.18	0.34	969,425
Proposed SW Treatment	3,877,700	0.90		34,110	0.83		0

Figure B-2 North Hook Mill Green Stormwater Drainage Area

SHEET		SCALE	DATE		
3	WATERSHED	AS NOTED	02.17.15	NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

Figure B-3 North Hook Mill Green Stormwater Treatment Site



SHEET		SCALE	DATE		
1	EXISTING OPEN CHANNEL	AS NOTED	02.17.15	NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

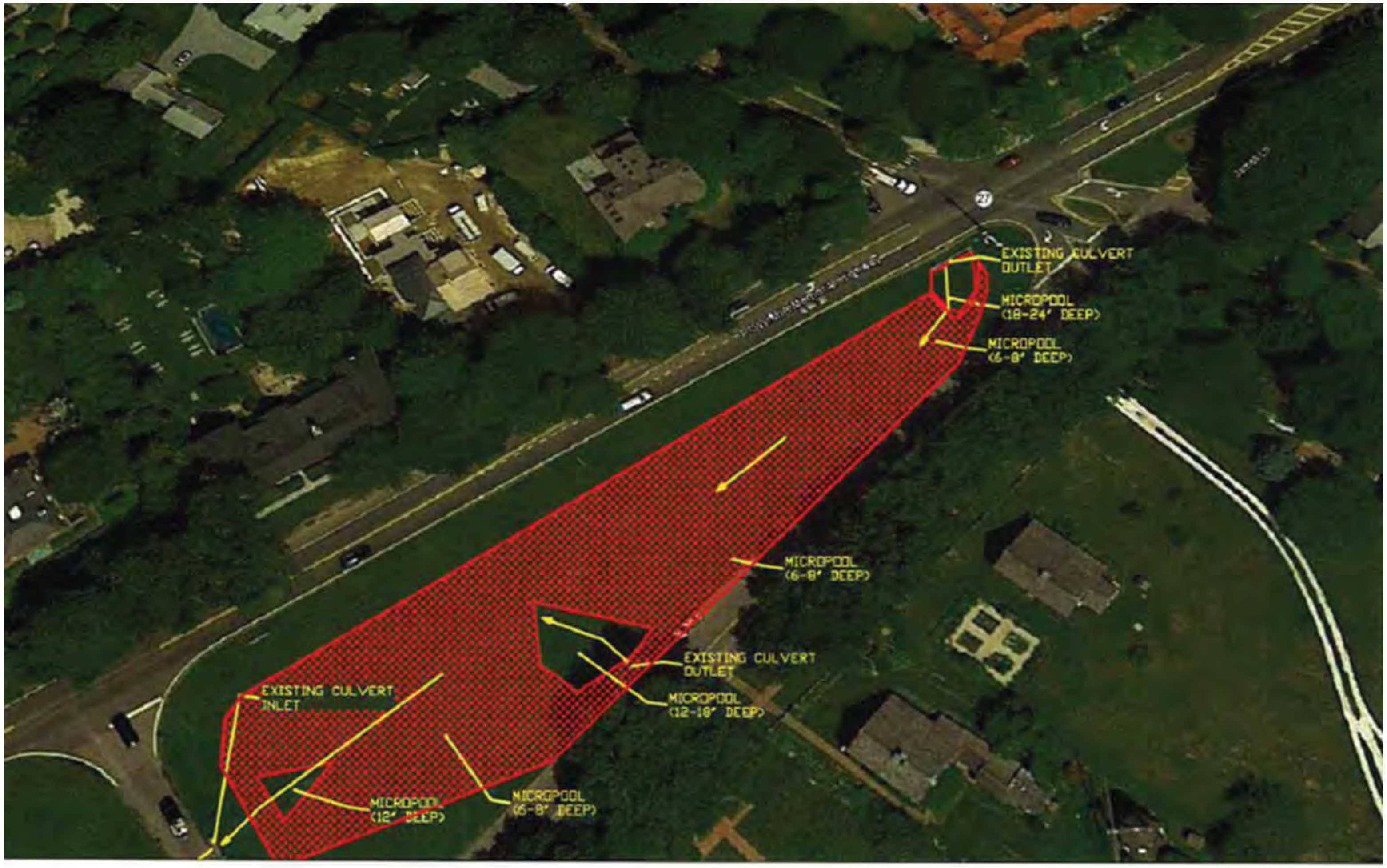
Figure B-4 North Hook Mill Green Stormwater Treatment System Layout

SHEET		SCALE	DATE		
2	PROPOSED BIOSWALE/WETLAND	AS NOTED	02.17.15	NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

Figure B-5 Village Green – Town Pond Stormwater Drainage Area

SHEET		SCALE	DATE		
2	WATERSHED	AS NOTED	02.17.15	VILLAGE GREEN - MICROPOOL/SWALES HOOK POND WATER QUALITY IMPROVEMENT PROJECT #2 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

Figure B-6 Village Green – Town Pond Stormwater Bioswale Layout



SHEET		SCALE	DATE		
1	RETROFIT GREEN	AS NOTED	02.17.15	VILLAGE GREEN - MICROPOOLS/SWALES HOOK POND WATER QUALITY IMPROVEMENT PROJECT #2 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

APPENDIX C STORMWATER CATCH BASIN INSERTS EVALUATION

The grant proposal detailed in Appendix B calls for the Fabco StormBasin inserts for existing catch basins. A picture of a typical insert is presented in Figure C-1, with a schematic diagram presented in Figure C-2. The StormBasin inserts are equipped with cartridges that can be customized based on the desired treatment. The cartridges are two-stage filters. The first stage is a foam filter that removes grit and larger solids. The second stage can be equipped with specialty cartridges that remove nutrients. Fabco reports the following nutrient removal efficiencies for their FabPhos cartridge:

- Total Nitrogen: 40% removal
- Total Phosphorus: 70% removal
- Fecal Coliform: 77% removal*
- Enteroccous: 49% removal*

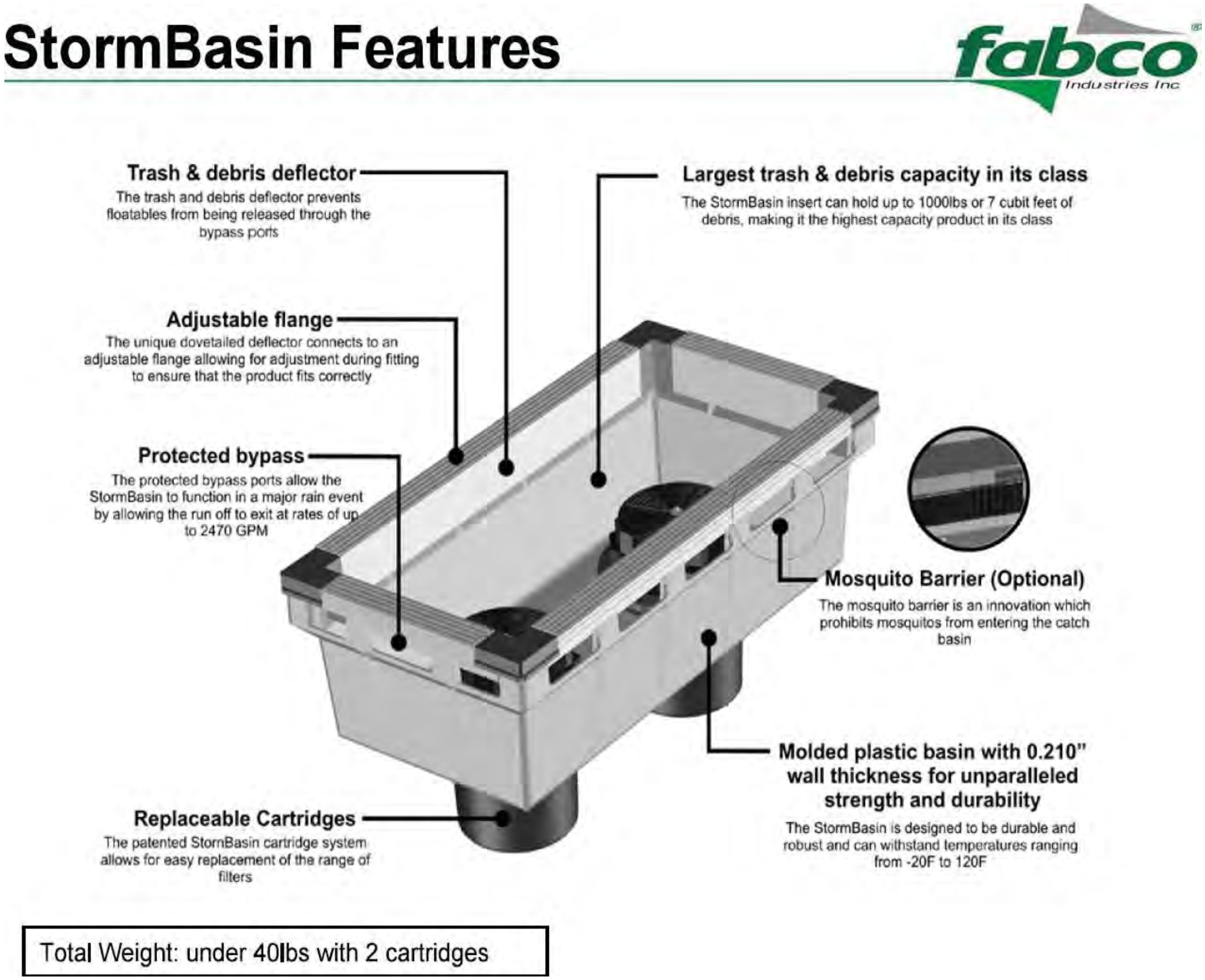
**The unsaturated sand that the stormwater infiltrates through between the bottom of the catch basin and groundwater typically provides >99% removal of bacteria and virus.*

Figure C-1 StormBasin Catch Basin Insert - Clean

The cartridges can be equipped with sample tubes that separate raw stormwater from water treated by the cartridges. This allows for the systems to be evaluated for nutrient removal efficiency.

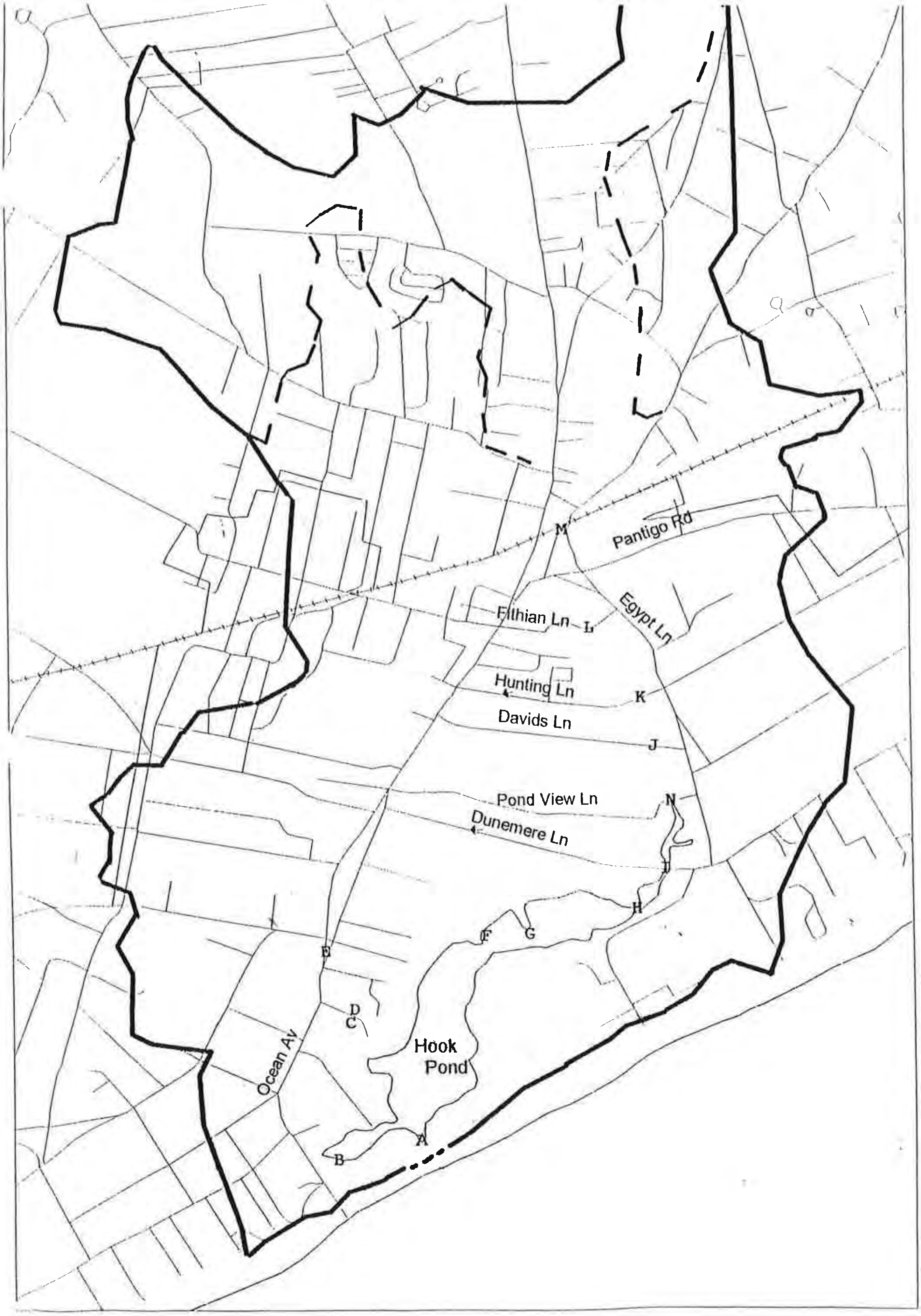
The models specified in the grant proposal are the 9730 and 9731 models, which have a filtered flow capacity of 230-gpm, a bypass flow rate of 1,975 – 2,110-gpm, and a debris capacity of 4.0 – 5.0 ft^3 respectively. The cartridges proposed are do not have the FabPhos cartridge for nutrient removal.

Figure C-2 Schmatic of StormBasin Catch Basin Insert



TASK 1-4 REPORT APPENDIX B - APPENDIX H

APPENDIX B 1997 EHDNR DATA



M
Pantigo Rd
Filthian Ln
L
Egypt Ln
Hunting Ln
K
Davids Ln
J
Pond View Ln
N
Dunemere Ln
I
H
F
G
E
D
C
Hook
Pond
Ocean Av
A
B

EHTNR-EPD

EHDNR Water Quality Data

Sampling Location A - Pond Discharge								
Date	TEMP	Sp. Cond.	TDS	pH	NH_3-N	NO_2-N	NO_3-N	PO_4 -3 - P
		µs/cm	(mg/L)		mg/L	mg/L	mg/L	mg/L
1/31/1997	34	2,400	1,300	6.95				
2/14/1997	38	2,400	1,200	7.37				
2/27/1997	49	2,600	1,300	6.20				
3/20/1997	42	2,700	1,300	7.60				
4/17/1997	52	2,600	1,300	7.55				
4/18/1997	52	2,300	1,300	7.60				
5/19/1997	60	2,900	1,400	7.40	0.02	0.033	0.2	0.1435
6/2/1997	64	6,200	3,100	7.75	0.16	0	0.5	0.0261
7/9/1997	78	3,000	1,500	7.60	0.03	0	0.2	0.2544
8/6/1997	74	3,600	1,800	8.00				
8/18/1997	74	2,800	1,900	9.10	0.01	0.5	0.002	0
9/29/1997	66	2,500	1,400	8.10	0.03	0.002	0	0.0033
11/13/1997	46	2,700	1,400	8.20			0.5	
Min	**34**	**2,300**	**1,200**	**6.2**	**0.01**	**0**	**0**	**0**
Max	**78**	**6,200**	**3,100**	**9.1**	**0.16**	**0.5**	**0.5**	**0.2544**
Avg	**56.08**	**2,977**	**1,554**	**7.65**	**0.05**	**0.107**	**0.2337**	**0.0854**

Sampling Location G - Mid Pond								
Date	TEMP	Sp. Cond.	TDS	pH	NH_3-N	NO_2-N	NO_3-N	PO_4 -3 - P
		µs/cm	(mg/L)		mg/L	mg/L	mg/L	mg/L
1/31/1997	35	5,800	2,900	6.95				
2/14/1997								
2/27/1997	46	4,300	2,100	7				
3/20/1997	40	2,600	1,200	6.6				
4/17/1997	52	2,500	1,200	6.9				
4/18/1997	50	2,500	1,200	7.1				
5/19/1997	60	2,700	1,300	7.6	0.01	0.005	0	0.0522
6/2/1997	62	6,000	3,100	8.75	0.03	0	0.6	0.0457
7/9/1997	80	2,700	1,900	6.8	0.27	0.011	0.4	0.0489
8/6/1997	76	2,500	1,800	7.6				
8/18/1997	72	3,300	1,600	7.1				
9/29/1997	64	2,400	1,200	8.3				
11/13/1997	44	2,300	1,200	7			0.8	
Min	**35**	**2,300**	**1,200**	**6.6**	**0.01**	**0**	**0**	**0.0457**
Max	**80**	**6,000**	**3,100**	**8.75**	**0.27**	**0.011**	**0.8**	**0.0522**
Avg	**56.75**	**3,300**	**1,725**	**7.31**	**0.1033**	**0.0053**	**0.45**	**0.0489**

Sampling Location H - Pond Eastern End								
Date	TEMP	Sp. Cond.	TDS	pH	NH_3-N	NO_2-N	NO_3-N	PO_4 -3 -P
		µs/cm	(mg/L)		mg/L	mg/L	mg/L	mg/L
1/31/1997	38	3,300	1,600	6.4				
2/14/1997								
2/27/1997	50	2,700	1,300	7.1				
3/20/1997	53	2,500	1,200	6.75				
4/17/1997	53	2,500	1,200	6.75				
4/18/1997	49	2,500	1,100	6.9				
5/19/1997	60	2,700	1,300	7.6	0.01	0.019	2	0.0196
6/2/1997	58	2,400	1,200	8.55	0.14	0.012	2.2	0.0685
7/9/1997	80	2,600	1,900	6.8				
8/6/1997	76	2,300	1,100	9.1				
8/18/1997		2,000	1,000	6.9				
9/29/1997	65	2,200	1,200	7.6				
11/13/1997	44	2,400	1,300	6.9			2.1	
Min	**38**	**2,000**	**1,000**	**6.4**	**0.01**	**0.012**	**2**	**0.0196**
Max	**80**	**3,300**	**1,900**	**9.1**	**0.14**	**0.019**	**2.2**	**0.0685**
Avg	**56.91**	**2,508**	**1,283**	**7.28**	**0.075**	**0.0155**	**2.1**	**0.044**

Date	pH				
	Hook Pond Open Water			Tributary Area	
	A	G	H	I	N
1/31/1997	6.95	6.95	6.40	6.35	
2/14/1997	7.37			6.60	
2/27/1997	6.20	7.00	7.10	6.60	6.50
3/20/1997	7.60	6.60	6.75	6.40	6.60
4/17/1997	7.55	6.90	6.75	6.35	6.15
4/18/1997	7.60	7.10	6.90	6.40	6.30
5/19/1997	7.40	7.60	7.60	6.60	6.20
6/2/1997	7.75	8.75	8.55	7.25	6.50
7/9/1997	7.60	6.80	6.80	6.20	6.00
8/6/1997	8.00	7.60	9.10	7.00	6.00
8/18/1997	9.10	7.10	6.90	6.60	6.30
9/29/1997	8.10	8.30	7.60	6.90	6.40
11/13/1997	8.20	7.00	6.90	6.50	6.40
Min	**6.20**	**6.60**	**6.40**	**6.20**	**6.00**
Max	**9.10**	**8.75**	**9.10**	**7.25**	**6.60**
Avg	**7.65**	**7.31**	**7.28**	**6.60**	**6.30**

Water Quality Testing Datasheet Natural Resource/Environmental Protection Department

Hook pond water samples

Location on map	Description of structure	Date collected	Collected by:	Time collected	Water Temp.	Tide	Date tested	Tested by:	station #	pH	TDS (ppm)	Conductivity (uS)	Salinity ppt
A	pond	1/31/97	B.F. K.S.	13 05	34°		2/5/97	T.D.		6.95	1300	2400	NA
C	culvert	1/31/97	B.F. K.S.	13:20	42°		2/5/97	T.D.		6.15	3100	6200	NA
D	culvert/pond	1/31/97	B.F. K.S.	13:25	42°		2/5/97	T.D.		6.0	2900	6100	NA
E	culvert/pond	1/31/97	B.F. K.S.	13:30	36°		2/5/97	T.D.		6.3	1900	4000	NA
F	pond	1/31/97	B.F. K.S.	13:50	33°		2/5/97	T.D.		6.7	2900	5800	NA
G	pond	1/31/97	B.F. K.S.	13:40	35°		2/5/97	T.D.		6.85	2900	5800	NA
H	pond	1/31/97	B.F. K.S.	14:08	38°		2/5/97	T.D.		6.4	1600	3300	NA
I	pond/culvert	1/31/97	B.F. K.S.	14:00	42°		2/5/97	T.D.		6.35	3100	6200	NA
J	pond/culvert	1/31/97	B.F. K.S.	14:18	43°		2/5/97	T.D.		7.1	1200	2600	NA
K	pond/culvert	1/31/97	B.F. K.S.	14:25	43°		2/5/97	T.D.		6.5	1400	2900	NA
L	stream/culvert	1/31/97	B.F. K.S.	14:30	42°		2/5/97	T.D.		6.8	2100	4400	NA
M	stream/culvert	1/31/97	B.F. K.S.	14:45	38°		2/5/97	T.D.		6.9	600	1300	NA
B	No sample was taken												

Water Quality Testing Datasheet Natural Resource/Environmental Protection Department

Location	Description of structure	Date collected	Collected by:	Time collected	Water Temp.	HACH KIT ~~Tdep~~ pH	Date tested	Tested by:	station #	pH	TDS (ppm)	Conductivity (uS)	Salinity ppt
Hook POND	POND -WEIR	2/14/97	K.S. KAMMY	10:45 AM	38°	7.37	2/19/97	T.D. Todd	A	7.2	1200	2400	N/A
Hook POND	phragmites POND	2/14/97	K.S.	10 30 AM	38°	6.45	2/19/97	T.D	B	6.3	10,000	17800	N/A
Hook POND	POND	2/14/97	K.S.	11:50 AM	44°	6.70	2/19/97	T.D	C	6.4	1500	3100	N/A
Hook POND	Stream culvert	2/14/97	K.S.	11:42 AM	—	6.21	2/19/97	T.D.	M	6.5	8000	15000	N/A
Hook POND	(DUCK POND) Stream culvert	2/14/97	K.S.	12.30 pm	—	6.73	2/19/97	T.D.	J	6.3	3300	6500	N/A
Hook POND	Stream culvert	2/14/97	K.S	12.25 pm	40°	6.88	2/19/97	T.D.	K	6.4	3000	5900	N/A
Hook POND	Stream culvert	2/14/97	K.S	12 20 pm	40°	6.84	2/19/97	T.D	L	6.4	6000	11500	N/A
Hook POND	POND	2/14/97	K S	11:50 AM	42°	6.69	2/19/97	T.D.	D	6.2	1500	3000	N/A
Hook POND	CULVERT POND	2/14/97	K.S	1200 AM	—	6.70	2/19/97	T.D.	E	6.2	1100	2400	N/A
Hook POND	CULVERT POND	2/14/97	K.S.	11 10 AM	40°	7.02	2/19/97	T.D.	I	6.6	1200	2400	N/A
Buffer solution of 4.0						4.06				4.0			

STORMWATER RUNOFF

Water Quality Testing Datasheet Natural Resource/Environmental Protection Department

Location	Description of structure	Date collected	Collected by:	Time collected	Water Temp.	Tide	Date tested	Tested by:	station #	pH	TDS (ppm) X10	Conducti-vity (uS) X10	Salinity ppt
(WEIR) 25 Hook Pond	Weir	2/27/97	KS/BF	11:15 Am	44°		3/3/97	DMD	A	8.0	1360	2600	
Hook Pond	[illegible]	2/27/97	KS/BF	11:10 Am	48°		3/3/97	DMD	B	6.2	1500	3200	
Hook Pond	Mouth of Culvert	2/27/97	KS/BF	11:30 Am	49°		3/3/97	DMD	C	6.0	1500	3100	
Hook Pond	R/O Culvert	2/27/97	KS/BF	11:25	49°		3/3/97	DMD	D	6.4	1800	3800	
Hook Pond	Pond	2/27/97	KS/BF	11:35	46°		3/3/97	DMD	E	6.9	1400	2900	
Hook Pond	Pond	2/27/97	KS/BF	11:45	46°		3/3/97	DMD	F	6.9	1300	2600	
Hook Pond	Pond	2/27/97	KS/BF	11:55	46°		3/3/97	DMD	G	7.0	2100	4300	
Hook Pond	Pond	2/27/97	KS/BF	12:05	50°		3/3/97	DMD	H	7.1	1300	2700	
Hook Pond	Pond	2/27/97	KS/BF	12:00	51°		3/3/97	DMD	I	6.8	1300	2700	
Hook Pond	Stream Culvert	2/27/97	KS/BF	12:40	50°		3/3/97	DMD	J	6.4	1300	2600	
Hook Pond	Stream Culvert Hunting Lane	2/27/97	KS/BF	12:42	50°		3/3/97	DMD	K	6.7	1400	2900	
Hook Pond	Stream Culvert	2/27/97	KS/BF	12:50	49°		3/3/97	DMD	L	6.7	2000	4200	
Hook Pond	Stream Culvert	2/27/97	KS/BF	12:55	46°		3/3/97	DMD	M	6.7	6300	12200	
Hook Pond	Stream Culvert	2/27/97	KS/BF	12:30	51°		3/3/97	DMD	N	6.5	1300	2600	

Water Quality Testing Datasheet Natural Resource/Environmental Protection Department

HOOK POND (MAP LETTER) Location	Description of structure	Date collected	Collected by:	Time collected	Water Temp. °F	Tide	Date tested	Tested by:	Bottle # station #	pH	TDS (ppm)	Conductivity (uS)	Salinity ppt
A	CULVERT POND	3/20/97	T.D.	11:41	42°	—	3/21/97	T.D.	566	7.6	1300	2700	N/A
B	POND	3/20/97	T.D.	11:50	43°	—	3/21/97	T.D.	730	7.3	1000	2200	N/A
C	Culvert POND	3/20	T.D.	12:05	43°	—	3/21/97	T.D.	5	6.2	1500	3100	N/A
D	CULVERT POND	3/20	T.D.	12:06	42°	—	3/21/97	T.D.	704	6.2	1500	3100	N/A
E	Culvert POND	3/20	T.D.	12:15	44°	—	3/21/97	T.D.	534	6.4	1800	3700	N/A
F	POND	3/20	T.D.	12:30	41° F	—	3/21	T.D.	8	6.6	1200	2500	N/A
G	POND	3/20	T.D.	12:19	40°F	—	3/21	T.D.	540	6.7	1200	2600	N/A
H	POND	3/20	T.D.	12:51	46°F	—	3/21	T.D.	541	6.4	1200	2500	N/A
I	Bridge POND	3/20	T.D.	12:45	45°F	—	3/21	T.D.	14	6.4	3300	6700	N/A
N	Stream culvert	3/20	T.D.	13:14	42°F	—	3/21	T.D.	3C	6.6	1200	2500	N/A
J	Stream Culvert	3/20	T.D.	13:21	42°F	—	3/21	T.D	26	6.2	1200	2600	N/A
K	Stream culvert	3/20	T.D	13:29	42°F	—	3/21	T.D.	2020	6.4	1400	2900	N/A
L	Stream culvert	3/20	T.D	13:34	46°F	—	3/21	T.D	700	6.6	1800	3800	N/A
M	Stream culvert	3/20	T.D	13:41	40°F	—	3/21	T.D	08.5	6.8	3100	6400	N/A

Water Quality Testing Datasheet

Natural Resource/Environmental Protection Department

Hook POND WATER SHED

Location	Description of structure	Date collected	Collected by:	Time collected	Water Temp.	Tide	Date tested	Tested by:	station #	pH	TDS (ppm)	Conductivity (uS)	Salinity ppt
Hook POND	weir pond	4/17/97	MATT walker	10:20	52°	/	4/18/97	Todd D.	A	7.55	1300	2600	N/A
Hook pond	pond	4/17/97	MATT walker	10:45	52°	/	4/18/97	TD	B	7.1	1400	3000	N/A
Hook pond	POND pipes	4/17/97	MATT walker	11:21	56°	/	4/18/97	TD	C	6.4	1500	3100	N/A
Hook pond	pond pipes	4/17/97	MD WG	11:21	52	/	4/18/97	TD	D	6.2	1500	3100	N/A
TOWN pond	POND weir cement	4/17/97	MD WG	11:45	56°	/	4/18/97	TD	E	6.6	1200	2500	N/A
Hook pond	pond old (bit) bridge	4/17/97	MD WG	12:10	52°	/	4/18/97	TD	F	6.6	1200	2500	N/A
Hook pond	Golf course	4/17/97	MD WG	12:52	52°	/	4/18/97	TD	G	6.9	1200	2500	N/A
Hook pond	POND NEAR ROAD	4/17/97	MD WG	13:00	53°	/	4/18/97	TD	H	6.75	1200	2500	N/A
Hook pond	POND Bridge	4/17/97	MD WG	13:15	52°	/	4/18/97	TD	I	6.35	1200	2500	N/A
Hookpond/stre	DAVIDS LANE Bridge	4/17/97	MD WG	13:35	52°	/	4/18/97	TD	J	6.25	1300	2700	N/A
Stream	Hunting LANE Stream Bridge	4/17/97	MD WG	1400	50°	/	4/18/97	TD	K	6.2	1400	2900	N/A
Stream	Culverts Fithian 2	4/17/97	MD WG	1410	50°	/	4/18/97	TD	L	6.6	2600	4000	N/A
Fithian st. stream	culverts Street runoff	4/17/97	MD WG	1410	54°	/	4/18/97	TD	L	6.3	1500	3000	N/A*
culverts Hook mill Road	cement 2 culverts	4/17/97	MD WG	14:20	50°		4/18/97	TD	M	7.1	2000	4200	N/A
POND view Ln	Culvert	4/17/97	MD WG	14:40	51°	/	4/18/97	TD	N	6.15	1200	2600	N/A

* BLACK WATER

RAINY

Water Quality Testing Datasheet Natural Resource/Environmental Protection Department

Hook pond watershed

Location	Description of structure	Date collected	Collected by:	Time collected	Water Temp.	Tide	Date tested	Tested by:	station #	pH	TDS (ppm)	Conductivity (uS)	Salinity ppt
OCEAN	weir	4/18/97	MATT, walker	10:30	52	/	4/18/97	Todd Dien	A	7.6	1300	2300	N/A
Parking Lot	pond	4/18/97	MD. WG.	11:00	51	/	4/18/97	T.D.	B	7.25	3100	6200	N/A
Laughlin's	pond	4/18/97	MD WG	11:20	51	/	4/18/97	TD	C	6.4	1500	3100	N/A
Private rd.	pond	4/18/97	MD WG	11:20	51	/	4/16/97	TD	D	6.4	1500	3100	N/A
Town pond	weir	4/18/97	MD WG	11:35	52	/	4/18/97	TD	E	6.45	1200	2600	N/A
Golf course	pond	4/18/97	MD WG	11:55	50°	/	4/16/97	TD	F	7.1	1200	2500	N/A
Golf course	pond bridge	4/18/97	MD WG	12:10	50°	/	4/18/97	TD	G	7.1	1200	2500	N/A
Golf course	pond bridge	4/18/97	MD WG	12:20	49°	/	4/18/97	TD	H	6.9	1100	2500	N/A
Dunmere Bridge	pond bridge	4/18/97	MD WG	12:35	50°	/	4/18/97	TD	I	6.4	1100	2400	N/A
nature trail	stream	4/18/97	MD WG	12:50	49°	/	4/18/97	TD	J	6.3	1200	2500	N/A
nature trail	stream	4/16/97	MD WG	13:05	50°	/	4/18/97	TD	K	6.3	1300	2700	N/A
Fithian Ln.	stream culvert	4/18/97	MD WG	13:20	48°	/	4/18/97	TD	L	6.6	1600	3400	N/A
Train tressel	culvert	4/18/97	MD WG	13:30	50°	/	4/18/97	TD	M	6.95	1100	2200	N/A
Pondview Ln.	Bridge mouth of stream	4/18/97	MD WG	13:40	52°	/	4/18/97	TD	N	6.3	1200	2500	N/A
Fithian Ln	Road Runoff culvert	4/18/97	MD. WG	13:20	50°	/	4/16/97	TD	L	7.1	900	1800	N/A

→ 2 pipes 1 runoff 1 stream

Hook Pond

Water Quality Datasheet
date collected: 5/19/97
date tested: 5/19/97

Natural Resource Department
collected by: [illegible]
tested by: [illegible]

AL RESULTS IN mg/L

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
A	weir	10:04	60°	7.4	1400	2900	.2 mg/L	.88 mg/L	.01 mg/L	.033 mg/L	.02	.0258	.44
B	pond	10:10	60°	7.2	1200	2500	0.0 mg/L	0 mg/L	.002 mg/L	.0066	.01	.0129	.32
C	pond culvert	10:20	60°	6.4	1600	3300	2.4 mg/L	10.56 mg/L	.062	.2046	.46	.5934	.31
D	pond culvert	10:20	60°	6.4	1600	2200	2.3 mg/L	10.12 mg/L	.01	.033	0	0	.23
E	Tokeneke Drain	10:30	60°	6.65	1500	2200	0.0 mg/L	0 mg/L	.005	.0165	0	0	.15
F	pond	10:38	60°	7.3	1300	2700	0.0 mg/L	0 mg/L	.038	.1254	0	0	.08
G	pond	10:45	60°	7.6	1300	2700	0.0 mg/L	0 mg/L	.005	.0165	.01	.0129	.16
H	pond	11:00	60°	7.3	1300	2700	2.0 mg/L	8.8 mg/L	.019	.0627	.01	.0129	.06
I	pond	10:55	60°	6.6	1300	2600	2.2 mg/L	9.68 mg/L	.016	.0528	.11	.1419	.10
J	Stream	11:20	58°	6.2	1400	2800	2.6 mg/L	11.44 mg/L	.049	.1617	.07	.0903	.07
K	stream	11:28	58°	6.2	1500	3100	2.8 mg/L	12.32 mg/L	.029	.0957	.04	.0516	.07
L	culvert Stream	11:36	58°	6.8	2400	4900	3.0 mg/L	13.2 mg/L	2.84	9.372	.22	.2838	.26
M	culvert Stream	11:40	60°	7.0	1000	2100	1.1 mg/L	4.84 mg/L	.147	.4851	.53	.6837	.34
N	pond mouth of stream	11:15	60°	6.2	1300	2600	2.6 mg/L	11.44 mg/L	.023	.0759	.11	.1419	.19

Water Quality Datasheet
date collected: 6/2/97
date tested: 6/3/97

Natural Resource Department
collected by: Todd D. + Walter
tested by: Conor McGowan

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
A	Drain	11:15	64	7.75	3100	6200	.5	2.2	0	0	.16	.2064	.09
B	Pond	11:23	64	7.1	1300	2700	.3	1.32	0	0	.31	.3999	.09
C	Culvert Pond	11:30	60°	6.15	1500	3100	3.4	14.96	.016	.0594	.19	.2451	.14
D	Culvert Pond	11:30	60°	6.35	1700	3400	2.7	11.88	.020	.066	.12	.1548	.19
E	Pond Town	11:36	66°	6.6	1600	32500	1.6	7.04	.006	.0198	.24	.3096	.18
F	Pond	11:44	62°	8.7	1200	2500	.9	3.96	0	0	.10	.129	.08
G	Pond	11:46	62°	8.75	3100	6000	.6	2.64	0	0	.03	.0387	.14
H	Pond	12:10	58°	8.55	1200	2400	2.2	9.68	.012	.0396	.14	.1806	.21
I	Pond	12:20	59°	7.25	1200	2500	2.3	10.12	.003	.0099	.16	.2064	.42
J	Stream	12:30	60°	6.35	0800	1700	1.5	6.6	.005	.0165	.12	.1548	.16
K	Stream	12:40	60°	6.4	600	1300	1.1	4.4	.013	.0429	.19	.2451	.12
L	Stream	12:45	62°	6.4	300	700	.2	.88	.005	.0165	.19	.2451	.16
M	Stream	1:00	64°	6.9	400	800	.3	1.32	.006	.0198	.30	.387	.17
N	Stream Pond	12:00	58°	6.5	1200	2400	2.2	9.68	.011	.0363	.21	.2709	.26

Water Quality Datasheet
date collected: 7/9/97
date tested: 7/9/97

Natural Resource Department
collected by: W.G. T.D.
tested by: T.D.

4.9 3.3 1.29

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
A	Weir	10:07	78	7.6	1500	3000	.2	.88	0.0	0	.03	.0387	.78
B	Pond	10:15	80°	7.4	1400	2900	—	—	—	—	—	—	—
C	culvert pond	10:21	74°	6.7	1500	3000	.9	3.96	.012	.0396	.21	.2709	.10
D	culvert pond	10:21	74°	6.4	1700	3400	—	—	—	—	—	—	—
E	Tam pond culvert	10:27	78°	8.2	1800	3600	—	—	—	—	—	—	—
F	Pond	10:35	80°	8.4	1300	2600	—	—	—	—	—	—	—
G	Pond	10:35	80°	6.8	1900 1700	2700	.4	1.76	.011	.0363	.27	.3483	.15
H	Pond	10:38	80°	6.8	1900	2600	—	—	—	—	[illegible]	—	—
I	Pond	10:42	76°	6.2	1900	2700	—	—	—	—	—	—	—
J	stream pond	10:52	65°	6.0	1400	2800	—	—	—	—	—	—	—
K	stream	11:10	60°	6.0	1600	3200	—	—	—	—	—	—	—
L	Stream	11:17	62°	5.9	1500	3100	.4	1.76	.021	.0693	.55	.7095	.12
M	Stream	11:28	DRY	NO WATER		—	—	—	—	—	—	—	—
N	pond stream	10:47	64°	6.0	1900	2600	2.9	12.76	.023	.0759	.20	.258	.15

Hook pond August

Water Quality Datasheet
date collected: 8/6/97
date tested: 8/6/97

Natural Resource Department
collected by: Todd Dion
tested by: Todd Dion

4.4

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
A	weir	10:25	74°	8.0	1800	3600							
B	pond	1030	70°	7.6	1900	2400	+ .9	3.96	0	0	.31		.26
C	culvert pond	1045	70°	6.2	1500	3100							
D	culvert pond	1046	69°	6.2	1600	3200							
E	Town pond	11:00	70°	6.9	1500	3000							
F	pond	1120	76°	7.4	1900	2600							
G	pond	1124	76°	7.6	1800	2500							
H	pond	1130	76°	9.1	1100	2300							
I	pond	11:25	73°	7.0	1000	2100							
J	stream	11:38	62°	6.2	[illegible]	2600	+ 0.0	0	.031	.1023	.23		.31
K	stream	11:40	66°	6.2	1500	3000							
L	stream	11:45	62°	6.8	800	1700	+ 2.6	11.44	.012	.0396	.28		.57
M	stream	10:15	70°	6.6	900	1800							
N	stream mouth	11:35	66°	6.0	1800	2500							

Hook pond

Water Quality Datasheet
date collected: 8/18/97
date tested: 8/18/97

Natural Resource Department
collected by: Kamy S. Lisa D.
tested by: Todd D. Bill T.

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
A	pond	10:00	74°	9.1	1900	2800	.5	22	.002	.0066	.01	.0129	0.0
B	pond	10:10	70°	6.9	1500	2900							
C	pond	11:00	60°	6.4	1500	3200							
D	pond	11:00	66°	6.2	1600	3300							
E	pond	10:50	71°	6.6	—	—							
F	pond	11:20	70°	6.9	1800	3800							
G	pond	11:10	72°	7.1	1600	3300							
H	pond	11:30	X	6.9	1000	2000							
I	pond	11:25	X	6.6	1000	2200							
J	stream	11:40	X	6.2	900	1900							
K	stream	11:45	66°	6.2	1000	2000							
L	culvert stream	10:35	70°	6.6	1000	2100	.7	3.08	.011	.083	.11	.01419	0.07
M	stream	11:55	X	6.8	900	700							
N	culvert stream	10 15	66°	6.3	800	1700	1.3	5.12	.009	.0077	.19	.2351	.01

Hookpond

Water Quality Datasheet
date collected: 9/29/97
date tested: 9/29/97

Natural Resource Department
collected by: TD SS
tested by: TD SS

°F

	location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
X	A	weir	10:05	66°	8.7	1400	2500	0	0	.002	.006	.03	.0387	.01
	B	pond	10:10	66°	6.9	1100	2200							
	C	pond	10:15	62°	6.8	1400	2900							
	D	pond	10:17	62°	6.7	1500	3000							
X	E	pond	10:22	66°	7.0	1600	3100	1.0	4.4	.017	.0561	.09	.1161	.2
	F	pond	10:30	64°	7.8	1300	2500							
	G	pond	10:37	64°	8.3	1200	2400							
	H	pond	10:50	65°	7.6	1200	2200							
X	I	pond	10:45	64°	6.9	1100	2200	2.0	8.8	.037	0.1221	.24	.3096	.1
	J	pond/stream	11:02	62°	6.5	1300	2500							
X	K	stream	11:06	60°	6.6	1500	2900	2.7	11.88	.019	.0627	.32	.4128	.11
	L	stream	11:19	64°	6.9	1100	2100							
	M	stream (Empty)	11:25	NO Bottle	[illegible]	[illegible]	[illegible]							
X	N	pond/stream	10:58	62°	6.4	1000	2000	1.4	6.16	.014	.0462	.15	.1935	.13

CLOUDY
WIND 10-15 N/W

1"

Hook Pond Test Wells

Test Well #	Road Drain #	Date	Time	Water Temp (F)	Depth to Water	Sample Bottle #	Samp-lers	pH	TDS (ppt)	Conduct-ivity (ms/cm)	Salinity	Tester
2	Wick	9-3	0945	70 AIR 64	2.9	13	TODD WG	6.6	2200	4200	N/A	Todd
GRD LEVEL 1	TIDE GUAGE 21.5"	9-3	1020	70 64	1.4	5	TODD WG	6.6	2000	3700	N/A	Todd
GRD LEVEL 3	Dunmere golf course	9-3	1210	72 64	1.6	12	TODD WG	6.8	2500	4800	N/A	Todd
GRD LEVEL 4	pondview	9-3	1420	66 64	5.14 6.2	10	T.D. WG	6.4	1400	2600	N/A	Todd
2.5 5	Davids	9-3	1440	66 66	.60	1	TD WG	6.7	1600	3100	N/A	TD
GRD LEVEL 6	Hunting	9-3	1520	68° 65	.50	4	TD WG	6.9	800	1600	N/A	TD
7	Fithian	9-8	1100	64 68	2.84	21	TD WG	6.2	1000	1900	N/A	TD
4	Pondview	9-8	1030	66 68	4.54	20	T.D. W.G.	6.5	1600	3100	N/A	TD

9-22-97

HOOK POND

TEMP OF POND 64°
AIR TEMP 58°

CLEAR 100%
WIND 1-4 N/W

Tide stake 18 3/4"

Test Well #	Road Drain #	Date	Time	Water Temp (F)	Depth to Water	Sample Bottle #	Samp-lers	pH	TDS (ppt)	Conduct-ivity (ms/cm)	Salinity	Tester
Wier 2		9-22-97	10 00	69°	2.68	7	WG S.S.	6.3	1500	2800	N/A	T.D.
Parking lot 1		9-22-97	10 20	66°	1.38	11	WG SS	6.1	1700	3300	N/A	T.D.
Dunemere 3		9-22-97	10 35	68°	2.00	8	WG SS	6.8	1900	3800	N/A	T.D.
4 Londview		9-22-97	10 50	66°	4.38	10	WG SS	6.2	1600	3000	N/A	T.D.
5 Davids Lane		9-22-97	11 15	58°	0.50	13	WG SS	6.4	1400	2800	N/A	T.D.
6 Hunting		9-22-97	11 25	60°	0.74	6	WG SS	6.6	1300	2500	N/A	T.D.
7 Fithian		9-22-97	11 35	60°	2.88	12	WG SS	6.2	1100	2200	N/A	T.D.

Hook POND
Te[illegible] wells

Water Quality Datasheet Hook pond
date collected: 9/3/97 + 9/8/97
date tested: 9/10/97

Natural Resource Department
collected by: WG TD
tested by: TD

°F

~~location or map letter~~ Test well	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
9/3/97 2	By wier AT BEACH	0745	70°	6.6	2200	4200	.2	.88	0.00	0	.72	.7288	0.09
9/3/97 3	By Gatehouse on Dunmere	1210	72°	6.8	2500	4800	.4	1.76	0.00	0	.39	.5031	0.00
9/3/97 5	Davids Lane Rock pond	1440	66°	6.7	1600	3100	.6	2.64	.120	.396	.00	0	0.08
9/8/97 7	Fishman LN	1100	64°	6.2	1000	1900	2.5	11	.003	.0099	.04	.0516	0.00
9/8/97 4	pondview	1030	66°	6.5	1600	3100	1.1	4.84	.000	0	.48	.6192	0.78

Sheet1

Hozzle Pond

Water Quality Datasheet
date collected: 10-27-97
date tested: 10-28-97

Natural Resource Department
collected by: WG
tested by: SS

Light Rain
Wind 360° 5-12
Airtemp 59°F

location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
Hock Pond 1	Test Well	1335	58°F	6.2	1500	2900	0.5	2.2	0.0	0.0	0.04	0.052	0.11
Hock Pond 2	Test Well	1405	59°F	6.5	1800	3500	0.2	0.88	0.0	0.0	0.15	0.194	0.0
Hock Pond 3	Test Well	1420	58°F	6.6	1600	3100	0.6	2.64	0.041	0.135	0.46	0.593	0.02
Hock Pond 4	Test Well	1435	57°F	6.6	1400	2600	0.7	3.08	0.005	0.017	1.2	1.548	0.35
Hock Pond 5	Test Well	1440	58°F	6.6	600	1100	2.0	8.8	0.002	0.007	0.06	0.077	0.0
Hock Pond 6	Test Well	1500	58°F	6.5	600	1100	1.7	7.48	0.022	0.073	0.02	0.026	0.04
Hock Pond 7	Test Well	1515	58°F	6.2	900	1800	2.4	10.56	0.007	0.023	0.02	0.026	0.07

Hook Pond

Clear, sunny, cold
Tide Gauge: 15.5" top stick

Water Quality Datasheet
date collected: 11-13-97
date tested:

Natural Resource Department
collected by: KS, SS
tested by: Stephanie Sturm

Bottle Number	location or map letter	description of structure	time collected	(°F) water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
51	A		1030	46°	8.2	1400	2700	0.5	2.2					
58	B		1040	42	7.8	1400	2700	0.2	0.88					
20	C		1050	48	6.6	1600	3100	3.5	15.4					
33	D		1050	44	6.5	1600	3000	3.3	14.52					
25	E		1055	44	6.4	1300	2400	0.5	2.2					
16	F		1115	46	6.9	1200	2300	0.6	2.64					
60	G		1110	44	7.0	1200	2300	0.8	3.52					
19	H		1135	44	6.9	1300	2400	2.1	9.24					
35	I		1130	43	6.5	1300	2400							
43	J		1158	50	6.2	1300	2500							
64	K		1155	50	6.2	1500	2800							
15	L		1205	48	6.4	2100	3900							
	M	NO SAMPLE TAKEN - CULVERT DRY												
52	N		1150	46	6.4	1200	2200							

Hook Pond

Clear, sunny, cold
Tide Gauge: 15.5" top stick

Water Quality Datasheet
date collected: 11-13-97
date tested: 11-13-97
11-17-97

Natural Resource Department
collected by: KS, SS
tested by: Stephanie Sturm

ittle imbe	location or map letter	description of structure	time collected	(°F) water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
51	A	Surface water samples	1030	46°	8.2	1400	2700	0.5	2.2					
58	B		1040	42	7.8	1400	2700	0.2	0.88					
10	C		1050	48	6.6	1600	3100	3.5	15.4					
33	D		1050	44	6.5	1600	3000	3.3	14.52					
15	E		1055	44	6.4	1300	2400	0.5	2.2					
16	F		1115	46	6.9	1200	2300	0.6	2.64					
60	G		1110	44	7.0	1200	2300	0.8	3.52					
19	H		1135	44	6.9	1300	2400	2.1	9.24					
35	I		1130	43	6.5	1300	2400	1.8	7.92					
43	J		1158	50	6.2	1300	2500	2.7	11.88					
64	K		1155	50	6.2	1500	2800	2.6	11.44					
15	L		1205	48	6.4	2100	3900	1.5	6.6					
	M	NO SAMPLE TAKEN - CULVERT DRY												
52	N		1150	46	6.4	1200	2200	2.7	11.88					

Hook Pond

Tide Stick - 15" top Stick
55% Clouds 37° F

Water Quality Datasheet
date collected: 11-17-97
date tested: 11-17-97, 11-18-97

Natural Resource Department
collected by: BF, SS
tested by: S$

Bottle #	location or map letter	description of structure	time collected	°F water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
61	1	Test Well	9:59	48°	6.7	1500	2900	0.3	1.32	0.100	0.330	0.96	1.238	1.65
36	2	Test Well	9:50	52°	6.6	2600	5800	0.5	2.20	0.041	0.135	0.52	0.671	0.06
66	3	Test Well	10:09	46°	7.0	1200	2300	0.5	2.20	0.000	0.000	0.19	0.245	0.00
27	4	Test Well	10:15	50°	6.6	1600	3300	0.5	2.20	0.000	0.000	0.48	0.619	0.39
57	5	Test Well	10:25	52°	6.6	1900	3700	3.4	14.96	0.006	0.020	0.01	0.013	0.13
44	6	Test Well	10:27	52°	6.7	600	1200	2.6	11.44	0.000	0.000	0.04	0.052	0.14
55	7	Test Well	10:36	54°	6.4	1000	1900	1.3	5.72	0.004	0.013	0.00	0.000	0.06

Horseshoe Anvil SW

Water Quality Datasheet
date collected: 12/18/97
date tested: 1/28/98

Natural Resource Department
collected by: WG
tested by: LD, AC

bottle #	location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3) x4.4	Nitrite nitrogen (NO2-N)	Nitrite (NO2-) x3.3	Ammonia (NH3-N)	Ammonium (NH4+) x1.29	Reactive Phosphorus (PO4 3-)
57	Dunmere 3			40°	8.0	1100	1900	.3	1.32	0	0	.06	.0774	0
65	S/S Laughlins Lane			44°	7.8	1300	2400	3.1	13.64	.014	.0462	.21	.2709	.24
70	N/S Laughlins Lane			45°	7.4	2600	4700	3.7	16.28	.012	.0396	.15	.1935	.02
42	#6 Hunting Lane			46°	7.4	900	1700	1.0	4.4	.004	.0132	0.0	0.0	.01
59	surface water at tide stake			36°	7.4	1100	2000	.2	.88	0	0	.06	.0774	.12
32	4 Pondview			42°	7.0	1800	3600	.2	.88	0	0	.82	1.0578	.16
58	Osprey Platform tide Stake			42°	6.9	1000	1900	.2	.88	0	0	.08	.1032	.38
16	David lane surface H2O			46°	6.8	1200	2200	2.7	11.88	.019	.0627	.34	.4386	.09

HOOK POND

Water Quality Datasheet
date collected: 12/18/97
date tested: 1/29/97

Natural Resource Department
collected by: WG
tested by: AC

x4.4 x3.3 1.29

Bottle #	location or map letter	description of structure	time collected	water temp	PH	TDS (ppm)	conductivity (us)	Nitrate nitrogen (NO3-N)	Nitrate (NO3)	Nitrite nitrogen (NO2-N)	Nitrite (NO2-)	Ammonia (NH3-N)	Ammonium (NH4+)	Reactive Phosphorus (PO4 3-)
33	Hunting Lane Surface water			46°	6.9	1600	2900	3.4	14.96	.012	.040	.32	.413	.04
15	Surface #7 water?				6.6	1300	2500	1.7	7.48	.019	.063	.36	.464	.03
60	#7			46°	6.8	900	1600	1.3	5.72	.001	.063	0	0	.06
61	Dunemere Surface WTR			44°	6.6	1100	1900	2.5	11.0	.023	.076	.29	.374	.06
66	WEIR HOOK POND SURFACE WATER			36°	7.6	1200	2300	1.2	5.28	.015	.0495	.60	.774	.1
55	PONDVIEW SURFACE WATER			45°	6.9	1100	2100	2.8	12.32	.010	.033	.20	.258	.04
43	Davids #5			47°	6.5	1400	2400	4.1	18.04	.002	.0066	.02	.0258	.04
21	HP #2			39°	6.6	1200	2200	.8	3.52	.001	.0033	.03	.0387	.12

12-18-97

WIND 3

TEMP 45

W C

Test Well #	Road Drain #	Date	Time	Water Temp (F)	Depth to Water	Sample Bottle #	Samplers	pH	TDS (ppt)	Conductivity (ms/cm)	Salinity	Tester
P #2				39°	.122 / 2.7	21						
WEIR HOOK POND SURFACE WTR				36°		66						
OSPREY PLATFORM TIDE STAKE H.P. #1				42°	GRD LEVEL 1.26	58						
SURFACE WATER AT TIDE STAKE				36°		59						
N/S LAUGHLINS LANE				45°		70						
S/S LAUGHLINS LANE ¢				44		65						
E/O OCEAN AVE				—								
DUNEMERE 3				40°	GROUND LEVEL 1.14	57						
DUNEMERE SURFACE WTR.				44°		61						
4 PONDVIEW				42°	1.22 / 4.26	32						
PONDVIEW SURFACE WTR				45		55						
DAVIDS #5				47°	.10 / .45	43						
DAVID LANE SURFACE WTR.				46°		16						
HUNTING LANE #6				46°	.34 / .80	42						
HUNTING LANE SURFACE WTR.				46°		33						
#7				46	2.10 / 2.90	60						
SURFACE WATER						45						

HOOK POND AND HOOK POND WATERSHED STUDY, 1997-98, PRELIMINARY FINDINGS

PHASE II STUDY

1. Continue Routine Water Quality Monitoring

2. Sample Sediments:

   a. Nutrients and Nutrient Flux
   b. Heavy Metals
   c. Organics (pesticides, etc.)

3. Sample Surface Runoff/Groundwaer From Golf Course/Lawns

4. Continue Monitoring of SAV/Aquatic Vegetation

5. Begin Plankton Monitoring/Charcterization

6. Floristics and Mapping Of Wetland Units

RECOMMENDED INTERIM ACTIONS

1. Aggressive Phragmites/Loosestrife Removal

2. Installation of Leaching Catchment Basins on streets crossing Hook Pond Stream

3. Begin a Hook Pond Watershed education program to reduce the amount of fertilizers, pesticides and other chemicals entering the pond

HOOK POND STUDY SUMMARY

The East Hampton Town Natural Resources and Environmental Protection Department started studying Hook Pond in January of 1997 with $10,000 provided by the Hook Pond Association and East Hampton Garden Club. The study was undertaken because there were concerns that the pond was receiving pollutants from various sources in its watershed and that these pollutants were accumulating in the pond and contiguous wetland habitats and would ultimately do damage to the pond's biota.

The study includes the following major components:

Water quality of runoff, groundwater and pond water
Watershed delineation and drainage characteristics
Watershed vegetation and land use
Pond bottom composition and depth (i.e., fathometry)
Pond vegetation (e.g., subaquatic vegetation = SAV)
Wetlands Vegetation
Phragmites coverage and influence
Bird fauna, particularly, the waterfowl fauna
Aquatic fauna: fish, invertebrates, turtles, frogs
Phytoplankton and zooplankton

The study is in its second year. All of the information collected to date is stored in databases and geographical information system maps on computers maintained in the natural resources/environmental protection department's offices. In addition to data and maps, the study has been thoroughly photo-documented. An archive of these study photographs is also on file at the department's offices.

To date, the department has devoted about 10 human salaried hours per week to carry out the Hook Pond study for 86 weeks at an average hourly cost of $14 per hour. This amounts to $12,040. This does not include the bird survey work performed by Marvin Kuhn who volunteered his time. It does not include meetings or presentations.

A break down of the work expended to date and the results of this work is as follows:

WATER QUALITY

The most salaried work has gone into water sampling and water testing. In the spring of 1997 the department installed groundwater test wells at select points in the Hook Pond system between Fithian Lane and the Atlantic Ocean. The wells have been monitored regularly since that time, except for a hiatus caused by the removal of at least three monitoring wells by Suffolk County's Vector Control during their clean up in the winter of 1998. Subsequently, new wells were installed to replace those removed. In addition to the groundwater sampling, pond surface water samples were collected at regular intervals and tested. The pond water samples included the south end of Town Pond where it flows out underground towards Hook Pond.

The results of the water quality testing are of interest. The pond routinely receives waters laden with relatively high amounts of nutrients (nitrates, in particular, but also, ammonia and phosphates). These nutrients are highest for stations situated in the Hook Pond streambed between Hunting Lane and Pond Lane, and for stations at the southwest part of the pond, i.e., that area receiving overflow water from Town Pond. Nitrate nitrogen in the most polluted samples can exceed 5 ppm, which is considered very high for runoff and surface water. Groundwater well samples are comparatively high in nutrients when compared to water table samples taken from other groundwater wells situated in less densely developed areas of the town maintained by this department.

Save for the southwestern part, Hook Pond water samples are comparatively low in nutrients, notwithstanding the fact that Hook Pond stream flows into it and nutrient laden water runs into it from the golf course and surrounding lawns and landscaped areas. Moreover, large congregations of waterfowl in the fall, winter and early spring contribute nitrogenous wastes directly to the water column, presumably, in large amounts. Apparently, the wetlands at the edge of the pond and the pond's aquatic vegetation, as well as its bottom substrate, are serving to remove nutrients from the water column, and are doing it quite efficiently. The bottom sediments are most likely storing up some of these nutrients, which could lead to problems later on. (Presently, We are in the process of trying to ascertain how much of the nutrients the bottom sediments are storing up.)

WATERSHED

The watershed of Hook Pond is extensive, many times larger than the pond's surface. It reaches north all the way to near Round Farm on Three Mile Harbor Road. The primary watershed is that part of the watershed that contributes runoff directly to Hook Pond; it is smaller than the rest of the watershed, the secondary watershed. The primary watershed has two areas which contribute significantly to Hook Pond. The smaller of the two is the watershed that drains to Town Pond. It receives water from north Main Street, from Buells Lane and Dayton Lane, and from the western parts of Fithian Lane, Hunting Lane, Davids Lane, Pond View Lane, and from all of James Lane.

The larger of these two primary watershed areas receives runoff water from as far north as Cedar Street; it collects runoff by a system of drainage ditches that move the water south under the LIRR embankment, where it continues to move south, by way of a ditch in the grassy sward east of North Main Street and west of Accabonac Highway; it then goes under NYS Route 27 and the parking lot west of the US Post Office, whence it dumps into the headwaters of Hook Pond stream via two culverts. Water from Egypt Lane runs west into the Hook Pond system, water from eastern parts of Fithian Lane, Hunting Lane, Davids Lane and Pond View Lane runs east into the Hook Pond system. This runoff water contains fairly large amounts of nutrients and sediments; it should be caught in leaching catchment basins (LCBs) and recharged into the groundwater (which runs to the ocean, not to the pond), it should not be allowed to run directly into the pond or stream as it does now.

The vegetation and landuse in the watershed has been worked out. There is comparatively little open space, the biggest piece being the Maidstone Club Golf Course. The vegetation in the watershed is for the most part made up of landscape units, lawns, and street trees. There is a little agricultural cropland. There are small pieces of upland second growth woodlands and shrublands scattered throughout the Hook Pond watershed. The largest piece of woodland is the swamp forest that occupies a portion of the primary watershed and Hook Pond streambed between Fithian Lane and Dunemere Lane. This woodland is extremely important to the Hook Pond system!

POND

The pond is a water table pond, its surface is at the same elevation as the water table under the land surrounding the pond. It's height is controlled by a weir at the south end which passes overflow water out to the ocean by way of an overflow pipe situated on the ocean beach. The pond's elevation is highest after periods of rain because the overflow pipe can't remove excess water from the pond as quickly as it accumulates.

The aquatic vegetation is of high quality, particularly that vegetation, or SAV, which is rooted to the pond floor. Water celery, elodea, and leafy pondweed comprise the bulk of this SAV. In the summer of 1997 our sampling shows that it covered about 90% of the bottom. Not only does this SAV remove nutrients and sediments from the water column, it is used as cover by a large number of pond species (fish, frogs, etc.) and used as food by many waterfowl species (e.g., mute swan, Canada goose, coot, mallard, black duck, canvasback, gadwall, widgeon, and others).

Because the bottom of the pond is shallow, averaging less than 2.5 feet, no deeper than 15 feet (at one small spot near the weir), sunlight is able to easily penetrate to the bottom to the benefit of the subaquatic vegetation. Thus, the phytoplankton is not able to get the upper hand; most of the nutrients go to the SAV, not to the phytoplankton.

The bottom, itself, is sandier and firmer in the south half of the pond, siltier and muckier at the north end, where the particulate matter coming down from the north by way of the Hook Pond stream tends to settle out.

WETLANDS

There is a wetland fringe around much of the pond. In some places this fringe is quite wide, 20 feet or more; in most places it is narrow, less than five feet in width. The highest quality wetlands occur south and north of Dunemere Lane west of the culvert. In these two spots the wetlands are diverse and rich in marsh species, some of which, for example, New England aster, and wild rice, are rare on the South Fork. Of these two, the south one is being rapidly overtaken by phragmites and purple loosestrife. The wetlands associated with the Nature Trail area north of Pond View Lane, south of Fithian Lane, are generally of high quality, but have been invaded by phragmites south of Fithian Lane. They are dominated by wetland trees and shrubs. About twenty years ago, ca. one acre of swampy wetlands on the west side of Egypt Lane was illegally filled; this wetland has yet to recover.

There are two aspects about the Hook Pond wetlands which are disturbing: 1) they are being overtaken by phragmites and purple loosestrife at a rapid rate; 2) there are very few wetlands along the edge of Hook Pond associated with the golf course where they are badly needed. Wetlands trap and filter particulates and pollutants from runoff before it reaches surface waters. There is ample opportunity to control phragmites and plant wetland fringes in the interest of improving the Hook Pond system.

FAUNA

The Hook Pond system has a comparatively rich macrofauna, the major elements of which are birds and fish. The waterfowl that use the pond in the fall, winter and spring is the most diverse assemblage of waterfowl in any one water body on the South Fork. This assemblage includes at least one species, the tundra swan, which is found nowhere else on Long Island every winter except as an ephemeral visitor during migration. Other unusual waterfowl which frequent the pond are Eurasian widgeon, common merganser and pied-billed grebe. As part of the Hook Pond study, Marvin Kuhn has compiled a list of more than 20 waterfowl species that use the pond based on a year-and-a-half of weekly observations.

The fish fauna is of interest in that there are very few sizeable freshwater ponds on eastern Long Island. After Fort Pond in Montauk, Hook Pond is the second largest in East Hampton Town. Long Island freshwater fish faunas are characteristically thin. Hook Pond is thicker than most. Seining studies in 1997 and 1998 conducted by our department have revealed the presence of at least eight species of freshwater fish. (The seining studies are continuing.) The same studies reveal that there is no apparent imbalance in these populations; there is no obvious stunting or dominance of one species over another. There is an abundant supply of banded killifish, a small baitfish, which serves as food for top predators such as the largemouth bass.

In summary, our research to date has demonstrated the following:

1. The runoff flowing into Hook Pond is rich in nutrients which could lead to damaging eutrophication (e.g., severe phytoplankton blooms) in the future. It needs to be caught upgradient in LCB's and perked into the groundwater before it reaches the pond.

2. Phragmites and purple loosestrife are rapidly overtaking the other wetland species comprising Hook Pond's wetland edges and pockets. These two species need to be controlled.

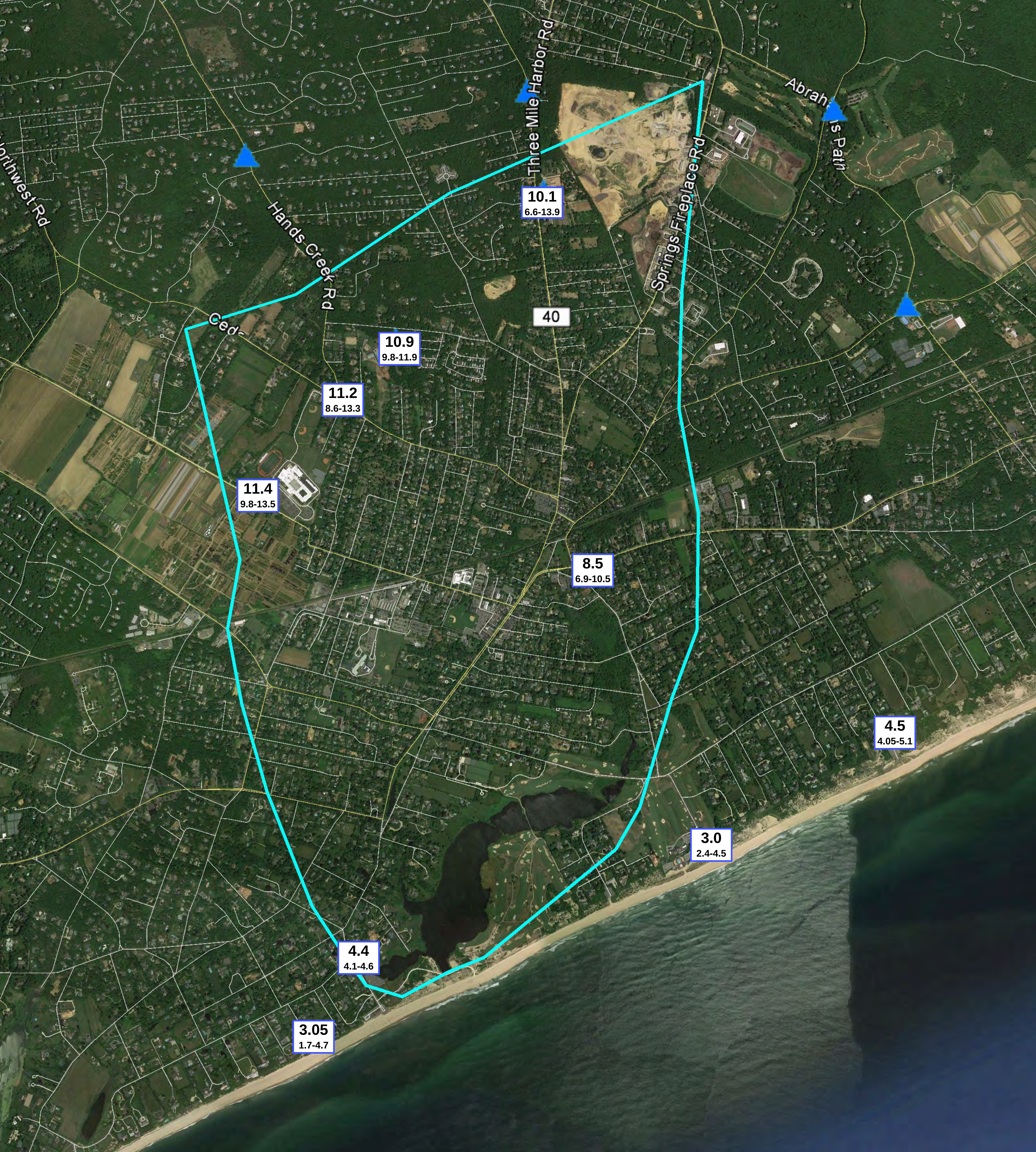
3. Wetlands consisting of high quality native marsh species should be replanted in several spots around the pond that will accommodate them and which are lacking in them now.

4. The aquatic vegetation, particularly, the rooted subaquatic vegetation (SAV), is in good shape and covers most of the pond's bottom. Present pond management practices appear to be favorable to the growth and distribution of this habitat type.

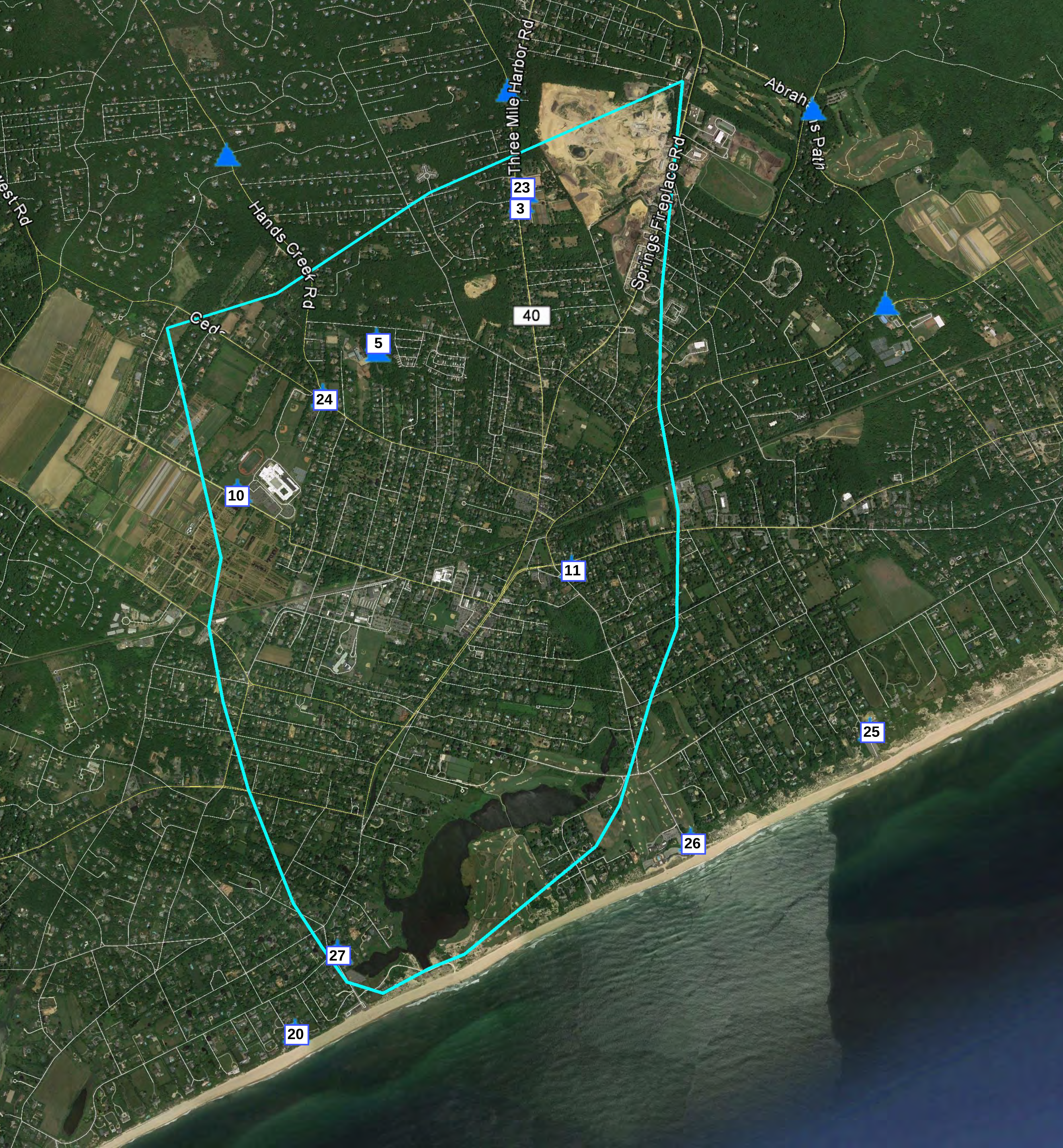
5. The fish and waterfowl fauna is rich in species and in apparent good health.

6. Homeowners and other Hook Pond stakeholders (e.g., the Maidstone Club, Town Trustees, East Hampton Village) should be acting in concert, not individually, according to a set of carefully worked out guidelines in order to better abate pollution and protect and enhance Hook Pond habitats.

APPENDIX C USGS GROUNDWATER LEVEL DATA



Three Mile Harbor Rd
Hands Creek Rd
Springs Fireplace Rd
10.1
6.6-13.9
40
10.9
9.8-11.9
11.2
8.6-13.3
11.4
9.8-13.5
8.5
6.9-10.5
4.5
4.05-5.1
3.0
2.4-4.5
4.4
4.1-4.6
3.05
1.7-4.7



Three Mile Harbor Rd
Abraham's Path
Springs Fireplace Rd
Hands Creek Rd
Ceda
40
23
3
5
24
10
11
25
26
27
20

Groundwater Elevation Data														
Project Well #	**Site Number**	**Site Name**	**Min. (ft)**	**Max. (ft)**	**Range (ft)**	**Avg. (ft)**	**Well Surface Elev. feet above NGVD29**	**Well depth**	**Aquifer**	**Elevation**			
										From	**To**	**# Years**	**Data Points**
Within Hook Pond Watershed													
23	405908072110001	S 8843. 1	6.59	12.75	6.2	10	32.5	25	Glacial Aquifer, Upper	7/28/1950	5/24/2000	49.9	298
3	405906072110102	S 8843. 2	8.15	13.86	5.7	10.2	32.5	35		6/22/2000	1/16/2015	14.6	163
5	405840072114501	S 7570. 1	9.81	11.92	2.1	10.9	70	162		4/14/1984	3/27/1985	1.0	2
24	405828072115101	S 46523. 1	8.62	13.3	4.7	11.2	64.5	97		11/20/1972	3/25/1999	26.4	68
10	405807072121001	S 48429. 1	9.81	13.47	3.7	11.4	50	66		1/8/1974	5/27/2009	35.4	78
11	405756072104901	S 8837. 1	6.92	10.53	3.6	8.47	20	35		8/1/1950	3/10/1994	43.6	109
25	405726072093701	S 1512. 1	4.05	5.13	1.1	4.47		31		3/29/1974	3/10/1994	20.0	18
Outside Hook Pond Watershed													
26	405706072102101	S 52691. 1	2.41	4.49	2.1	3.01		46	Glacial Aquifer, Upper	3/29/1974	10/6/1976	2.5	13
27	405646072114601	S 52687. 1	4.07	4.59	0.5	4.38		33		3/28/1974	10/6/1976	2.5	6
20	405632072115601	S 52686. 1	1.68	4.73	3.1	3.05		45		3/28/1974	3/10/1994	20.0	27

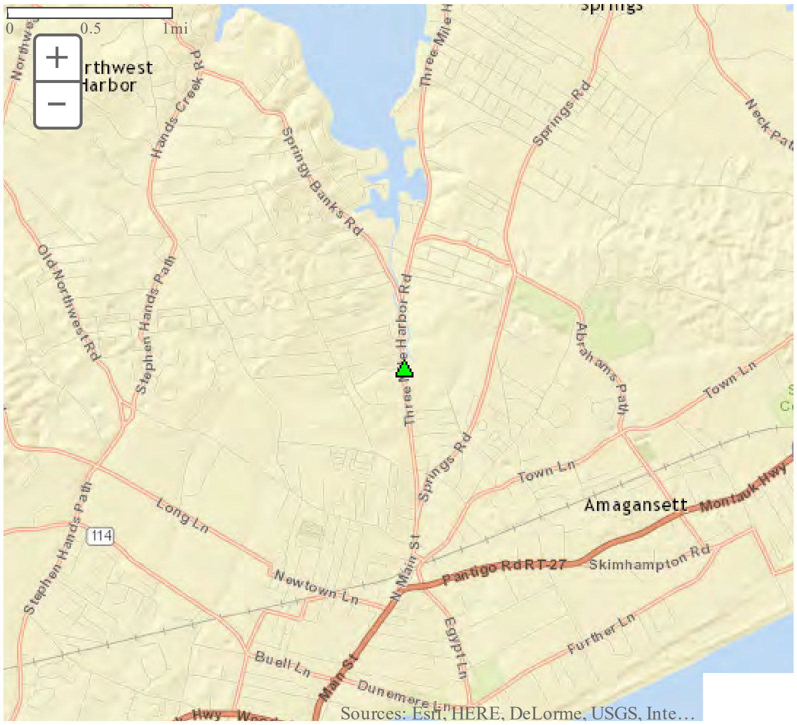
USGS science for a changing world

Groundwater Watch

USGS Home
Contact USGS
Search USGS

Latest News...

Site Number: 405906072110102 - S 8843. 2



Groundwater Watch Help Page

DESCRIPTION:

Latitude 40°59'06", Longitude 72°11'01" NAD27
Suffolk County, New York, Hydrologic Unit 02030202
Well depth: 35.0 feet
Hole depth: 35.0 feet
Land surface altitude: 32.5feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

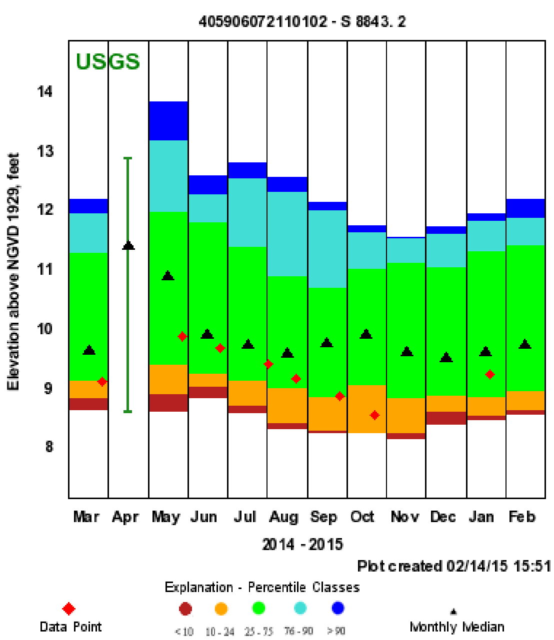
Data Type	Begin Date	End Date	Count
Daily Data			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Daily Statistics			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Monthly Statistics			
Elevation above NGVD 1929, feet	2001-08	2008-12	
Annual Statistics			
Elevation above NGVD 1929, feet	2001	2009	
Field groundwater-level measurements	2000-06-22	2015-01-16	163
Field/Lab water-quality samples			
Water-Year Summary	2005	2008	4

Additional Data Sources	Begin Date	End Date	Count
Groundwater Watch **offsite**	2000	2015	2543

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site toNew York Water Science Center Water-Data Inquiries

Site Statistics



Most recent data value: 9.23 on 1/16/2015
Period of Record Monthly Statistics for 405906072110102
Elevation above NGVD 1929, feet
All Approved Continuous & Periodic Data Used In Analysis
Note: Highlighted values in the table indicate closest statistic to the most recent data value.

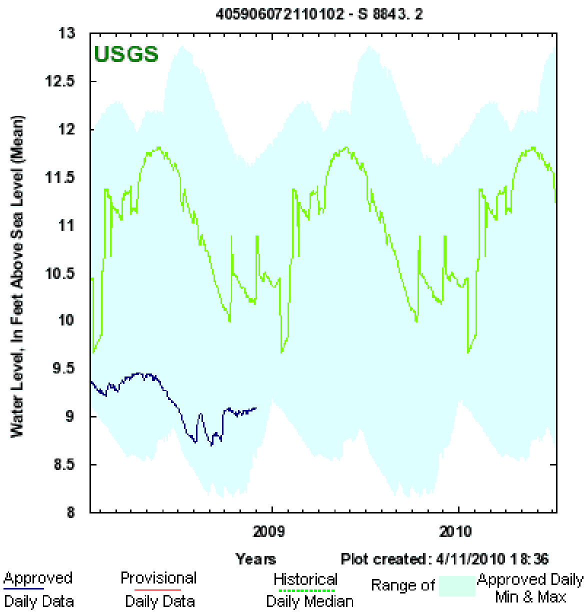
Month	Lowest Median	10th %ile	25th %ile	50th %ile	75th %ile	90th %ile	Highest Median	Number of Years
Jan	8.48	8.56	8.88	9.61	11.32	11.83	11.96	12
Feb	8.58	8.66	8.97	9.73	11.42	11.89	12.20	13
Mar	8.66	8.84	9.13	9.63	11.30	11.97	12.21	13
Apr	8.60	-	-	-	-	-	12.88	9
May	8.62	8.91	9.42	10.88	11.99	13.19	13.86	13
Jun	8.85	9.05	9.27	9.89	11.81	12.27	12.59	15
Jul	8.59	8.71	9.15	9.74	11.39	12.55	12.81	13
Aug	8.32	8.42	9.02	9.59	10.91	12.32	12.57	13
Sep	8.25	8.30	8.86	9.76	10.70	12.01	12.17	14
Oct	8.25	8.26	9.07	9.91	11.04	11.65	11.77	14
Nov	8.15	8.25	8.85	9.60	11.14	11.54	11.58	13
Dec	8.41	8.62	8.89	9.50	11.06	11.62	11.74	14

As of 2/14/2015 02:27-2

Statistics Options

View month/year statistics

Daily Groundwater Data



Most recent Approved daily data value: 9.10 on 12/01/08

Summary for Period of Continuous Record

Elevation above NGVD 1929, feet

Approved Daily Mean Values Data Used in Analysis

Begin Date	End Date	Days	% Complete
08/10/01	12/01/08	2,380	89
Min Level	Mean	Max Level	
8.16	10.58	12.86	

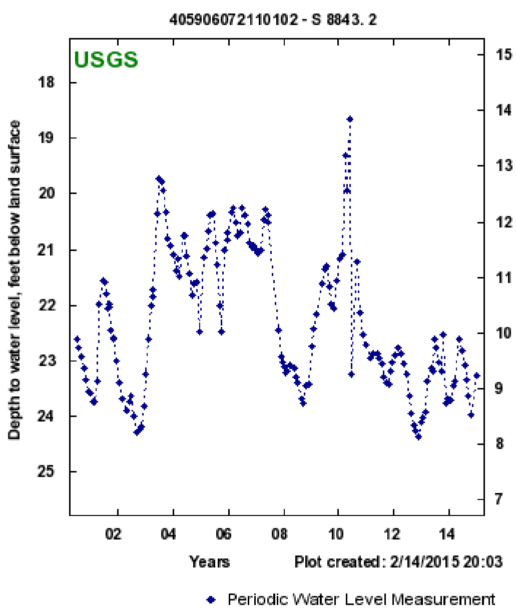
Daily Data Options

View data in calendar format

Download data in text format

View daily medians

Periodic Groundwater Data



Summary for Period of Record Periodic Water Levels

Elevation above NGVD 1929, feet

Approved Periodic Water Level Values

Begin Date		End Date	Number of Values
06/22/00		01/16/15	163
Lowest WL	Date of Lowest WL	Highest WL	Date of Highest WL
8.15	11/20/12	13.86	05/27/10

Groundwater Levels Options

View latest data on NWISWeb

Download Groundwater levels in text format

Period of Record - All Data Types

Summary for Period of Record - All Data Types

Elevation above NGVD 1929, feet

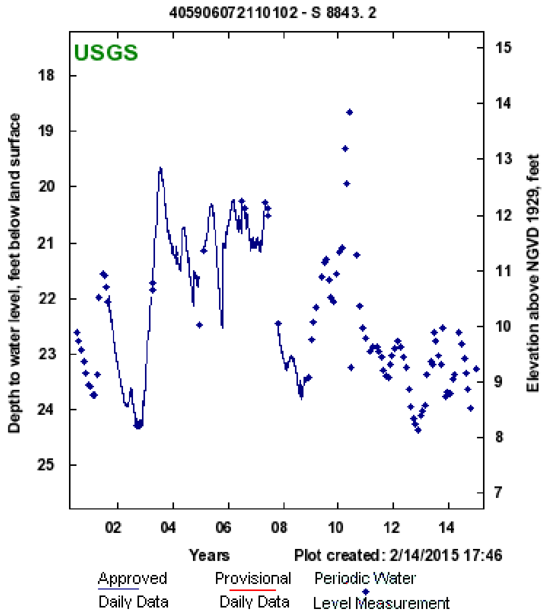
Begin Date		End Date	Number of Values
06/22/00		01/16/15	2,544
Lowest WL	Date of Lowest WL	Highest WL	Date of Highest WL
8.15	11/20/12	13.86	05/27/10

Period of Record Options

View latest data on NWISWeb for all data types

View annual monthly statistics for all data types

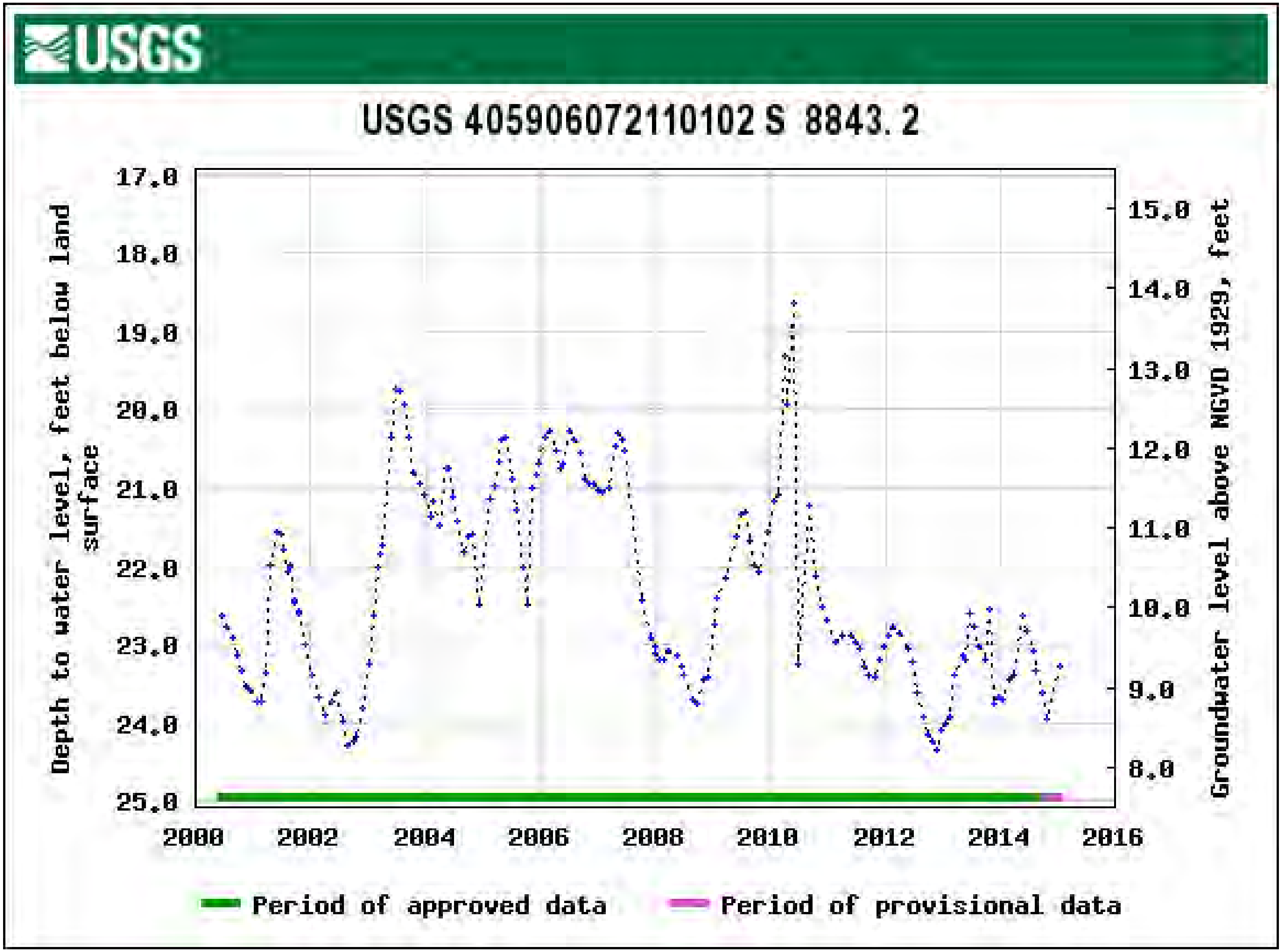
Download Groundwater levels in text format of all data types



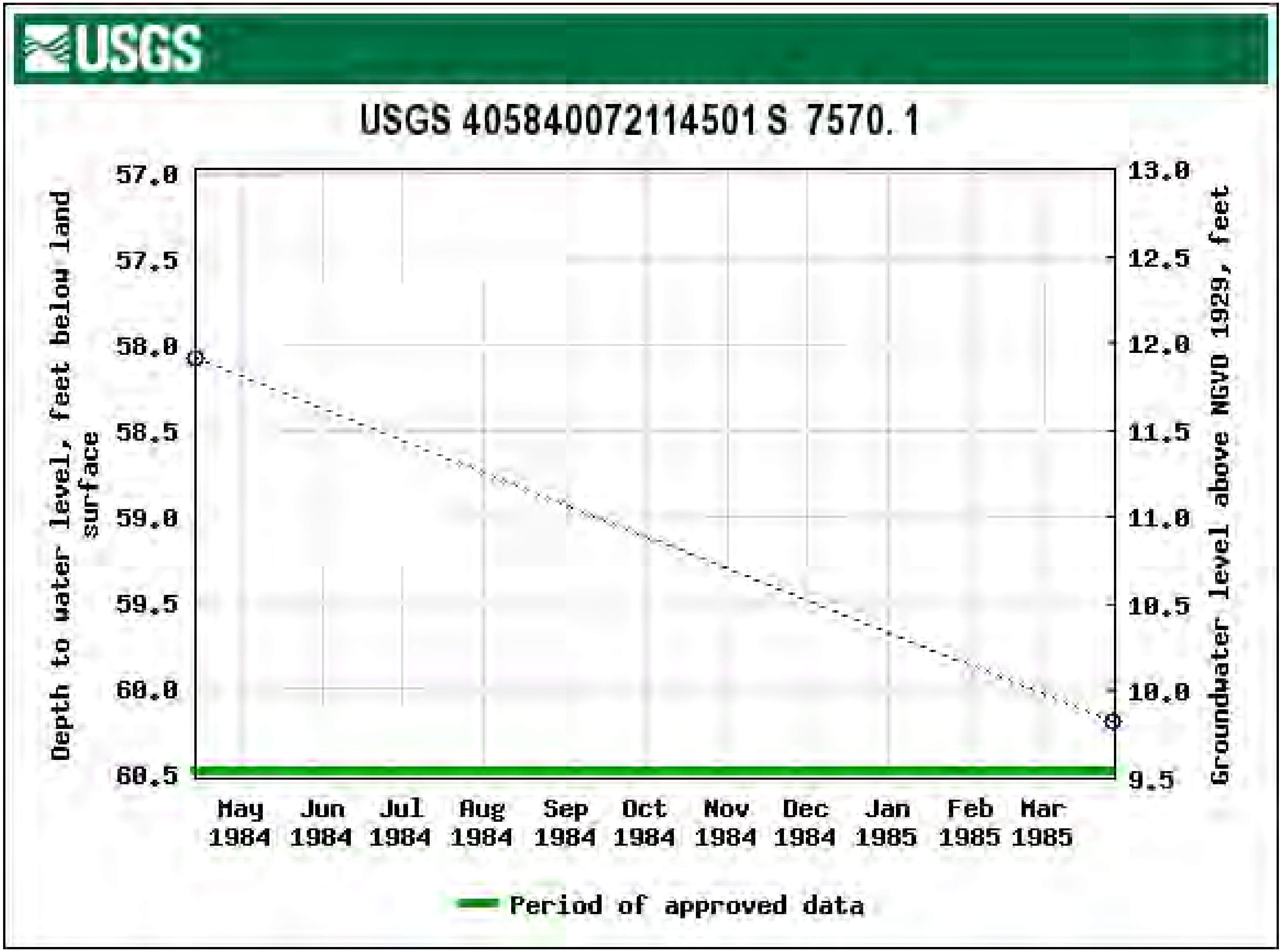
Return to Groundwater Watch | Return to County Page | Return to State Page

*References to non-Department of the Interior (DOI) products do not constitute an endorsement by the DOI.

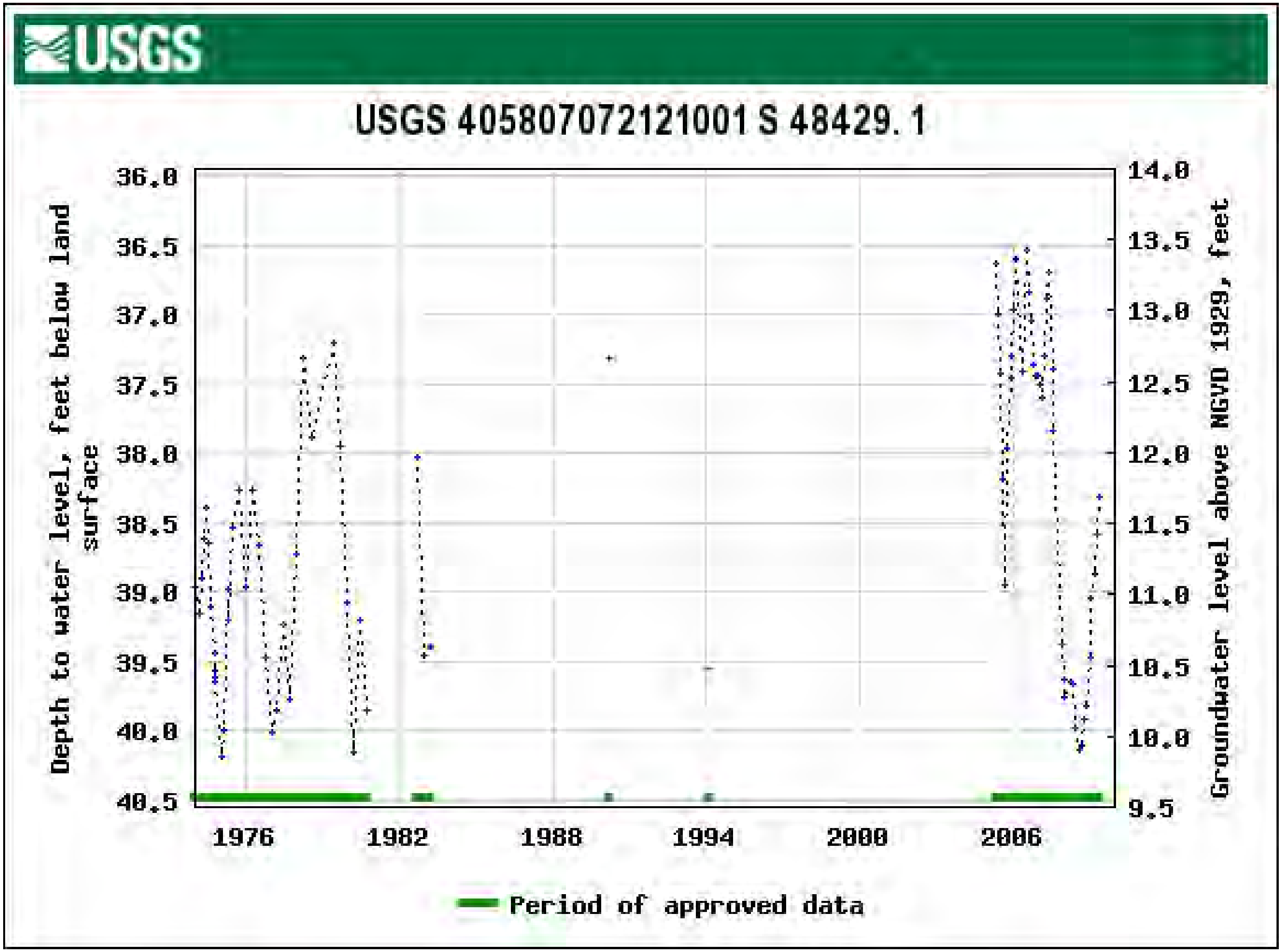
Well #3 Water Level Data



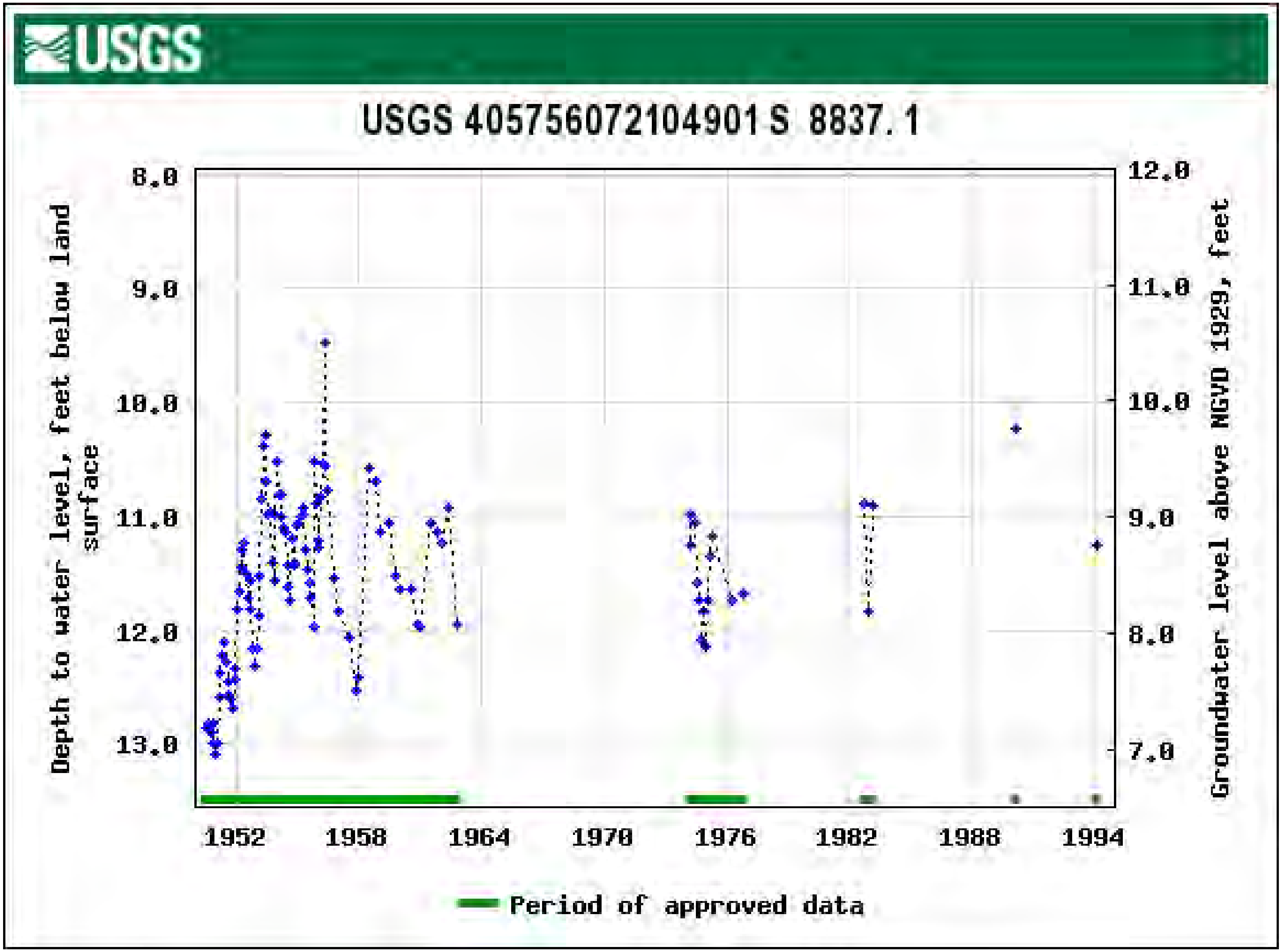
Well #5 Water Level Data



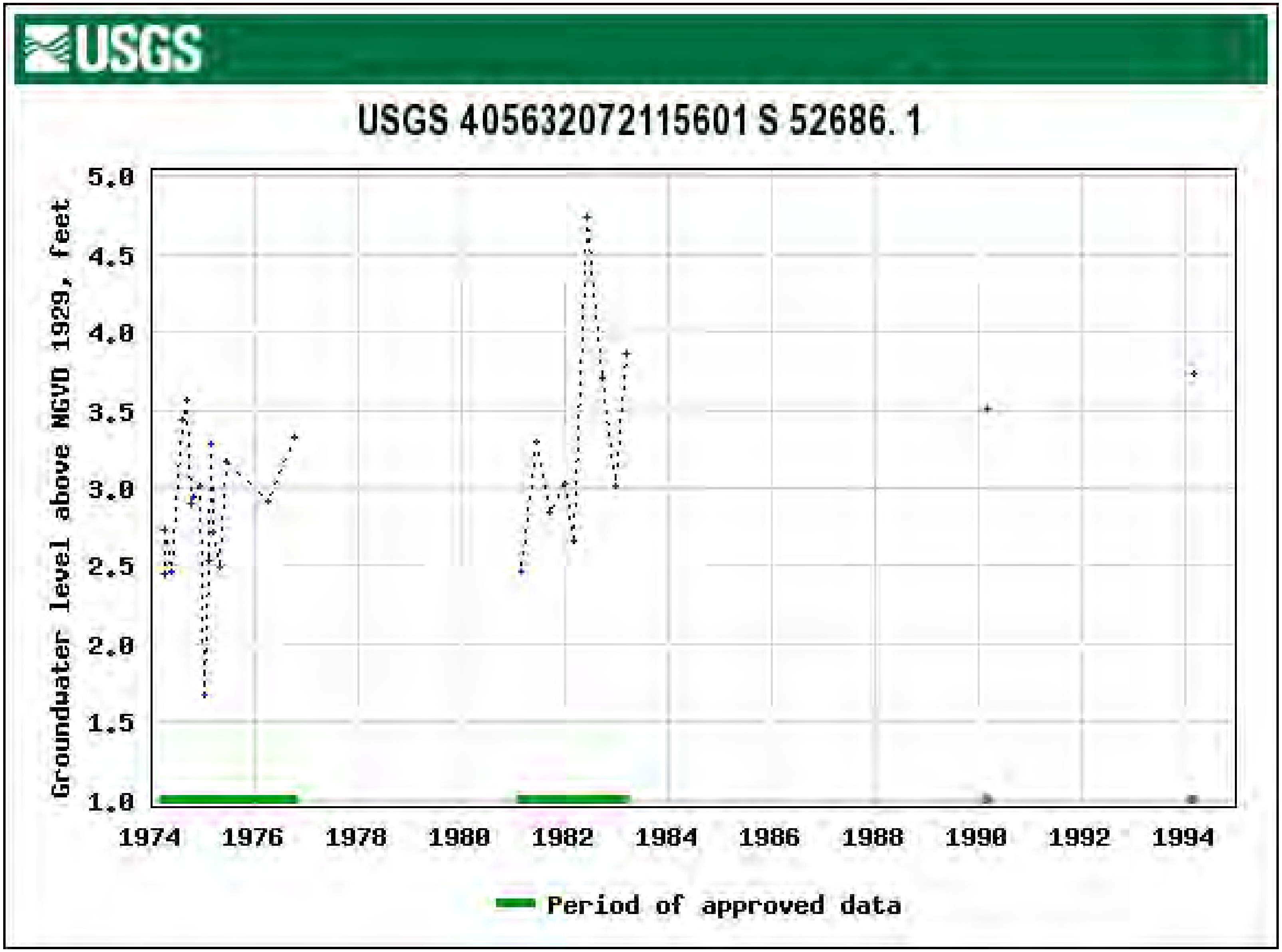
Well #10 Water Level Data



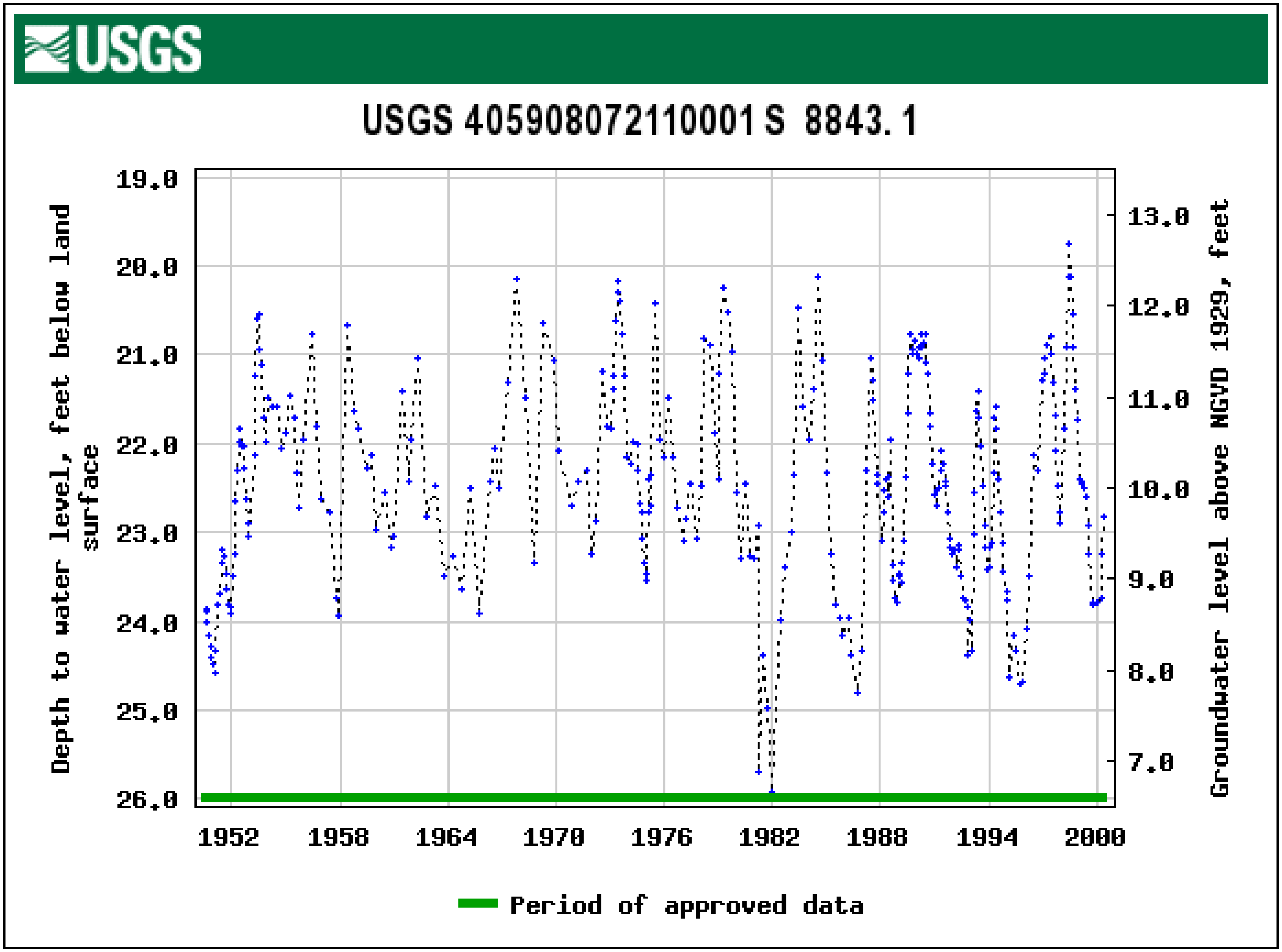
Well #11 Water Level Data



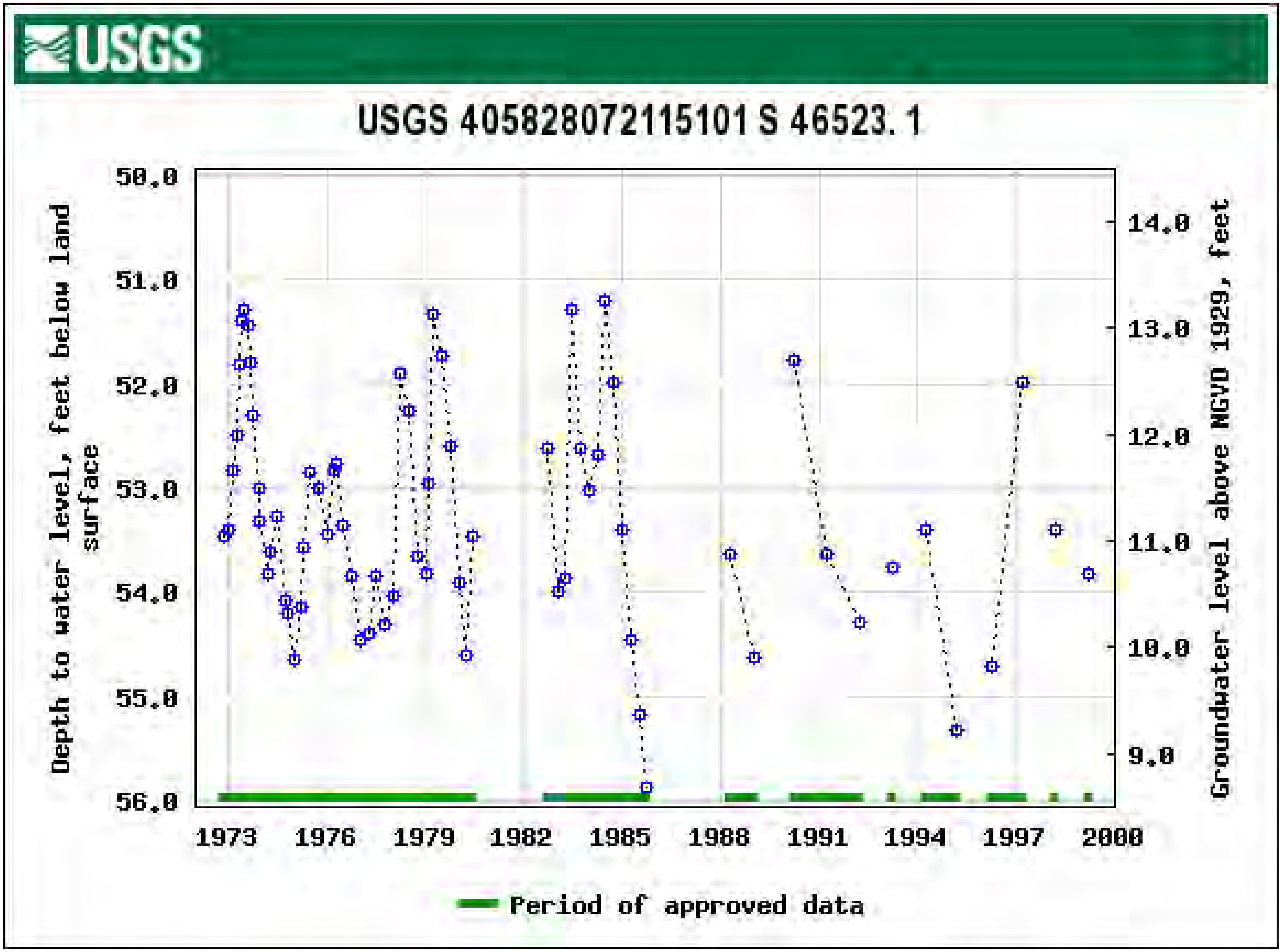
Well #20 Water Level Data



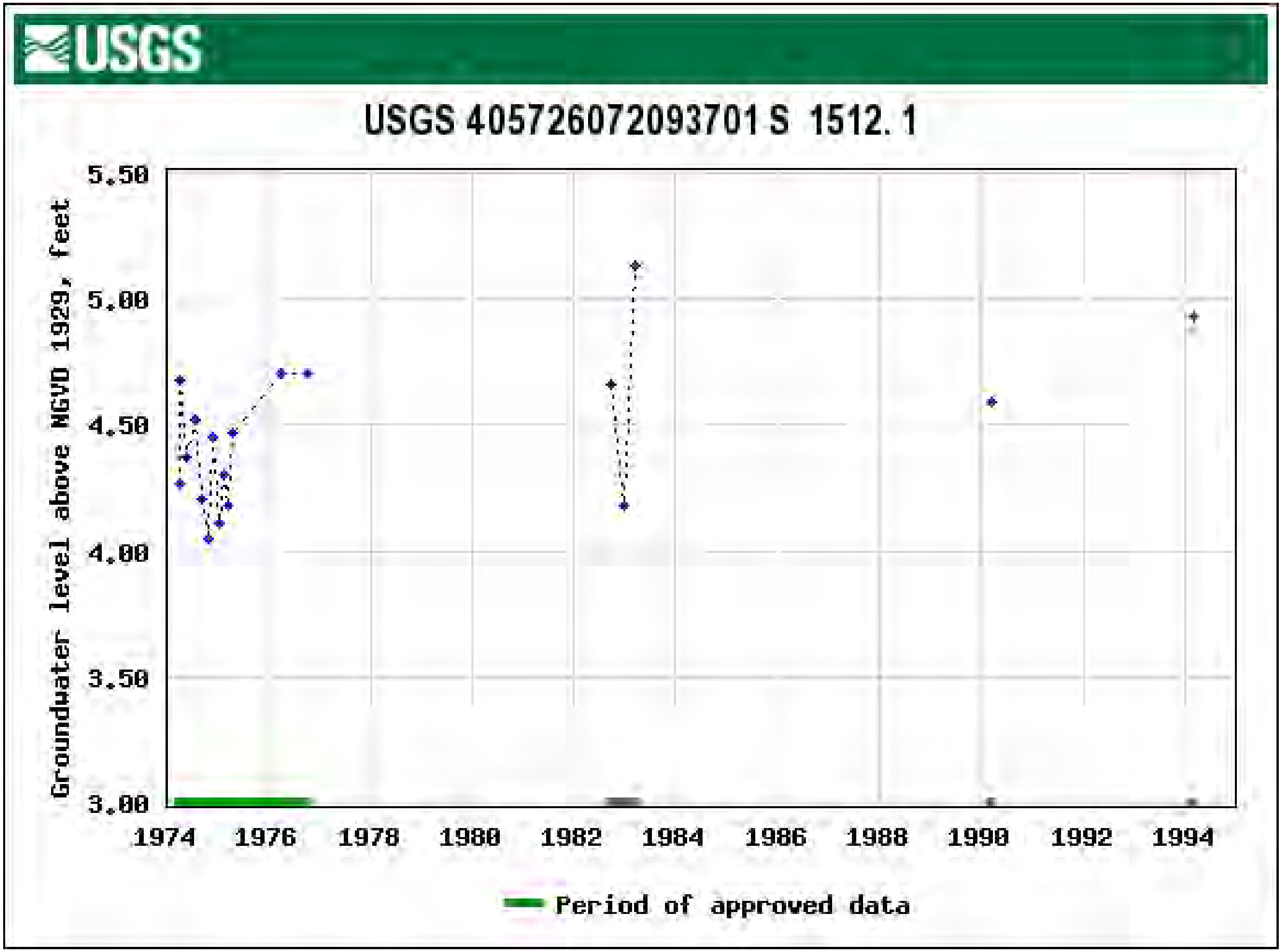
Well #23 Water Level Data



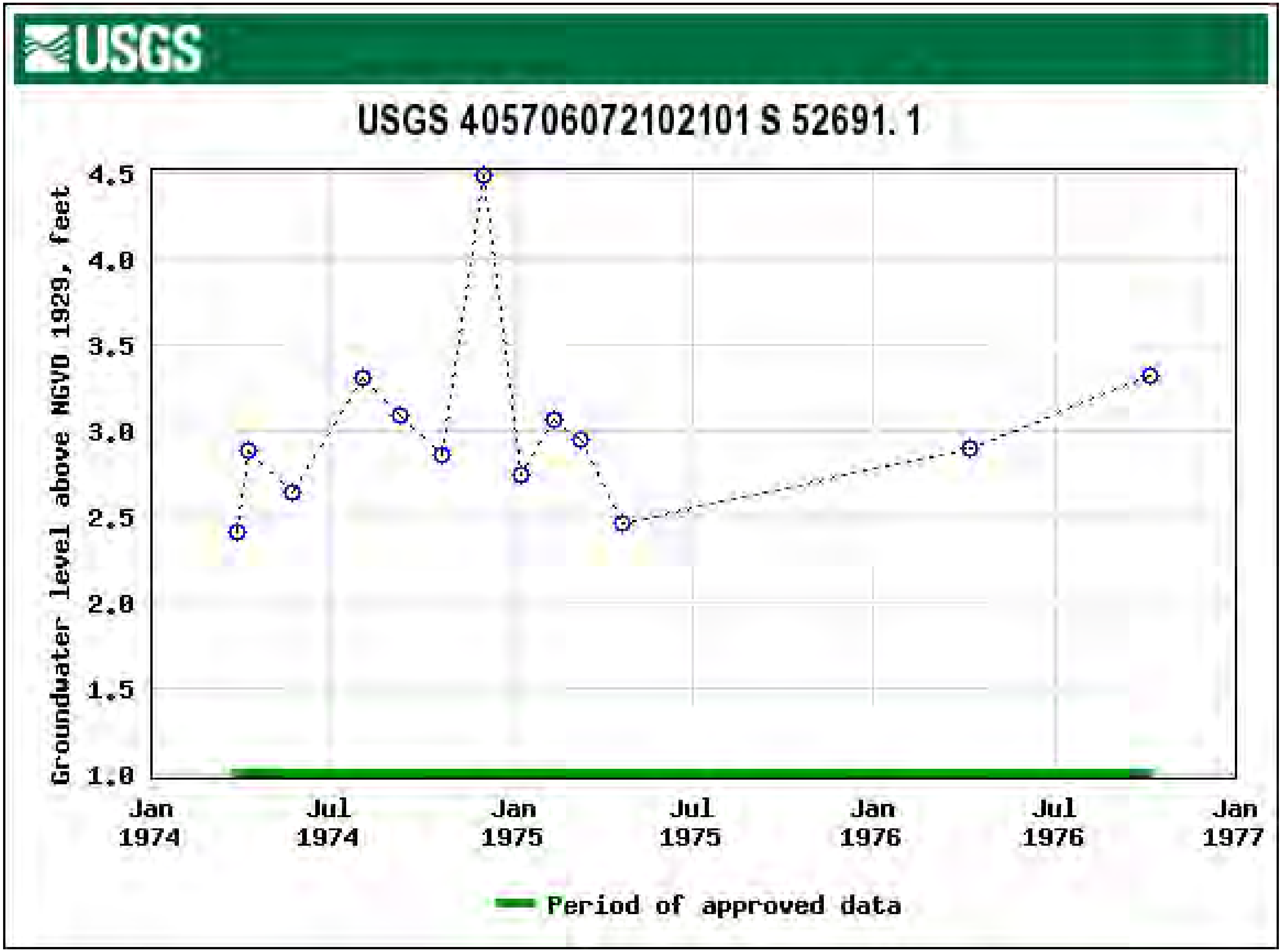
Well #24 Water Level Data



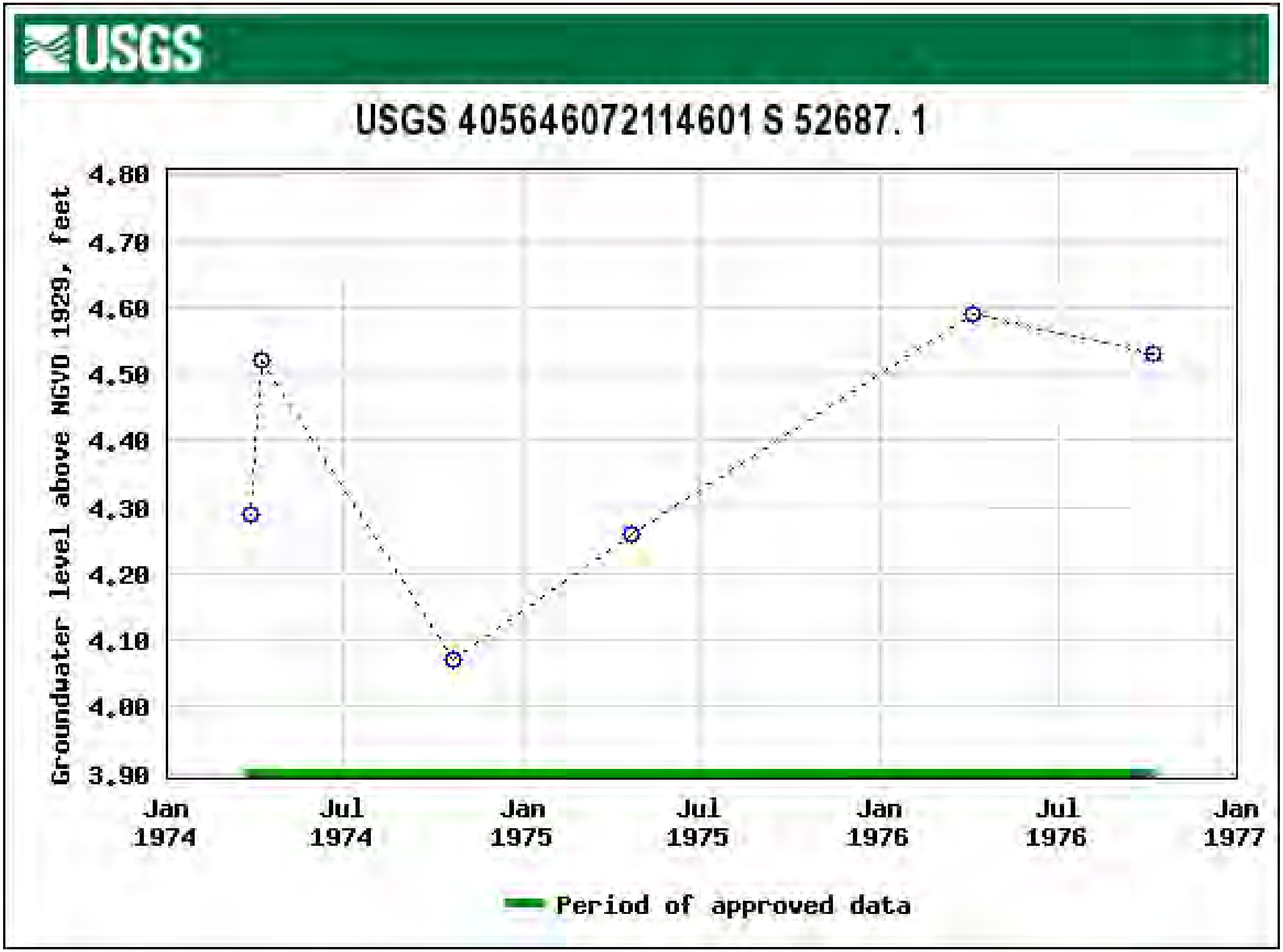
Well #25 Water Level Data



Well #26 Water Level Data



Well #27 Water Level Data



National Water Information System: Web Interface

USGS Water Resources

Data Category: Site Information ▼ Geographic Area: United States ▼ GO

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405908072110001 S 8843. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA ▼ GO

Well Site

DESCRIPTION:

Latitude 40°59'08",   Longitude 72°11'00"   NAD27
Suffolk County, New York   , Hydrologic Unit 02030202
Well depth: 25. feet
Land surface altitude: 32.5 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1950-07-28	2000-05-24	298

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?
Feedback on this web site
Automated retrievals

Title: NWIS Site Information for USA: Site Inventory
URL: http://waterdata.usgs.gov/nwis/inventory?

Page Contact Information: USGS Water Data Support Team
Page Last Modified: 2015-02-12 13:21:33 EST
0.42 0.41 vaww01

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category: Site Information
Geographic Area: United States
GO

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405906072110102 S 8843. 2

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:
Latitude 40°59'06", Longitude 72°11'01" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 35.0 feet
Hole depth: 35.0 feet
Land surface altitude: 32.5 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Daily Data			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Daily Statistics			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Monthly Statistics			
Elevation above NGVD 1929, feet	2001-08	2008-12	
Annual Statistics			

Elevation above NGVD 1929, feet	2001	2009	
Field groundwater-level measurements	2000-06-22	2015-01-16	163
Field/Lab water-quality samples	2003-09-25	2008-06-12	5
Water-Year Summary	2005	2008	4
Additional Data Sources	Begin Date	End Date	Count
Groundwater Watch **offsite**	2000	2015	2543

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

---

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

USGS 405840072114501 S 7570. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:

Latitude 40°58'39", Longitude 72°11'37" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 162. feet
Land surface altitude: 70.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1984-04-14	1985-03-27	2
Field/Lab water-quality samples	1963-06-10	1987-02-26	63

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?

USGS 405828072115101 S 46523. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA ▼ GO

Well Site

DESCRIPTION:

Latitude 40°58'28.7", Longitude 72°11'48.6" NAD83
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 97. feet
Land surface altitude: 64.5 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1972-11-20	1999-03-25	68

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405807072121001 S 48429. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:
Latitude 40°58'10.6", Longitude 72°12'09.5" NAD83
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 66. feet
Land surface altitude: 50.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1974-01-08	2009-05-27	78
Field/Lab water-quality samples	1973-08-07	1999-09-08	22
Additional Data Sources	Begin Date	End Date	Count
Annual Water-Data Report (pdf) **offsite**	2005	2009	5

OPERATION:
Record for this site is maintained by the USGS New York Water Science Center

Email questions about this site to New York Water Science Center Water-Data Inquiries

---

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

National Water Information System: Web Interface

USGS Water Resources

Data Category: Site Information
Geographic Area: United States
GO

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405756072104901 S 8837. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:
Latitude 40°57'56", Longitude 72°10'49" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 35. feet
Land surface altitude: 20.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1950-08-01	1994-03-10	109
Field/Lab water-quality samples	1974-04-10	1977-04-26	9

OPERATION:
Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405726072093701 S 1512. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA ▼ GO

Well Site

DESCRIPTION:
Latitude 40°57'26", Longitude 72°09'37" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 31. feet

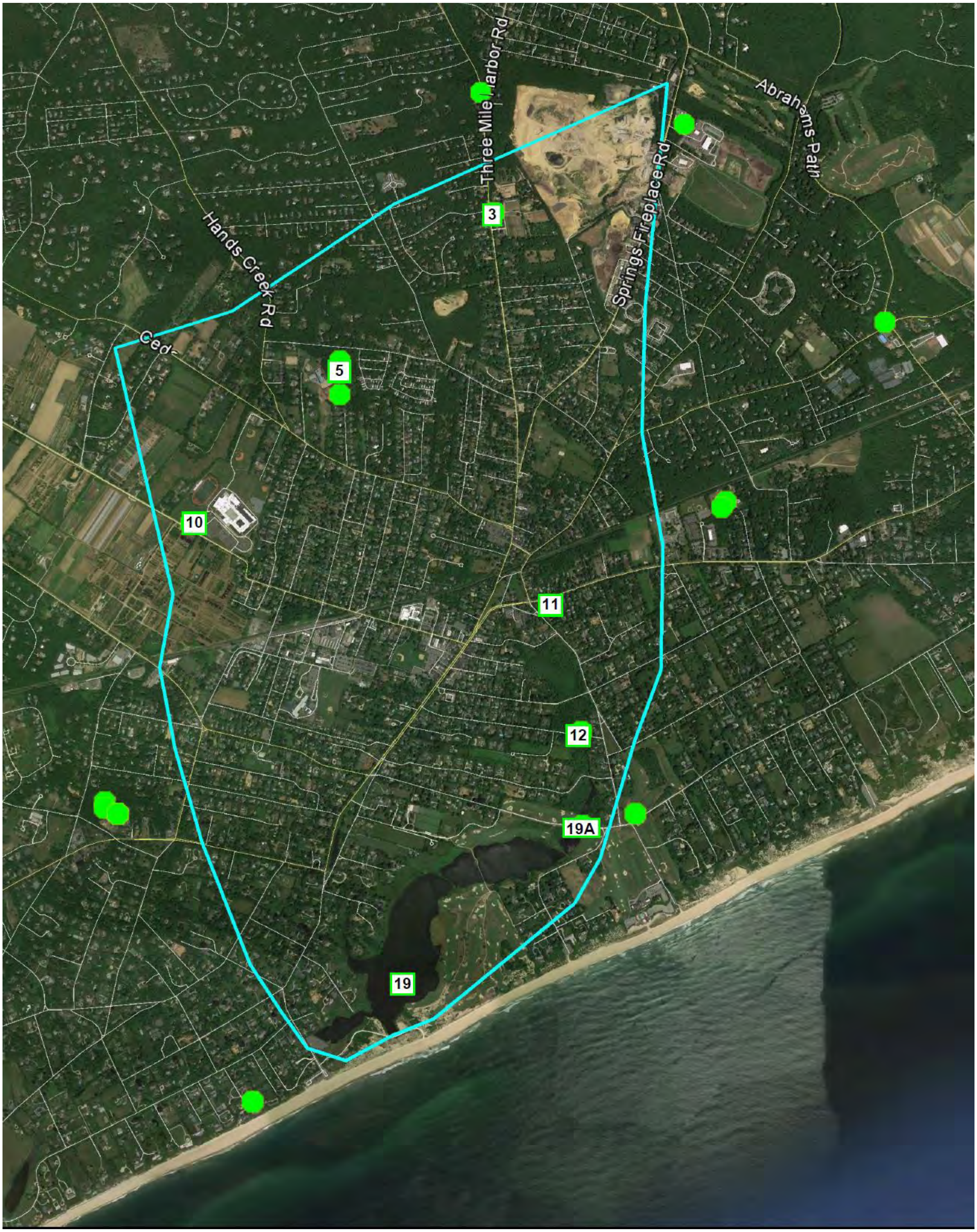
AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1974-03-29	1994-03-10	18

OPERATION:
Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes

APPENDIX D USGS GROUNDWATER QUALTIY DATA



Three Mile Harbor Rd
Abrahams Path
Springs Fireplace Rd
Hands Creek Rd
Ced
3
5
10
11
12
19A
19

USGS Groundwater & Tributary N & P Quality Data (mg/l)											
Project Well #	Site Name	NO_3 Min	NO_3 Max	NO_3 Avg	P Min	P Max	P Avg	Quality			
								From	To	# Years	Data Points
3	S 8843. 2	0.68	6.88	3.60	0.004	0.006	0.0048	9/25/2003	6/12/2008	4.7	5
5	S 7570. 1	0.00	3.30	1.66	0	0.1	0.0065	6/10/1963	2/26/1987	23.7	63
10	S 48429. 1	0.49	6.49	3.59	0	0.01	0.0067	8/7/1973	9/8/2008	35.1	22
11	S 8837. 1	0.87	2.30	1.63	0.01	0.04	0.0233	4/10/1974	4/26/1977	3.0	9
12	Hook Pond Tributary	1.40	4.79	3.22	0.03	0.05	0.04	2/27/1974	4/5/1995	21.1	13
19	Hook Pond At Beginning	0.02	1.95	0.60	0.017	0.13	0.0795	8/6/2001	7/11/2008	6.9	62

Groundwater Elevation Data

Project Well #	Site Number	Site Name	Min. (ft)	Max. (ft)	Range (ft)	Avg. (ft)	Well Surface Elev. feet above NGVD29	Well depth	Aquifer	Elevation From	Elevation To	Elevation # Years	Elevation Data Points
Within Hook Pond Watershed													
23	405908072110001	S 8843. 1	6.59	12.75	6.2	10	32.5	25	Glacial Aquifer, Upper	7/28/1950	5/24/2000	49.9	298
3	405906072110102	S 8843. 2	8.15	13.86	5.7	10.2	32.5	35		8/10/2001	12/1/2008	7.3	163
5	405840072114501	S 7570. 1	9.81	11.92	2.1	10.9	70	162		4/14/1984	3/27/1985	1.0	2
24	405828072115101	S 46523. 1	8.62	13.3	4.7	11.2	64.5	97		11/20/1972	3/25/1999	26.4	68
10	405807072121001	S 48429. 1	9.81	13.47	3.7	11.4	50	66		1/8/1974	5/27/2009	35.4	78
11	405756072104901	S 8837. 1	6.92	10.53	3.6	8.47	20	35		8/1/1950	3/10/1994	43.6	109
25	405726072093701	S 1512. 1	4.05	5.13	1.1	4.47		31		3/29/1974	3/10/1994	20.0	18
Outside Hook Pond Watershed													
26	405706072102101	S 52691. 1	2.41	4.49	2.1	3.01		46	Glacial Aquifer, Upper	3/29/1974	10/6/1976	2.5	13
27	405646072114601	S 52687. 1	4.07	4.59	0.5	4.38		33		3/28/1974	10/6/1976	2.5	6
20	405632072115601	S 52686. 1	1.68	4.73	3.1	3.05		45		3/28/1974	3/10/1994	20.0	27

Well #1 Water Quality

Site #	Date	TEMP	DO	Sp. Cond.	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
				µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405928072110401	8/7/1973			277	6.1	16	0.33	0.022	15	0.51		0.013		
405928072110401	4/18/1974	13		260	5.9	7	1.72	0.06	10.7	1.6	< 0.010	0.01		
405928072110401	10/31/1974	14		136		13								
405928072110401	11/4/1974	14		133	6.2	11		0	2.1					
405928072110401	1/27/1975	12	0.8	170		18	0	0.01	2.6			0		
405928072110401	5/2/1975	11		290		16		0.01	3.4					
405928072110401	7/25/1975	12	0.8	185		14	0.2	0.02	3.5			0		
405928072110401	11/6/1975	14	1.5	200		17	0	0	5.2			0		
405928072110401	1/30/1976	13.5	1.5	245		15	0.32	0.01	4			0		
405928072110401	4/6/1976	12	2.3	270		20								
405928072110401	10/4/1976	13	2.4	220		16	0.02	0.01	1.3	0	0.01		32	
405928072110401	4/25/1977	10.5	2.2	135		13	0.04	0.01	0.99	0	0.02		32	
405928072110401	2/22/1979	14	0.7	279		13	0.38	0.008	3.3			0		
405928072110401	11/5/1979	14	0.4	220		16	3	0.006	4			0		
405928072110401	3/18/1980	12	1.2	167		15	0.23	0.004	2.9			0		
405928072110401	4/22/1981	12	1	215		14	0.14	0.004	0.14					
405928072110401	6/9/1981													
405928072110401	8/4/1981	13	0.8	375		20	0.06							
405928072110401	9/30/1981	12	0.3	175		13	0.13	0.003	0.87					
405928072110401	5/27/1982	11	0.8	380			0.02		0.5					
405928072110401	9/8/1982	13	1.7	286		13	0.53		2.3					
405928072110401	4/3/1984	12	0.8	280		14	1.4	0.002	12					
	Min	**10.5**	**0.3**	**133**	**5.9**	**7**	**0**	**0**	**0.14**	**0**	**0.01**	**0**	**32**	
	Max	**14**	**2.4**	**380**	**6.2**	**20**	**3**	**0.06**	**15**	**1.6**	**0.02**	**0.013**	**32**	
	Avg	**12.6**	**1.2**	**233.2**	**6.07**	**14.7**	**0.5012**	**0.0112**	**4.156**	**0.528**	**0.015**	**0.00255556**	**32**	

Well #2 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
		(°C)	μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405922072101601	**9/25/2003**	16.8	1500	4.5										

Well #3 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405906072110102	9/25/2003	13.1	388											
405906072110102	6/13/2005	11.9	272	5.5	5.7		0.04	0.008	0.682			0.006		
405906072110102	6/14/2006	12	273	3.2	5.6		0.079	0.002	5.03			0.004		20.68
405906072110102	6/18/2007	12.3	214	4.1	6.1		0.02	0.002	1.8			0.004		20.51
405906072110102	6/12/2008	12.9	286	3.5	6.1		0.02	0.002	6.88			0.005		23.35
405928072110401	5/2/1975	11	290											
405928072110401	7/25/1975	12	185	0.8										
405928072110401	11/6/1975	14	200	1.5										
405928072110401	1/30/1976	13.5	245	1.5										
405928072110401	4/6/1976	12	270	2.3										
405928072110401	10/4/1976	13	220	2.4										
405928072110401	4/25/1977	10.5	135	2.2										
405928072110401	2/22/1979	14	279	0.7										
405928072110401	11/5/1979	14	220	0.4										
405928072110401	3/18/1980	12	167	1.2										
405928072110401	4/22/1981	12	215	1										
405928072110401	6/9/1981													
405928072110401	8/4/1981	13	375	0.8										
405928072110401	9/30/1981	12	175	0.3										
405928072110401	5/27/1982	11	380	0.8										
405928072110401	9/8/1982	13	286	1.7										
405928072110401	4/3/1984	12	280	0.8										
	Min	**10.5**	**135**	**0.3**	**5.6**		**0.02**	**0.002**	**0.682**			**0.004**		**20.51**
	Max	**14**	**388**	**5.5**	**6.1**		**0.079**	**0.008**	**6.88**			**0.006**		**23.35**
	Avg	**12.4**	**255**	**1.8**	**5.875**		**0.0398**	**0.0035**	**3.598**			**0.00475**		**21.5**

Well #4 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405846072093001	10/10/1973	11.5	74			7		0.003	0.11	0.05		0.002	64	41
405846072093001	4/10/1974	10	98			5	0.02	0.01	0.22	0.07	0			
405846072093001	4/10/1974	10	95			6	0	0	0.2			0		
405846072093001	9/24/1974	11	79			8	0.2	0	0.15			0		
405846072093001	10/25/1974	12	79			6		0	0.09					
405846072093001	4/22/1975	11	69	9.2		4		0	0.26					
405846072093001	8/6/1975	11	54	7		12	0	0	0.28			0		
405846072093001	4/7/1976	11	255			11								39.44
405846072093001	10/6/1976	12.5	70	9.5		15	0.05	0	0.23	0.03	0.01			40.76
405846072093001	4/27/1977	11	295	4.9		19	0.09	0.01	0.97	0.22	0.02			40.55
405846072093001	2/23/1979	10	240	8.4		10	0.05	0.002	0.14			0.004		39.07
405846072093001	3/1/1979	8	147	11.2		11	0.04	0.002	0.08			0.008		38.82
405846072093001	11/1/1979	11	108	8		22	0.07	0.002	0.05			0		40.11
405846072093001	3/18/1980	11	102	7.5		20	0.05	0.002	0.04			0.003		42.42
405846072093001	4/27/1981	11	118	8		16	0.08	0.002	0.11					42.38
405846072093001	6/10/1981													
405846072093001	6/24/1981	11	99	8.5		18	0.07	0.002	0.08					42.31
405846072093001	8/4/1981	13	122	5.9		35	0							42.36
405846072093001	9/14/1982	11	73	8.2		15	0		0					39.12
405846072093001	4/3/1984	12	81	9.2		21	0.06	0.003	0.07					39.55
405846072093001	6/13/2005	11.6	83		5.5		0	0	0.144			0		
405846072093001	6/14/2006	11.7	69		5.9		0.008	0	0.246			0.006		47.35
405846072093001	6/21/2007	12	78		6.3		0	0	0.871			0.005		38.51
405846072093001	6/10/2008	12.3	182	7.7	5.7		0	0	1.07			0.005		32.65
	Min	**8**	**54**	**4.9**	**5.5**	**4**	**0**	**0**	**0**	**0.03**	**0**	**0**	**64**	**32.65**
	Max	**13**	**295**	**11.2**	**6.3**	**35**	**0.2**	**0.01**	**1.07**	**0.22**	**0.02**	**0.008**	**64**	**47.35**
	Avg	**11.16**	**116.087**	**8.09**	**5.85**	**13.7**	**0.0415**	**0.0019**	**0.2577**	**0.093**	**0.01**	**0.00275**	**64**	**40.4**

Well #5 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405840072114501	1/6/1969		80			20								
405840072114501	8/28/1972		102			8	0	0	0					
405840072114501	12/11/1972		100			10	0	0	1.28					
405840072114501	3/19/1973		98			10	0	0	1.32					
405840072114501	8/9/1973		102			10	0	0	1.04					
405840072114501	12/10/1973		100			10	0	0	1.08					
405840072114501	3/25/1974		108			11	0	0	1.46					
405840072114501	7/22/1974		107			8	0	0.01	1.05					
405840072114501	12/11/1974		104			13	0	0	1.16					
405840072114501	4/9/1975		112			12	0	0	1.54					
405840072114501	12/16/1975		108			11	0	0	1.02					
405840072114501	4/14/1976		112			14	0.03	0	1.59					
405840072114501	3/28/1978		126			12	0	0.01	1.48					
405840072114501	9/17/1979				6.4		0	0	1.62		0			
405840072114501	1/21/1980				6.2		0	0	1.63		0			
405840072114501	6/9/1980				6.1		0	0	1.68		0			
405840072114501	10/16/1980				6.1		0	0	1.62		0			
405840072114501	3/4/1981				6.1		0	0	1.74		0	0		
405840072114501	8/17/1981				6		0	0	1.83		0			
405840072114501	2/16/1982				5.4		0	0	1.8		0			
405840072114501	3/28/1982				6		0	0.01	1.48		0			
405840072114501	5/24/1982				6		0	0	1.9		0			
405840072114501	8/26/1982				6		0	0	2.14		0			
405840072114501	11/27/1982				6.6		0	0	2.08		0			
405840072114501	2/23/1983				5.8		0	0	2.09		0			
405840072114501	6/27/1983				5.9		0	0	2.42		0			
405840072114501	10/16/1983				6		0	0	2.11		0.1	0.1		
405840072114501	2/28/1984				6		0	0	2.19		0			
405840072114501	6/25/1984				5.9		0	0	2.43		0			
405840072114501	2/26/1987	11	154	10	6.6	10	0	0.001	3.3	0.8	0.01	0.005		
	Min	**11**	**80**	**10**	**5.4**	**8**	**0**	**0**	**0**	**0.8**	**0**	**0**		
	Max	**11**	**154**	**10**	**6.6**	**20**	**0.03**	**0.01**	**3.3**	**0.8**	**0.1**	**0.1**		
	Avg	**11**	**108.0714**	**10**	**6.06**	**11.4**	**0.001**	**0.0011**	**1.6579**	**0.8**	**0.0065**	**0.035**		

Well #6 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405838072114201	4/23/1972					17		0	0					
405838072114201	8/28/1972					11		0	0					
405838072114201	3/19/1973					11		0	0					
405838072114201	8/9/1973					8	0	0	0					
405838072114201	12/10/1973					10	0	0	0					
405838072114201	3/25/1974					12	0	0	0					
405838072114201	7/22/1974					9	0	0	0					
405838072114201	4/9/1975					11	0	0	0					
405838072114201	12/11/1975					10	0	0	0					
405838072114201	4/14/1976					14	0.02	0	0.01					
405838072114201	3/28/1978					11	0	0	0					
405838072114201	9/17/1979		6		6		0	0	0.02		0			
405838072114201	1/21/1980		6.3		6.3		0	0	0		0.31			
405838072114201	6/9/1980		6.3		6.3		0	0	0		0			
405838072114201	11/29/1982		6.2		6.2		0	0	0		1.25	0.6		
405838072114201	3/1/1983		5.8		5.8		0	0	0		1.34	1.09		
405838072114201	6/27/1983		5.9		5.9		0	0	0		0			
405838072114201	10/12/1983		6		6		0	0	0		1.98	1.23		
405838072114201	2/27/1984		6.1		6.1		0	0	0		0.29	0.14		
405838072114201	6/26/1984		5.8		5.8		0	0	0		0.19	0.15		
405838072114201	2/18/1985		6.2		6.2		0	0	0		0.66	0.55		
405838072114201	6/4/1985		6		6		0	0	0		0.95	0.74		
	Min		**5.8**		**5.8**	**8**	**0**	**0**	**0**		**0**	**0.14**		
	Max		**6.3**		**6.3**	**17**	**0.02**	**0**	**0.02**		**1.98**	**1.23**		
	Avg		**6.055**		**6.05**	**11.3**	**0.0011**	**0**	**0.0014**		**0.6336**	**0.643**		

Well #7 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405833072113701	2/27/1987	11	86.2	9	6.6	16	0	0	1.8	0.5	0.04	0.01		

Well #8 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405814072100801	10/16/1983				6.8		0	0	2.39		0.1	0.1		
405814072100801	2/27/1984				6.8		0	0	2.47		0.16	0.16		
405814072100801	6/25/1984				6.6		0	0	2.37		0.12	0.08		
405814072100801	2/19/1985				6.9		0	0	2.52		0.15	0.14		
405814072100801	5/31/1985				6.4		0	0	2.37		0			
	Min				**6.4**		**0**	**0**	**2.37**		**0**	**0.08**		
	Max				**6.9**		**0**	**0**	**2.52**		**0.16**	**0.16**		
	Avg				**6.7**		**0**	**0**	**2.424**		**0.106**	**0.12**		

Well #9 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405806072095401	4/23/1972		104				0	0	0.78					
405806072095401	4/24/1972		104				0	0	0.08					
405806072095401	8/28/1972		107				0	0	1.12					
405806072095401	12/11/1972		128				0	0	1.12				125	
405806072095401	3/19/1973		112				0	0	1.28					
405806072095401	8/9/1973		116				0	0	0.4				125	
405806072095401	12/10/1973		104				0	0	0.98				125	
405806072095401	3/25/1974		123				0	0	1.5				125	
405806072095401	7/22/1974		112				0	0	0.62				125	
405806072095401	12/9/1974		93				0	0	0.64				125	
405806072095401	4/2/1975		114				0	0	1.12				125	
405806072095401	12/12/1975		120				0	0.01	1.18				125	
405806072095401	3/29/1976		112				0.03	0	1.34				125	
405806072095401	9/17/1979				6.1		0	0	0.93		0			
405806072095401	1/21/1980				6.3		0	0	1.06		0			
405806072095401	6/9/1980				6.2		0	0	0.99		0			
405806072095401	10/15/1980				5.9		0	0	0.98		0			
405806072095401	3/4/1981				6		0.01	0	1.13		0			
405806072095401	8/17/1981				6		0.97	0	1.17		0			
405806072095401	3/17/1982				5.7		0	0	1.22		0			
405806072095401	7/12/1982				5.8		0	0	1.27		0			
405806072095401	8/24/1982				5.8		0	0	1.02		0			
405806072095401	11/27/1982				6.2		0	0	1.08		0			
405806072095401	2/28/1983				6.2		0	0	1.33		0			
405806072095401	10/18/1983				6		0	0	0.73		0			
405806072095401	2/27/1984				5.8		0	0	0.68		0			
405806072095401	6/26/1984				5.8		0	0	0.64		0			
405806072095401	2/18/1985				6.3		0	0	0.77		0			
405806072095401	6/1/1985				5.8		0	0	0.64		0			
	Min		**93**		**5.7**		**0**	**0**	**0.08**		**0**		**125**	
	Max		**128**		**6.3**		**0.97**	**0.01**	**1.5**		**0**		**125**	
	Avg		**111.4615**		**5.99**		**0.0348**	**0.0003**	**0.9586**		**0**		**125**	

Well #10 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405807072121001	8/7/1973		392											
405807072121001	8/7/1973	11	392	7.3	6.3	16	0.01	0.01	6.49	0.06		0	66	42
405807072121001	4/10/1974	10	350			15	0.07	0.01	5	0.04	0.01		65.5	
405807072121001	4/10/1974	10	350				0.01						65	
405807072121001	9/25/1974	11	250			22	0.3	0	5.2			0		
405807072121001	10/25/1974	11	350			20		0.01	4.8					
405807072121001	1/28/1975	10.5	390	8.6		25	0	0	4.95			0		
405807072121001	4/23/1975	12	430	9		27		0.01	3.8					
405807072121001	8/6/1975	11.5	410	8.2		27	0	0	0.67			0		
405807072121001	11/5/1975	11.5	380	9.1		25	0	0	5.2			0		
405807072121001	2/10/1976	10.5	375	9.4		25	0	0	4.2			0		
405807072121001	4/6/1976	11.5	370			23								40.46
405807072121001	10/6/1976	11.5	375			25	0.02	0	3.7	0.08	0.01	0.01	66	41.66
405807072121001	4/27/1977	11.5	385	8.4		26	0.01	0	2.7	0.1	0	0	66	41.8
405807072121001	3/16/1979	11	360	9.6		45	0.06	0.003	3			0.002		39.23
405807072121001	11/7/1979	12	330	10.6		23	0.04	0.002	4.3			0		40.64
405807072121001	4/28/1981	11	118	2.7		23	0.49	0.025	0.49					43.57
405807072121001	8/4/1981	12.5	118	5.6		18	0							43.78
405807072121001	9/14/1982	11	104	6.7		21	0.09		0.8					40.16
405807072121001	4/4/1984	12	115	9.4		19	0		2.2					39.98
	Min	**10**	**104**	**2.7**	**6.3**	**15**	**0**	**0**	**0.49**	**0.04**	**0**	**0**	**65**	**39.23**
	Max	**12.5**	**430**	**10.6**	**6.3**	**45**	**0.49**	**0.025**	**6.49**	**0.1**	**0.01**	**0.01**	**66**	**43.78**
	Avg	**11.21**	**317.2**	**8.05**	**6.3**	**23.6**	**0.0688**	**0.005**	**3.5938**	**0.07**	**0.0067**	**0.0012**	**65.7**	**41.328**

Well #11 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405756072104901	4/10/1974	10	387		5.3	40	2.8	0.01	2.3	3.1	0.01		35	
405756072104901	10/22/1974	13	410		5.8	40		0	2.3					
405756072104901	1/27/1975	13	405	1.1	6.1	43	2	0	0.98	3.2	0.01	0.01		
405756072104901	1/27/1975	13	430	1.2	6.0	42	3.3	0.02	1.9	3.1	0.04	0.01		
405756072104901	1/27/1975	13	425	1.2	6.1	42	1.4	0	0.87	3	0.01	0.01		
405756072104901	4/22/1975	12	411		6.1	45		0.01	1.3					
405756072104901	4/6/1976	11	425	2.2	6.4	33								
405756072104901	10/4/1976	12	450	0.3	6.3	53	2.7	0.01	1.9	2.5	0.03	0.01		7.79
405756072104901	4/26/1977	10	345	1.6	6.2	52	3.2	0.01	1.5	3.7	0.04	0.01		7.95
	Min	**10**	**345**	**0.3**	**5.3**	**33**	**1.4**	**0**	**0.87**	**2.5**	**0.01**	**0.01**	**35**	**7.79**
	Max	**13**	**450**	**2.2**	**6.4**	**53**	**3.3**	**0.02**	**2.3**	**3.7**	**0.04**	**0.01**	**35**	**7.95**
	Avg	**11.89**	**409.8**	**1.27**	**6.03**	**43.3**	**2.6**	**0.0075**	**1.6313**	**3.1**	**0.02**	**0.01**	**35**	**7.87**

Well #12 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
1304693	2/27/1974	6	150		6.3		0.48	0.014	4.79			0		
1304693	4/19/1974	10	200		6.4	19	0.21	0.06	3.4	0.57	0.03			
1304693	8/13/1974				6.8		0.4	0.016	3.9			0.02		
1304693	10/22/1974	8	225		7.4	22		0.03	3.7					
1304693	1/16/1975	4	242				0	0.007	2.08					
1304693	4/22/1975	13	218		6.3	20		0.01	1.4					
1304693	8/27/1975	16	239				0.23	0.024	3.5			0.02		
1304693	1/20/1976	5			6.4		0.33	0.007	3.5			0		
1304693	3/8/1976	10	240		6.5		0.36	0.013	3.6			0.01		
1304693	4/6/1976	15	222	8.3	6.4	22								
1304693	10/5/1976	12	210	5.4	6.4	25	0.23	0.03	2.3	0.25	0.05	0.02		
	Min	**4**	**150**	**5.4**	**6.3**	**19**	**0**	**0.007**	**1.4**	**0.25**	**0.03**	**0**		
	Max	**16**	**242**	**8.3**	**7.4**	**25**	**0.48**	**0.06**	**4.79**	**0.57**	**0.05**	**0.02**		
	Avg	**9.9**	**216.2222**	**6.85**	**6.54**	**21.6**	**0.28**	**0.0211**	**3.217**	**0.41**	**0.04**	**0.01166667**		

Well #13 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405721072123001	7/6/1965				6.7	20								
405721072123001	10/4/1965				6.1	34								
405721072123001	1/3/1966				5.9	16								
405721072123001	4/4/1966				6	24								
405721072123001	7/6/1966				5.9	24								
405721072123001	10/3/1966				6	24								
405721072123001	1/3/1967				6.3	26								
405721072123001	4/3/1967				5.5	34								
405721072123001	7/3/1967				5.8	18								
405721072123001	10/2/1967				5.6	18								
405721072123001	4/1/1968				6.1	22								
405721072123001	7/2/1968				5.9	20								
405721072123001	10/8/1968				6	16								
405721072123001	1/6/1969				6	22								
405721072123001	4/8/1969				6.2	14								
405721072123001	7/8/1969				6.2	15								
405721072123001	10/7/1969				6	14								
405721072123001	1/11/1970				5.6	10								
405721072123001	1/13/1970				6	13								
405721072123001	4/14/1970				5.7	10								
405721072123001	7/13/1970				5.7	15								
405721072123001	10/23/1970				5.8	10								
405721072123001	11/9/1970				5.9									
405721072123001	4/19/1971				5.8	15								
405721072123001	6/7/1971				6.1									
405721072123001	7/12/1971				5.9	18								
405721072123001	10/12/1971				5.6	10								
405721072123001	4/23/1972		116		5.9	13	0	0	0.8					
405721072123001	8/28/1972		96		5.8	6	0	0	0.32					
405721072123001	3/19/1973		87		5.8	10	0	0	0.28					
405721072123001	8/9/1973		98		5.9	10	0	0	0.16					
405721072123001	12/10/1973		95		5.7	10	0	0	0					
405721072123001	3/26/1974		103		5.9	8	0	0	0.5					
405721072123001	8/5/1974		114		6.3	10	0	0.16	1.24					
405721072123001	12/11/1974		150		7	30	0	0	2.04					
405721072123001	4/3/1975		160		6.4	24	0	0	1.54					
405721072123001	12/9/1975		155		6.4	20	0	0.01	2.52					
405721072123001	3/22/1976		121		6.4	12	0	0	0.66					
405721072123001	9/17/1979				5.8		0	0	3.66		0			
405721072123001	1/22/1980				6.1		0	0	3.27		0			
405721072123001	6/10/1980				6		0	0	3.79		0			
405721072123001	10/20/1980				6		0	0	4.08		0			
405721072123001	3/4/1981				5.7		0	0	4.76		0			
405721072123001	8/12/1981				5.6		0.08	0	4.75		0			
405721072123001	1/20/1982								5.96					
405721072123001	2/11/1982								5.59					
405721072123001	2/17/1982				5.4		0	0	5.41		0			
405721072123001	3/11/1982								5.27					
405721072123001	4/16/1982								4.88					
405721072123001	5/24/1982				6		0	0	4.96		0			
405721072123001	6/10/1982								4.18					
405721072123001	7/14/1982								4.42					
405721072123001	8/5/1982								4.51					
405721072123001	8/28/1982				5.8		0	0	4.75		0			
405721072123001	9/9/1982								4.77					
405721072123001	11/30/1982				5.9		0	0	4.6		0			
405721072123001	2/28/1983				5.6		0	0	4.83		0			
405721072123001	6/27/1983				5.8		0	0	5.15		0			
405721072123001	10/16/1983				5.7		0	0	3.27		0			
405721072123001	2/27/1984				5.9		0	0	4.76		0			
405721072123001	10/9/1991	11		10.2	5.6									
405721072123001	10/21/1991	11		9.6	5.5									
	Min	**11**	**87**	**9.6**	**5.4**	**6**	**0**	**0**	**0**		**0**			
	Max	**11**	**160**	**10.2**	**7**	**34**	**0.08**	**0.16**	**5.96**		**0**			
	Avg	**11**	**117.7273**	**9.9**	**5.93**	**17.1**	**0.0032**	**0.0068**	**3.3842**		**0**			

Well #14 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405719072122802	12/11/1972		80		5.9	9	0	0	0.8					
405719072122802	8/9/1973		128		5.7	10	0	0	1.36					
405719072122802	12/10/1973		110		5.5	10	0	0	1.28					
405719072122802	3/26/1974		87		5.9	9	0	0	0.89					
405719072122802	7/22/1974		130		6	9	0	0	2.2					
405719072122802	4/2/1975		140		6.4	10	0	0	2.54					
405719072122802	12/9/1975		147		6	10	0	0.01	1.68					
405719072122802	3/22/1976		152		6.1	17	0	0	1.44					
405719072122802	11/22/1977		134		6.2	14	0	0	3.55					
405719072122802	1/30/1979		118		6.3	15	0	0	1.72					
405719072122802	9/17/1979				5.7		0	0	4.34		0			
405719072122802	1/22/1980				6		0	0	4.73		0			
405719072122802	6/9/1980				5.8		0	0	4.68		0			
405719072122802	10/20/1980				6		0	0	5.64		0			
	Min		**80**		**5.5**	**9**	**0**	**0**	**0.8**		**0**			
	Max		**152**		**6.4**	**17**	**0**	**0.01**	**5.64**		**0**			
	Avg		**122.6**		**5.96**	**11.3**	**0**	**0.0007**	**2.6321**		**0**			

Well #15 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
405720072103001	12/8/1999													
405720072103001	8/29/2000	12.2	221											
405720072103001	8/28/2003	12.9	224	6.4	7.3		0	0	5.85	0.09	0	0		
405720072103001	9/8/2003	13.5	222	5.9										
405720072103001	7/26/2004	12.8	226	5.3	6.2		0	0	5.65	0.08	0	0		
	Min	**12.2**	**221**	**5.3**	**6.2**		**0**	**0**	**5.65**	**0.08**	**0**	**0**		
	Max	**13.5**	**226**	**6.4**	**7.3**		**0**	**0**	**5.85**	**0.09**	**0**	**0**		
	Avg	**12.85**	**223.25**	**5.87**	**6.75**		**0**	**0**	**5.75**	**0.085**	**0**	**0**		

Well #16 Water Quality

0	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405720072122701	6/11/1963				5.9	20								
405720072122701	12/9/1963				6.5	15								
405720072122701	3/2/1964				6.1	20								
405720072122701	6/1/1964				6.1	16								
405720072122701	10/5/1964				6.4	12								
405720072122701	1/4/1965				6.6	30								
405720072122701	4/5/1965				6.2	18								
405720072122701	7/6/1965				6.6	22								
405720072122701	10/4/1965				6.5	40								
405720072122701	1/3/1966		6			16								
405720072122701	4/4/1966				6	14								
405720072122701	7/6/1966				5.9	18								
405720072122701	10/4/1966		128		6.3	24								
405720072122701	1/4/1967				6.8	46								
405720072122701	4/3/1967				5.9	30								
405720072122701	7/3/1967				6.1	50								
405720072122701	10/2/1967				5.8	22								
405720072122701	1/2/1968				6.5	36								
405720072122701	4/1/1968		6			48								
405720072122701	7/2/1968				5.8	26								
405720072122701	10/8/1968		6			30								
405720072122701	1/6/1969		88		5.9	18								
405720072122701	4/8/1969				6	16								
405720072122701	7/8/1969				6	26								
405720072122701	10/7/1969				6.1	24								
405720072122701	1/13/1970				6	11								
405720072122701	4/14/1970				5.6	16								
405720072122701	7/13/1970				5.8	20								
405720072122701	10/23/1970				5.6	10								
405720072122701	1/11/1971				5.9	12								
405720072122701	7/12/1971				6.1	17								
405720072122701	10/12/1971				5.8	22								
405720072122701	4/23/1972		142		5.8	10	0	0	1.8					
405720072122701	8/28/1972		150		5.6	10	0							
405720072122701	12/11/1972		150		6.1	13	0	0	2.64					
405720072122701	3/19/1973		150		5.5	13	0	0	2.72					
405720072122701	8/9/1973		152		5.7	12	0	0	2.28					
405720072122701	12/12/1973		190		5.8	20	0	0	4.96					
405720072122701	3/26/1974		178		6	17	0	0	4.3					
405720072122701	7/24/1974		158		6	9	0	0	3.56					
405720072122701	12/12/1974		112		6.3	12	0	0	1.82					
405720072122701	4/2/1975		142		5.9	9	0	0	3					
405720072122701	12/9/1975		175		5.9	11	0	0.02	2.92					
405720072122701	3/22/1976		180		6.1	18	0	0	2.66					
405720072122701	9/17/1979				6		0	0	1.74		0			
405720072122701	8/12/1981				5.6		0	0	3.92		0			
405720072122701	1/20/1982								4.15					
405720072122701	2/11/1982								4.05					
405720072122701	2/17/1982				5.5		0	0	5.82		0			
405720072122701	3/11/1982								3.75					
405720072122701	4/16/1982								3.75					
405720072122701	5/25/1982				6.1		0	0	3.84		0			
405720072122701	6/10/1982								3.2					
405720072122701	7/14/1982								3.83					
405720072122701	8/22/1982				5.8		0	0	3.54		0			
405720072122701	9/9/1982								3.52					
405720072122701	11/28/1982				6		0	0	3.49		0			
405720072122701	2/28/1983				5.6		0	0	3.6		0			
405720072122701	6/27/1983				5.8		0	0	3.83		0			
405720072122701	10/17/1983				5.7		0	0	3.23		0			
405720072122701	2/25/1984				5.9		0	0	2.84		0			
405720072122701	6/25/1984				5.6		0	0	2.04		0			
	Min		**6**		**5.5**	**9**	**0**	**0**	**1.74**	**0**	**0**			
	Max		**190**		**6.8**	**50**	**0**	**0.02**	**5.82**	**0**	**0**			
	Avg		**124.3**		**5.98**	**20.4**	**0**	**0.0009**	**3.34**	**####**	**0**			

Well #17 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405720072122702	7/24/1974		135		6.1	11	0	0	2.16					
405720072122702	4/3/1975		150		6.2	18	0	0	1.16					
405720072122702	8/11/1975		121		6.1	18	0	0	0.56					
405720072122702	12/9/1975		130		6.1	17	0	0.01	1.02					
405720072122702	3/22/1976		120		6.2	12	0	0	0.89					
405720072122702	1/22/1980				6.5		0	0	1.23		0			
405720072122702	6/10/1980				6.2		0	0	1.71		0			
405720072122702	11/29/1982				6.1		0	0	1.54		0			
405720072122702	2/28/1983				5.8		0	0	1.46		0			
405720072122702	6/28/1983				5.9		0	0	1.85		0			
405720072122702	10/13/1983				6.1		0	0	1.71		0			
405720072122702	2/27/1984				6.2		0	0	1.48		0			
405720072122702	6/25/1984				5.8		0	0	1.23		0			
405720072122702	2/20/1985				6.1		0	0	2.14		0			
405720072122702	6/4/1985				6		0	0	2.08		0			
	Min		**120**		**5.8**	**11**	**0**	**0**	**0.56**		**0**			
	Max		**150**		**6.5**	**18**	**0**	**0.01**	**2.16**		**0**			
	Avg		**131.2**		**6.09**	**15.2**	**0**	**0.0007**	**1.48**		**0**			

Well #18 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405720072122703	3/25/1985				6		0	0	4.31		0			
405720072122703	6/5/1985				5.9		0	0	4.34		0			
405720072122703	11/6/1991	11		9.2	5.6									
405720072122703	11/21/1991	11		9.4	5.6									
	Min	**11**		**9.2**	**5.6**		**0**	**0**	**4.31**		**0**			
	Max	**11**		**9.4**	**6**		**0**	**0**	**4.34**		**0**			
	Avg	**11**		**9.3**	**5.78**		**0**	**0**	**4.325**		**0**			

Well #19 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	fbg	fbg
1304695	3/28/2002	7.9	265	12	7.2									
1304695	3/28/2002	7.9	265	12.1	7.5									
1304695	3/28/2002	7.9	265	12.1	7.6									
1304695	3/28/2002	7.9	265	12.2	7.7									
1304695	3/28/2002	7.8	265	12.1	7.7									
1304695	4/23/2002	11.2	263	11	6.9									
1304695	4/23/2002	11.3	263	11.1	7.4									
1304695	4/23/2002	11.3	263	11.1	7.6									
1304695	4/23/2002	11.8	273	2.2	7.1									
1304695	4/23/2002	11.2	263	11.5	7.5		0.09	0.023	0.604	0.88	0.058	0.01		
1304695	6/7/2002						0.16	0.012	1.83	0.47	0.026	0		
1304695	7/19/2003						0.24	0.037	1.95	1.4	0.097	0.01		
1304695	9/16/2003	23.3	250	11	8.5									
1304695	9/16/2003	23.3	250	10.9	8.6									
1304695	9/16/2003	23.3	250	10.9	8.6									
1304695	9/16/2003	23.3	250	10.8	8.6									
1304695	9/16/2003	22.8	250	2.3	6.7									
1304695	9/16/2003	23.3	250	10.9	9.1		0	0.006	0.063	1.8	0.13	0		
1304695	7/13/2004						0.13	0.022	0.756	3.2	0.017	0.02		
1304695	9/2/2004	24.2	245	8.4	7.3									
1304695	9/2/2004	24.1	245	8.2	7.4									
1304695	9/2/2004	24	245	8.1	7.4									
1304695	9/2/2004	23.9	245	7.5	7.2									
1304695	9/2/2004	23.9	246	7.2	7.2									
1304695	9/2/2004	24.1	246	8.2	7.4		0.09	0.01	0.198	1.3	0.078	0		
1304695	7/14/2005	24.1	293	10.3	8.5									
1304695	7/14/2005	24.1	295	10.2	8.6									
1304695	7/14/2005	24.1	295	10.1	8.6									
1304695	7/14/2005	24	295	10.1	8.6									
1304695	7/14/2005	24	295	10	8.6									
1304695	7/14/2005	23.8	295	9.2	8.3									
1304695	7/14/2005	23.8	296	9.2	8.4									
1304695	7/14/2005	23.8	296	9.2	7.8		0.03	0.008	0.171		0.089	0		
1304695	7/20/2006	26.2	247	9.2	7.1									
1304695	7/20/2006	26.2	247	9.1	7.3									
1304695	7/20/2006	26.1	247	15	7.3									
1304695	7/20/2006	26.1	247		7.3									
1304695	7/20/2006	26.2	247	9.1	7.5		0.047	0.016	0.338		0.12	0.003		
1304695	8/28/2007	24.8	286	10.2	7.7									
1304695	8/28/2007	24.9	286	10.4	8.7									
1304695	8/28/2007	24.9	286	10.4	8.8									
1304695	8/28/2007	24.9	285	10.5	8.8									
1304695	8/28/2007	24.9	285	10.5	8.8									
1304695	8/28/2007	24.9	286	10.5	8.8									
1304695	8/28/2007	24.9	286	10.5	8.8									
1304695	8/28/2007	24.6	286	9.6	8.6									
1304695	8/28/2007	24.2	299	10.2	8.7									
1304695	8/28/2007	23.4	360	3.6	7.1									
1304695	8/28/2007	24.9	286	10.5	8.7		0.05	0.017	0.371		0.05	0.006		
1304695	7/11/2008	25.8	323	9.7	8.8									
1304695	7/11/2008	25.8	323	9.7	8.8									
1304695	7/11/2008	25.7	323	9.5	8.8									
1304695	7/11/2008	25.5	323	9.4	8.7									
1304695	7/11/2008	25.5	323	9.4	8.7									
1304695	7/11/2008	25.4	324	9.1	8.7									
1304695	7/11/2008	25	324	8.1	8.3									
1304695	7/11/2008	24.8	350	0.7	8.4									
1304695	7/11/2008	25.9	319	9.4	7.8		0.02	0.002	0.023		0.091	0.008		
	Min	**7.8**	**245**	**0.7**	**6.7**		**0**	**0.002**	**0.023**	**0.47**	**0.017**	**0**		
	Max	**26.2**	**360**	**15**	**9.1**		**0.24**	**0.037**	**1.95**	**3.2**	**0.130**	**0.02**		
	Avg	**21.87**	**279.6364**	**9.53**	**8.05**		**0.0857**	**0.0153**	**0.6304**	**1.51**	**0.076**	**0.006**		

Well #19A Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4
			μs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1304695	8/6/2001	25.8	263		7.2							
1304695	8/6/2001	25.3	263		7.3							
1304695	8/6/2001	25.3	263		7.3							
1304695	8/6/2001	25	263		7.3		0.06	0.018	0.274	1.2	0.119	0
	Min	**25**	**263**	**0**	**7.2**		**0.06**	**0.018**	**0.274**	**1.2**	**0.119**	**0**
	Max	**25.8**	**263**	**0**	**7.3**		**0.06**	**0.018**	**0.274**	**1.2**	**0.119**	**0**
	Avg	**25.35**	**263**	**#DIV/0!**	**7.28**		**0.06**	**0.018**	**0.274**	**1.2**	**0.119**	**0.000**

Well #20 Water Quality

Site #	Date	TEMP	Sp. Cond.	DO	pH	ALK.	NH3-N	NO2-N	NO3-N	TKN	P	ORTHO-PO4	Well Depth	Water lev.
			µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	as N	mg/L	mg/L	fbg	fbg
405632072115601	4/10/1974	11	220		5	10	0	0.01	6	0	0.01		45	
405632072115601	10/23/1974	12	210		5.7	11		0	4.8					
405632072115601	4/22/1975	12	179		5.5	8		0.01	3.7					
405632072115601	4/6/1976	11	230	6.5	6	10								
405632072115601	10/7/1976	11.5	250	8.5	5.8	16	0.01	0	3.7	0	0.01	0.01		13.91
	Min	**11**	**179**	**6.5**	**5**	**8**	**0**	**0**	**3.7**	**0**	**0.01**	**0.01**	**45**	**13.91**
	Max	**12**	**250**	**8.5**	**6**	**16**	**0.01**	**0.01**	**6**	**0**	**0.01**	**0.01**	**45**	**13.91**
	Avg	**11.5**	**217.8**	**7.5**	**5.6**	**11**	**0.005**	**0.005**	**4.55**	**0**	**0.01**	**0.01**	**45**	**13.91**

National Water Information System: Web Interface

USGS Water Resources

Data Category: Site Information | Geographic Area: United States | GO

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405906072110102 S 8843. 2

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:

Latitude 40°59'06", Longitude 72°11'01" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 35.0 feet
Hole depth: 35.0 feet
Land surface altitude: 32.5 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Daily Data			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Daily Statistics			
Elevation above NGVD 1929, feet	2001-08-10	2008-12-01	2380
Monthly Statistics			
Elevation above NGVD 1929, feet	2001-08	2008-12	
Annual Statistics			

Elevation above NGVD 1929, feet	2001	2009	
Field groundwater-level measurements	2000-06-22	2015-01-16	163
Field/Lab water-quality samples	2003-09-25	2008-06-12	5
Water-Year Summary	2005	2008	4
Additional Data Sources	Begin Date	End Date	Count
Groundwater Watch **offsite**	2000	2015	2543

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

---

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405840072114501 S 7570. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:

Latitude 40°58'39", Longitude 72°11'37" NAD27
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 162. feet
Land surface altitude: 70.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1984-04-14	1985-03-27	2
Field/Lab water-quality samples	1963-06-10	1987-02-26	63

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category: Site Information
Geographic Area: United States
GO

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405807072121001 S 48429. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:

Latitude 40°58'10.6", Longitude 72°12'09.5" NAD83
Suffolk County, New York , Hydrologic Unit 02030202
Well depth: 66. feet
Land surface altitude: 50.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1974-01-08	2009-05-27	78
Field/Lab water-quality samples	1973-08-07	1999-09-08	22
Additional Data Sources	Begin Date	End Date	Count
Annual Water-Data Report (pdf) **offsite**	2005	2009	5

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center

Email questions about this site to New York Water Science Center Water-Data Inquiries

---

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 405756072104901 S 8837. 1

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Well Site

DESCRIPTION:
Latitude 40°57'56",   Longitude 72°10'49"   NAD27
Suffolk County, New York   , Hydrologic Unit 02030202
Well depth: 35. feet
Land surface altitude: 20.0 feet above NGVD29.
Well completed in "Northern Atlantic Coastal Plain aquifer system" (S100NATLCP) national aquifer.
Well completed in "Glacial Aquifer, Upper" (112GLCLU) local aquifer

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field groundwater-level measurements	1950-08-01	1994-03-10	109
Field/Lab water-quality samples	1974-04-10	1977-04-26	9

OPERATION:
Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?

Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

USGS 01304693 HOOK POND TRIBUTARY AT EASTHAMPTON NY

Available data for this site SUMMARY OF ALL AVAILABLE DATA ▼ GO

Stream Site

DESCRIPTION:
Latitude 40°57'34", Longitude 72°10'42" NAD27
Suffolk County, New York, Hydrologic Unit 02030202

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field measurements	1974-04-19	2008-06-26	18
Field/Lab water-quality samples	1974-02-27	1995-04-05	13
Additional Data Sources	Begin Date	End Date	Count
Annual Water-Data Report (pdf) **offsite**	2005	2008	4

OPERATION:
Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

Accessibility Plug-Ins FOIA Privacy Policies and Notices

U.S. Department of the Interior | U.S. Geological Survey
Title: NWIS Site Information for USA: Site Inventory
URL: http://waterdata.usgs.gov/nwis/inventory?

Page Contact Information: USGS Water Data Support Team
Page Last Modified: 2015-02-12 13:07:25 EST
0.46 0.44 vaww01

Click to hideNews Bulletins

- February 3, 2015 - The NWIS Mapper is now accessible.
- Try our new Mobile-friendly water data site from your mobile device!
- Full News

USGS 01304695 HOOK POND AT EAST HAMPTON, NY

Available data for this site SUMMARY OF ALL AVAILABLE DATA GO

Lake Site

DESCRIPTION:

Latitude 40°57'18", Longitude 72°10'42" NAD27
Suffolk County, New York, Hydrologic Unit 02030202
Drainage area: 4.06 square miles
Datum of gage: 5 feet above NGVD29.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Field/Lab water-quality samples	2001-08-06	2008-07-11	62
Additional Data Sources	Begin Date	End Date	Count
Annual Water-Data Report (pdf) **offsite**	2005	2008	4

OPERATION:

Record for this site is maintained by the USGS New York Water Science Center
Email questions about this site to New York Water Science Center Water-Data Inquiries

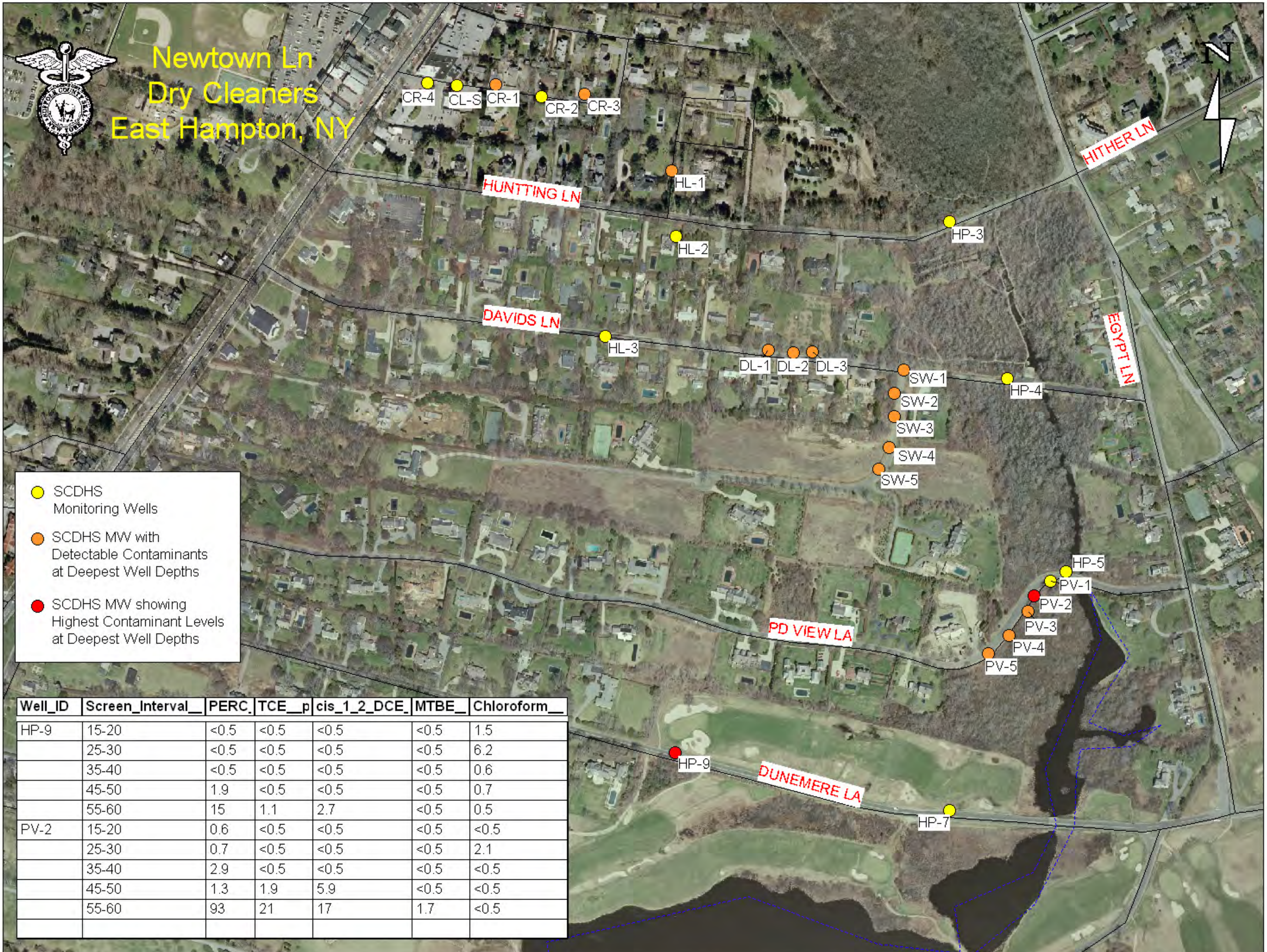
Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

Accessibility Plug-Ins FOIA Privacy Policies and Notices

U.S. Department of the Interior | U.S. Geological Survey
Title: NWIS Site Information for USA: Site Inventory
URL: http://waterdata.usgs.gov/nwis/inventory?

Page Contact Information: USGS Water Data Support Team
Page Last Modified: 2015-02-12 13:15:13 EST
0.4 0.39 vaww02

APPENDIX E SCDHS VOC SAMPLING DATA



Well_ID	Screen_Interval__	PERC_	TCE__p	cis_1_2_DCE_	MTBE__	Chloroform__
HP-9	15-20	<0.5	<0.5	<0.5	<0.5	1.5
	25-30	<0.5	<0.5	<0.5	<0.5	6.2
	35-40	<0.5	<0.5	<0.5	<0.5	0.6
	45-50	1.9	<0.5	<0.5	<0.5	0.7
	55-60	15	1.1	2.7	<0.5	0.5
PV-2	15-20	0.6	<0.5	<0.5	<0.5	<0.5
	25-30	0.7	<0.5	<0.5	<0.5	2.1
	35-40	2.9	<0.5	<0.5	<0.5	<0.5
	45-50	1.3	1.9	5.9	<0.5	<0.5
	55-60	93	21	17	1.7	<0.5

East Hampton
VOC Plume

						Parameters					Metals						Standard inorganics		
Well ID	Screen Interval	Location	North	West	Date	Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
HP-3	5--10	Huntting Lane	40.96109	-72.17902	7/15/2009	1.7	0.13	14.4	6.7	503	1	61	1	270	121	7.48	5.7	<0.1	1.9
	15-20		40.96109	-72.17902	7/15/2009	1.7	6.42	12.7	7.23	177	<1	12	<1	981	53	0.33	0.15	<0.1	5.2
	25-30		40.96109	-72.17902	7/15/2009	1.7	6.43	12.6	7.32	133	<1	5	<1	138	31	<.1	0.08	<0.1	3.9
	35-40		40.96109	-72.17902	7/15/2009	1.7	5.91	12.5	7.37	139	<1	6	<1	143	31	0.1	0.09	<0.1	3.6
	45-50		40.96109	-72.17902	7/15/2009	1.7	6.09	12.5	7.3	139	<1	6	<1	150	33	0.11	0.09	<0.1	3.8
	55-60		40.96109	-72.17902	7/15/2009	1.7	6.83	12.6	6.77	144	<1	8	3	51	36	0.41	<.020	<0.1	3.8
HP-4	5--10	Davids Lane	40.95953	-72.17831	7/15/2009	0.69	0.44	14.4	5.95	381	<1	41	<1	137	107	4.45	0.57	<0.1	2.8
	15-20		40.95953	-72.17831	7/15/2009	0.69	0.2	13.2	5.92	487	<1	168	3	1900	102	9.27	4.54	<0.1	7.7
	25-30		40.95953	-72.17831	7/15/2009	0.69	0.3	12.8	5.4	507	<1	89	5	242	146	4.27	0.33	<0.1	6
	35-40		40.95953	-72.17831	7/15/2009	0.69	3.65	13	6.23	287	<1	29	<1	410	97	2.32	0.44	<0.1	5.9
	45-50		40.95953	-72.17831	7/15/2009	0.69	4.61	13.1	6.18	283	<1	32	1	751	98	1.91	0.57	<0.1	8.2
	55-60		40.95953	-72.17831	7/15/2009	0.69	6.74	12.9	6.06	280	<1	25	<1	159	94	1.1	0.08	<0.1	6.1

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters: Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Metals: Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Standard inorganics: Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
HP-5	5--10	Pond View Lane	40.95762	-72.17778	7/16/2009	5.08	0.12	18.4	6.65	410	1	22	2	192	37	2.59	0.26	<0.1	<.2
	15-20		40.95762	-72.17778	7/16/2009	5.08	0.11	13.6	6.31	395	<1	53	2	656	124	6.31	1.27	<0.1	2.9
	25-30		40.95762	-72.17778	7/16/2009	5.08	0.15	13.6	7.4	465	<1	132	<1	542	113	2.36	3.14	<0.1	7.2
	35-40		40.95762	-72.17778	7/16/2009	5.08	3.73	13.5	6.59	377	<1	45	<1	99	110	1.42	0.06	<0.1	7.4
	45-50		40.95762	-72.17778	7/16/2009	5.08	5.97	13.4	6.69	203	<1	13	<1	88	70	0.26	0.04	<0.1	4.9
	55-60		40.95762	-72.17778	7/16/2009	5.08	6	13.3	6.66	123	<1	7	2	63	32	0.27	0.03	<0.1	4
HP-7	5--10	Dunemere Lane	40.95526	-72.17918	7/16/2009	1.02	0.08	14	5.93	752	<1	26	3	546	242	2.12	3.45	<0.1	<.2
	15-20		40.95526	-72.17918	7/16/2009	1.02	0.64	12.3	5.78	217	<1	27	2	2100	60	3.02	0.04	<0.1	1.3
	25-30		40.95526	-72.17918	7/16/2009	1.02	5.05	12.6	5.77	242	<1	34	2	203	92	1.11	0.05	<0.1	4.2
	35-40		40.95526	-72.17918	7/16/2009	1.02	5.63	13.2	5.86	286	<1	57	<1	226	70	1.3	0.07	<0.1	3.6
	45-50		40.95526	-72.17918	7/16/2009	1.02	0.18	13.2	5.81	507	<1	121	<1	630	153	0.89	0.66	<0.1	10.3
	55-60		40.95526	-72.17918	7/16/2009	1.02	0.22	13.5	5.4	506	<1	105	1	668	152	1.58	0.83	<0.1	10.1

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Parameters					Metals						Standard inorganics		
Well ID	Screen Interval	Location	North	West	Date	Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
HP-9	15-20	Dunemere Lane	40.95589	-72.18275	7/16/2009	8.28	3.15	12.7	6.9	245	<1	38	<1	165	75	0.83	0.07	<0.1	2.6
	25-30		40.95589	-72.18275	7/16/2009	8.28	3.17	12.7	6.87	252	<1	53	<1	106	82	0.98	0.05	<0.1	4.1
	35-40		40.95589	-72.18275	7/16/2009	8.28	6.49	13	6.8	286	<1	45	<1	176	95	0.77	0.1	<0.1	4.8
	45-50		40.95589	-72.18275	7/16/2009	8.28	7.7	13.1	6.65	295	<1	62	<1	184	73	0.13	<0.20	<0.1	9.7
	55-60		40.95589	-72.18275	7/16/2009	8.28	6.72	13.7	5.55	375	<1	151	<1	73	117	0.23	0.05	<0.1	9.7
SW-1	15-20	Sarah's Way East Hampton	40.95963	-72.17966	9/8/2009	8.65	5.05	13.9	6.79	264	<1	37	1	285	74	2.52	0.07	<0.1	2
	25-30		40.95963	-72.17966	9/8/2009	8.65	5.22	13.3	6.93	303	<1	47	1	124	79	1.73	0.1	<0.1	6.3
	35-40		40.95963	-72.17966	9/8/2009	8.65	0.08	13.3	6.9	421	<1	85	2	705	52	1.32	8.82	<0.1	6.5
	45-50		40.95963	-72.17966	9/8/2009	8.65	0.04	13.6	6.86	531	<1	137	2	499	103	1.35	9.04	<0.1	5.7
	55-60		40.95963	-72.17966	9/8/2009	8.65	0.19	13.6	7.17	508	<1	171	2	364	127	0.97	2.62	<0.1	8.2

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters					Metals						Standard inorganics		
						Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
SW-2	15-20	Sarah's Way East Hampton	40.95942	-72.17983	9/8/2009	10.01	5.52	14	6.11	397	<1	31	3	71	117	0.81	NA	<.1	1.6
	25-30		40.95942	-72.17983	9/8/2009	10.01	5.88	13.4	6.04	284	<1	31	2	114	79	1.31	NA	<.1	4.4
	35-40		40.95942	-72.17983	9/8/2009	10.01	0.13	13.6	5.81	320	<1	58	1	780	58	1.27	NA	<.1	4.7
	45-50		40.95942	-72.17983	9/8/2009	10.01	0.08	13.8	5.97	482	<1	92	3	1440	97	0.85	NA	<.1	<.5
	55-60		40.95942	-72.17983	9/8/2009	10.01	0.29	14.4	7.47	628	<1	185	4	156	217	0.5	NA	<.2	2.2
SW-3	15-20	Sarah's Way East Hampton	40.95917	-72.17980	9/10/2009	10.04	6	15.3	5.95	290	<1	19	2	130	103	1	NA	<0.1	1.6
	25-30		40.95917	-72.17980	9/10/2009	10.04	5.55	14.1	5.63	269	<1	41	3	44	49	1.02	NA	<0.1	6.1
	35-40		40.95917	-72.17980	9/10/2009	10.04	0.12	14.1	5.79	420	<1	47	1	953	49	0.52	NA	<0.1	2.6
	45-50		40.95917	-72.17980	9/10/2009	10.04	0.12	14.3	5.52	582	<1	106	3	904	114	0.75	NA	<0.2	<1
	55-60		40.95917	-72.17980	9/10/2009	10.04	0.28	14.3	6.03	628	<1	152	3	843	124	0.44	NA	<0.2	<1

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters: Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Metals: Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Standard inorganics: Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
SW-4	15-20	Sarah's Way East Hampton	40.95887	-72.17987	9/10/2009	9.06	6.64	14.1	6.74	277	<1	29	1	71	86	0.65	<0.02	<0.1	5
	25-30		40.95887	-72.17987	9/10/2009	9.06	6.91	13.4	6.87	250	<1	35	1	45	77	0.64	0.04	<0.1	3.7
	35-40		40.95887	-72.17987	9/10/2009	9.06	0.99	13.7	7.01	467	<1	87	2	158	111	2.25	0.06	<0.1	5.7
	45-50		40.95887	-72.17987	9/10/2009	9.06	0.19	13.8	7.14	490	<1	127	3	378	115	2.49	0.33	<0.1	7.2
	55-60		40.95887	-72.17987	9/10/2009	9.06	0.16	13.8	7.57	537	<1	123	<1	430	135	10.3	0.98	<0.1	10.1
SW-5	15-20	Sarah's Way East Hampton	40.95866	-72.18002	9/14/2009	9.25	5.13	14.6	6.61	252	<1	45	3	409	84	4.77	NA	<0.1	5.3
	25-30		40.95866	-72.18002	9/14/2009	9.25	6.08	14	6.67	258	<1	40	3	89	83	1.25	0.04	<0.1	4.9
	35-40		40.95866	-72.18002	9/14/2009	9.25	0.21	13.9	6.63	370	<1	95	2	312	126	4.35	NA	<0.1	13.2
	45-50		40.95866	-72.18002	9/14/2009	9.25	0.1	14	6.75	514	<1	205	4	906	179	4.79	3.85	<0.1	5
	55-60		40.95866	-72.18002	9/14/2009	9.25	0.11	13.9	7.41	593	<1	219	8	214	154	2.13	NA	<0.3	26

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters: Depth to water (feet)	Parameters: Dissolved Oxygen (mg/L)	Parameters: Temperature (Celsius)	Parameters: pH	Parameters: Conductivity (umho)	Metals: Arsenic (ppb)	Metals: Barium (ppb)	Metals: Chromium (ppb)	Metals: Manganese (ppb)	Metals: Strontium (ppb)	Metals: Iron (ppm)	Standard inorganics: Ammonia (ppm)	Standard inorganics: Nitrite (ppm)	Standard inorganics: Nitrate (ppm)
PV-1	15-20	Pond View Lane	40.95751	-72.17781	9/17/2009	4.24	0.09	14.7	6.91	320	<1	73	<1	814	69	6.17	1.17	<0.1	4.2
PV-1	25-30	Pond View Lane	40.95751	-72.17781	9/17/2009	4.24	4.1	13.6	6.88	288	<1	53	3	95	81	2.36	0.06	<0.1	5.1
PV-1	35-40	Pond View Lane	40.95751	-72.17781	9/17/2009	4.24	0.2	13.3	7.04	432	<1	113	3	198	122	7.3	0.08	<0.1	7.2
PV-1	45-50	Pond View Lane	40.95751	-72.17781	9/17/2009	4.24	6.12	13.2	7.7	272	<1	23	<1	120	87	0.96	0.05	<0.1	7
PV-1	55-60	Pond View Lane	40.95751	-72.17781	9/17/2009	4.24	6.72	13.1	8.7	127	<1	8	<1	47	38	0.2	0.03	<0.1	4.8
PV-2	15-20	Pond View Lane	40.95737	-72.17802	9/15/2009	5.1	1.66	15.4	6.95	297	<1	50	<1	1460	108	2.03	0.07	<0.1	5.1
PV-2	25-30	Pond View Lane	40.95737	-72.17802	9/15/2009	5.1	5.73	13.6	6.8	264	<1	53	2	331	83	1.11	0.05	<0.1	5.2
PV-2	35-40	Pond View Lane	40.95737	-72.17802	9/15/2009	5.1	0.23	13.4	6.76	431	<1	163	<1	759	134	4.15	3.89	<0.1	8.3
PV-2	45-50	Pond View Lane	40.95737	-72.17802	9/15/2009	5.1	0.13	13.5	6.58	496	<1	214	<1	697	196	5.27	1.09	<0.1	11.2
PV-2	55-60	Pond View Lane	40.95737	-72.17802	9/15/2009	5.1	1.28	13.7	7.62	338	<1	59	<1	131	96	1.48	<0.02	<0.1	5.9

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Parameters					Metals						Standard inorganics		
Well ID	Screen Interval	Location	North	West	Date	Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
PV-3	15-20	Pond View Lane	40.95722	-72.17811	9/22/2009	4.98	1.61	15.2	6.68	202	<1	23	<1	51	24	2.18	<0.02	<0.1	0.9
	25-30		40.95722	-72.17811	9/22/2009	4.98	5.75	13.5	6.66	252	<1	44	<1	47	81	0.97	<0.02	<0.1	3.2
	35-40		40.95722	-72.17811	9/22/2009	4.98	0.25	13.1	6.55	360	<1	109	3	386	124	1.61	1.25	<0.1	9.9
	45-50		40.95722	-72.17811	9/22/2009	4.98	0.14	13.2	660	456	<1	207	3	954	115	1.91	4.69	<0.1	10
	55-60		40.95722	-72.17811	9/22/2009	4.98	0.26	13.3	7.13	493	<1	241	3	1480	113	3.15	6.77	<0.1	11.5
PV-4	15-20	Pond View Lane	40.95698	-72.17836	9/24/2009	4.63	0.08	16.5	6.94	534	<1	67	<1	1440	193	25.2	NA	<0.3	<1.5
	25-30		40.95698	-72.17836	9/24/2009	4.63	5.33	14	8.48	230	<1	37	1	159	107	1.1	NA	<0.1	2.6
	35-40		40.95698	-72.17836	9/24/2009	4.63	0.08	13.6	5.76	395	<1	97	2	155	114	3.28	NA	<0.1	6.5
	45-50		40.95698	-72.17836	9/24/2009	4.63	0.07	13.8	5.53	460	<1	175	3	1700	85	3.64	NA	<0.1	8
	55-60		40.95698	-72.17836	9/24/2009	4.63	0.21	13.7	6.2	460	<1	140	<1	1290	74	3.79	NA	<0.1	8.7

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters					Metals						Standard inorganics		
						Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
PV-5	15-20	Pond View Lane	40.95681	-72.17864	9/24/2009	3.92	0.09	16.8	6.75	276	<1	44	1	1890	101	2.45	1.53	<0.1	5.8
	25-30		40.95681	-72.17864	9/24/2009	3.92	0.79	14.9	6.72	238	<1	39	3	93	113	2.02	0.07	<0.1	5.4
	35-40		40.95681	-72.17864	9/24/2009	3.92	3.68	14.1	6.77	379	<1	85	5	77	131	1.98	0.07	<0.1	8.5
	45-50		40.95681	-72.17864	9/24/2009	3.92	0.16	14.2	6.94	529	<1	237	<1	215	119	1.27	11	<0.1	5.1
	55-60		40.95681	-72.17864	9/24/2009	3.92	0.2	13.8	7.17	535	<1	223	<1	339	125	0.99	16.2	<0.1	3
DL-1	15-20	Davids Lane	40.95986	-72.18142	12/17/2009	14.44	4.82	14.1	6.7	438	<1	49	2	444	105	1.77	NA	<0.6	<3.0
	25-30		40.95986	-72.18142	12/17/2009	14.44	4.16	14.4	6.3	252	<1	35	5	55	89	1.86	NA	<0.6	<3.0
	35-40		40.95986	-72.18142	12/17/2009	14.44	0.16	14.1	6.49	390	<1	62	2	46	83	1.28	NA	<0.1	4
	45-50		40.95986	-72.18142	12/17/2009	14.44	0.18	14.1	6.43	460	<1	114	1	185	108	0.64	NA	<0.1	4.6
	55-60		40.95986	-72.18142	12/17/2009	14.44	0.21	14.2	6.95	616	<1	188	2	315	149	1.62	NA	<0.1	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters: Depth to water (feet)	Parameters: Dissolved Oxygen (mg/L)	Parameters: Temperature (Celsius)	Parameters: pH	Parameters: Conductivity (umho)	Metals: Arsenic (ppb)	Metals: Barium (ppb)	Metals: Chromium (ppb)	Metals: Manganese (ppb)	Metals: Strontium (ppb)	Metals: Iron (ppm)	Standard inorganics: Ammonia (ppm)	Standard inorganics: Nitrite (ppm)	Standard inorganics: Nitrate (ppm)
DL-2	15-20	Davids Lane	40.98983	-72.18110	12/17/2009	14.85	4.65	13	6.3	267	<1	37	1	302	122	3.26	0.13	<0.1	7.2
	25-30		40.98983	-72.18110	12/17/2009	14.85	4.68	13	6.3	231	<1	31	<1	107	69	2.54	0.08	<0.1	3.2
	35-40		40.98983	-72.18110	12/17/2009	14.85	0.73	13.4	6.3	399	<1	56	1	765	76	2.28	0.41	<0.1	6.4
	45-50		40.98983	-72.18110	12/17/2009	14.85	0.24	13.4	6.5	650	<1	113	3	957	121	2.31	0.77	<0.1	0.9
	55-60		40.98983	-72.18110	12/17/2009	14.85	0.5	13.3	6.72	565	<1	172	12	726	131	1.85	0.29	<0.1	3.1
DL-3	15-20	Davids Lane	40.98983	-72.18085	12/28/2009	11.17	5.3	14.4	6.66	166	<1	17	<1	134	57	1.11	NA	<.1	1.4
	25-30		40.98983	-72.18085	12/28/2009	11.17	4.54	14.8	6.71	260	<1	30	<1	31	81	0.61	NA	<.1	5.9
	35-40		40.98983	-72.18085	12/28/2009	11.17	0.36	14.7	6.8	389	<1	61	2	687	76	1.6	NA	<.1	6.3
	45-50		40.98983	-72.18085	12/28/2009	11.17	0.15	14.3	6.89	485	<1	183	8	772	133	2.72	NA	<.1	<.5
	55-60		40.98983	-72.18085	12/28/2009	11.17	0.34	14.6	7.14	705	<1	265	3	316	147	2.97	NA	<.2	<1.0

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters					Metals						Standard inorganics		
						Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
HL-1	25-30	Hunting Lane	40.96165	-72.18263	12/14/2009	20.05	1.35	15.3	6.18	425	<1	102	3	194	111	5.96	NA	<0.1	6.7
	35-40		40.96165	-72.18263	12/14/2009	20.05	1.91	15.1	6.1	533	<1	41	2	632	79	3.11	NA	<0.2	1.6
	45-50		40.96165	-72.18263	12/14/2009	20.05	1.13	15.1	6.51	565	<1	56	<1	239	117	1.33	NA	<0.2	1.3
	55-60		40.96165	-72.18263	12/14/2009	20.05	1.65	14.9	7.3	575	<1	115	<1	451	107	1.18	NA	<0.2	2.1
HL-2	25-30	Hunting Lane	40.961	-72.18260	12/16/2009	20.48	na	13.5	7.19	207	<1	32	1	146	101	1.89	0.11	<0.1	3.3
	35-40		40.961	-72.18260	12/16/2009	20.48	na	13.5	7.06	341	<1	96	2	891	51	1.58	16.6	<0.1	5.7
	45-50		40.961	-72.18260	12/16/2009	20.48	7.09	13.2	7.06	484	<1	165	4	2220	136	0.46	24	<0.1	1.4
	55-60		40.961	-72.18260	12/16/2009	20.48	3.42	13.4	7.16	560	<1	173	3	1460	130	0.57	14.6	<0.2	<1
HL-3	25-30	Hunting Lane	40.95998	-72.18352	1/13/2010	20.11	6.23	13.3	6.12	205	<1	25	2	40	52	0.63	NA	<.1	7.7
	35-40		40.95998	-72.18352	1/13/2010	20.11	0.13	13.7	6.23	400	<1	44	2	313	71	1.68	NA	<.1	5.1
	45-50		40.95998	-72.18352	1/13/2010	20.11	0.12	13.1	6.57	407	1	41	9	1040	86	3.18	NA	<0.3	8.2
	55-60		40.95998	-72.18352	1/13/2010	20.11	0.12	13.5	6.57	512	<1	119	2	77	126	<0.1	NA	<0.2	12.4

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Parameters					Metals						Standard inorganics		
Well ID	Screen Interval	Location	North	West	Date	Depth to water (feet)	Dissolved Oxygen (mg/L)	Temperature (Celsius)	pH	Conductivity (umho)	Arsenic (ppb)	Barium (ppb)	Chromium (ppb)	Manganese (ppb)	Strontium (ppb)	Iron (ppm)	Ammonia (ppm)	Nitrite (ppm)	Nitrate (ppm)
CR-1	25-30	The Circle	40.96254	-72.18491	12/8/2009	22.75	0.79	14.7	5.92	536	1	176	4	335	117	3.19	1.07	<0.15	21.1
	35-40		40.96254	-72.18491	12/8/2009	22.75	1.01	14.2	6.89	335	<1	17	<1	280	85	5.19	2.26	<0.1	7.4
	45-50		40.96254	-72.18491	12/8/2009	22.75	0.46	14.4	6.77	415	<1	48	<1	353	87	3.54	4.98	<0.1	4.8
	55-60		40.96254	-72.18491	12/8/2009	22.75	0.54	14.5	6.8	536	<1	143	2	1280	78	0.46	7.57	<0.3	3
CR-2	25-30	The Circle	40.96241	-72.18431	12/10/2009	22.64	2.52	13.7	6.88	397	<1	63	<1	539	71	6.2	0.23	<0.2	10.1
	35-40		40.96241	-72.18431	12/10/2009	22.64	0.34	14.2	6.77	603	1	87	2	545	104	2.47	2.63	<0.1	1.2
	45-50		40.96241	-72.18431	12/10/2009	22.64	0.39	14.2	6.75	458	<1	79	<1	905	65	1.49	2.82	<0.1	<0.5
	55-60		40.96241	-72.18431	12/10/2009	22.64	0.21	14.2	6.88	446	<1	95	<1	3510	34	1.73	4.35	<0.1	1.3
CR-3	25-30	The Circle	40.96243	-72.18375	12/10/2009	20.33	0.31	16	5.92	443	<1	41	<1	585	81	6.09	NA	<0.1	5.8
	35-40		40.96243	-72.18375	12/10/2009	20.33	0.44	15.5	5.91	395	<1	37	<1	365	64	7.07	NA	0.1	4.5
	45-50		40.96243	-72.18375	12/10/2009	20.33	1.8	15.7	5.9	425	1	65	1	276	91	6.19	NA	<0.1	3.8
	55-60		40.96243	-72.18375	12/10/2009	20.33	1.85	15.3	6.82	362	<1	90	<1	98	100	1.17	NA	<0.1	4.1

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Parameters: Depth to water (feet)	Parameters: Dissolved Oxygen (mg/L)	Parameters: Temperature (Celsius)	Parameters: pH	Parameters: Conductivity (umho)	Metals: Arsenic (ppb)	Metals: Barium (ppb)	Metals: Chromium (ppb)	Metals: Manganese (ppb)	Metals: Strontium (ppb)	Metals: Iron (ppm)	Standard inorganics: Ammonia (ppm)	Standard inorganics: Nitrite (ppm)	Standard inorganics: Nitrate (ppm)
CR-4	25-30	Circle Lane	40.96257	-72.18580	5/19/2010	23.6	0.4	15.5	5.99	920	<1	80	<1	897	152	4.98	4.8	<.3	5.7
	35-40		40.96257	-72.18580	5/19/2010	23.6	0.32	16	6.02	447	<1	56	<1	7010	43	4.32	7.2	<.1	3.9
	45-50		40.96257	-72.18580	5/19/2010	23.6	1.63	15.9	6.02	453	<1	48	<1	6710	65	3.47	1.71	<.1	6.2
	55-60		40.96257	-72.18580	5/19/2010	23.6	6.93	15.7	5.88	402	<1	97	<1	16	140	<.1	<.02	<.1	7.1
CL-S	25-30	Circle Lane (South Of Bank)	40.96254	-72.18542	5/17/2010	22.07	0.65	16.8	5.97	823	<1	63	1	3180	168	4.2	3.42	<.3	2.8
	35-40		40.96254	-72.18542	5/17/2010	22.07	0.44	16.6	6.25	876	<1	81	6	3240	104	1.43	35	<.3	<1.5
	45-50		40.96254	-72.18542	5/17/2010	22.07	0.36	16.6	6.33	761	<1	84	3	756	93	1.85	28	<.3	<1.5
	55-60		40.96254	-72.18542	5/17/2010	22.07	0.66	16.4	5.91	557	<1	103	<1	717	127	1.17	4.3	<.2	<1

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Voc's												
Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
HP-3	5--10	Huntting Lane	40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1
	15-20		40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96109	-72.17902	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HP-4	5--10	Davids Lane	40.95953	-72.17831	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	15-20		40.95953	-72.17831	7/15/2009	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95953	-72.17831	7/15/2009	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95953	-72.17831	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95953	-72.17831	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.95953	-72.17831	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's												
						Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
HP-5	5--10	Pond View Lane	40.95762	-72.17778	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	15-20		40.95762	-72.17778	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
	25-30		40.95762	-72.17778	7/16/2009	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.6	15	<0.5	<0.5
	35-40		40.95762	-72.17778	7/16/2009	119	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	13	11	0.9	<0.5
	45-50		40.95762	-72.17778	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.95762	-72.17778	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HP-7	5--10	Dunemere Lane	40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	15-20		40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7
	35-40		40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.95526	-72.17918	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's												
						Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
HP-9	15-20	Dunemere Lane	40.95589	-72.18275	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5
	25-30		40.95589	-72.18275	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6.2
	35-40		40.95589	-72.18275	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6
	45-50		40.95589	-72.18275	7/16/2009	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7
	55-60		40.95589	-72.18275	7/16/2009	15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	2.7	<0.5	0.5
SW-1	15-20	Sarah's Way East Hampton	40.95963	-72.17966	9/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5
	25-30		40.95963	-72.17966	9/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.7
	35-40		40.95963	-72.17966	9/8/2009	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5
	45-50		40.95963	-72.17966	9/8/2009	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5
	55-60		40.95963	-72.17966	9/8/2009	1.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's: Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
SW-2	15-20	Sarah's Way East Hampton	40.95942	-72.17983	9/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95942	-72.17983	9/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6
	35-40		40.95942	-72.17983	9/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95942	-72.17983	9/8/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.95942	-72.17983	9/8/2009	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	1	<0.5
SW-3	15-20	Sarah's Way East Hampton	40.95917	-72.17980	9/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95917	-72.17980	9/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95917	-72.17980	9/10/2009	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95917	-72.17980	9/10/2009	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.6	<0.5
	55-60		40.95917	-72.17980	9/10/2009	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
						Voc's												
SW-4	15-20	Sarah's Way East Hampton	40.95887	-72.17987	9/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95887	-72.17987	9/10/2009	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5
	35-40		40.95887	-72.17987	9/10/2009	25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	13	101	<0.5	<0.5
	45-50		40.95887	-72.17987	9/10/2009	22	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	0.9	12	127	<0.5	<0.5
	55-60		40.95887	-72.17987	9/10/2009	16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	9.8	120	<0.5	<0.5
SW-5	15-20	Sarah's Way East Hampton	40.95866	-72.18002	9/14/2009	<0.5	17	6	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.5
	25-30		40.95866	-72.18002	9/14/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.4
	35-40		40.95866	-72.18002	9/14/2009	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5
	45-50		40.95866	-72.18002	9/14/2009	5.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.5	4.9	3.3	<0.5
	55-60		40.95866	-72.18002	9/14/2009	8.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	4	1.7	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's												
						Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
PV-1	15-20	Pond View Lane	40.95751	-72.17781	9/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95751	-72.17781	9/17/2009	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7
	35-40		40.95751	-72.17781	9/17/2009	48	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	9.1	15	1.7	<0.5
	45-50		40.95751	-72.17781	9/17/2009	25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	1.9	<0.5	<0.5
	55-60		40.95751	-72.17781	9/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PV-2	15-20	Pond View Lane	40.95737	-72.17802	9/15/2009	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95737	-72.17802	9/15/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.1
	35-40		40.95737	-72.17802	9/15/2009	2.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95737	-72.17802	9/15/2009	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.9	5.9	<0.5	<0.5
	55-60		40.95737	-72.17802	9/15/2009	93	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	21	17	1.7	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Voc's												
Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
PV-3	15-20	Pond View Lane	40.95722	-72.17811	9/22/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95722	-72.17811	9/22/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95722	-72.17811	9/22/2009	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95722	-72.17811	9/22/2009	16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.6	7.8	0.7	<0.5
	55-60		40.95722	-72.17811	9/22/2009	5.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.1	<0.5	<0.5
PV-4	15-20	Pond View Lane	40.95698	-72.17836	9/24/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95698	-72.17836	9/24/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95698	-72.17836	9/24/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95698	-72.17836	9/24/2009	5.2	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	0.9	1.6	<0.5	<0.5
	55-60		40.95698	-72.17836	9/24/2009	8.3	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	1.4	2.9	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
						Voc's												
PV-5	15-20	Pond View Lane	40.95681	-72.17864	9/24/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95681	-72.17864	9/24/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95681	-72.17864	9/24/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.95681	-72.17864	9/24/2009	0.8	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.95681	-72.17864	9/24/2009	1.2	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
DL-1	15-20	Davids Lane	40.95986	-72.18142	12/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.95986	-72.18142	12/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.95986	-72.18142	12/17/2009	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.8	14	0.6	<0.5
	45-50		40.95986	-72.18142	12/17/2009	5.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.5	27	<0.5	<0.5
	55-60		40.95986	-72.18142	12/17/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's												
						Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
DL-2	15-20	Davids Lane	40.98983	-72.18110	12/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.98983	-72.18110	12/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.98983	-72.18110	12/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.98983	-72.18110	12/17/2009	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.98983	-72.18110	12/17/2009	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5
DL-3	15-20	Davids Lane	40.98983	-72.18085	12/28/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	25-30		40.98983	-72.18085	12/28/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.98983	-72.18085	12/28/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.98983	-72.18085	12/28/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.98983	-72.18085	12/28/2009	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
						Voc's												
HL-1	25-30	Hunting Lane	40.96165	-72.18263	12/14/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5
	35-40		40.96165	-72.18263	12/14/2009	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96165	-72.18263	12/14/2009	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96165	-72.18263	12/14/2009	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5
HL-2	25-30	Hunting Lane	40.961	-72.18260	12/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.4
	35-40		40.961	-72.18260	12/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.961	-72.18260	12/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.961	-72.18260	12/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HL-3	25-30	Hunting Lane	40.95998	-72.18352	1/13/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9
	35-40		40.95998	-72.18352	1/13/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.8
	45-50		40.95998	-72.18352	1/13/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	14
	55-60		40.95998	-72.18352	1/13/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

						Voc's												
Well ID	Screen Interval	Location	North	West	Date	Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
CR-1	25-30	The Circle	40.96254	-72.18491	12/8/2009	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5
	35-40		40.96254	-72.18491	12/8/2009	1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96254	-72.18491	12/8/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96254	-72.18491	12/8/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CR-2	25-30	The Circle	40.96241	-72.18431	12/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.96241	-72.18431	12/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96241	-72.18431	12/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96241	-72.18431	12/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CR-3	25-30	The Circle	40.96243	-72.18375	12/10/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.96243	-72.18375	12/10/2009	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6
	45-50		40.96243	-72.18375	12/10/2009	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96243	-72.18375	12/10/2009	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

East Hampton
VOC Plume

Well ID	Screen Interval	Location	North	West	Date	Voc's												
						Tetrachloroethene (ppb)	n-Propane (ppb)	n-Butane (ppb)	1-Bromo-2chloroethane (ppb)	1, 4 Dichlorobenzene (ppb)	p-Diethylbenzene	n-Butylbenzene	sec-Butylbenzene (ppb)	trans-1,2-Dichloroethane (ppb)	Trichloroethene (ppb)	cis-1,2-Dichloroethene (ppb)	MTBE (ppb)	Chloroform (ppb)
CR-4	25-30	Circle Lane	40.96257	-72.18580	5/19/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.96257	-72.18580	5/19/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96257	-72.18580	5/19/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96257	-72.18580	5/19/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CL-S	25-30	Circle Lane (South Of Bank)	40.96254	-72.18542	5/17/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	35-40		40.96254	-72.18542	5/17/2010	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	1.9	2.2	<0.5	<0.5	<0.5	<0.5	<0.5
	45-50		40.96254	-72.18542	5/17/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	<0.5	<0.5	<0.5	<0.5
	55-60		40.96254	-72.18542	5/17/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5

* Indicates trace amounts present
NA- not analyzed
P- pending lab results

APPENDIX F - 2015 STORMWATER PROJECTS SUBMITTED FOR GRANTS

Following from Village application:

Project 1: North Hook Mill Green: Design and implementation of Bioswale/Shallow Wetland:

The project will improve an open channel area at the North Hook Mill Green by converting it into a bioswale and/or extended retention area for stormwater control. The open channel/swale conveys stormwater runoff from the North Main Street Commercial area to Hook Pond. Hook Pond is listed by the NYSDEC as an impaired water body. Stormwater runoff has been identified as one of the causes of the water quality impairment.

Please refer to the attached conceptual plans and cost estimate. The location of the existing channel and the proposed bioswale/shallow wetland is shown below.

The existing 250 foot long earthen open channel and village "green" would be converted into an approximately 0.5 acres of bioswale/shallow wetland. During dry antecedent conditions, the swale would promote infiltration and filtering of stormwater and attenuate peak stormwater velocities with extended detention. During wet antecedent conditions, the swale would function as a shallow wetland and provide treatment and peak flow attenuation of stormwater runoff. The project will be designed with the guidance of the NYSDEC Stormwater Management Manual.

Please see the attachments to this application for further detail. Concurrently with Project 1, eleven (11) stormwater filters will be installed at 11 existing storm basin locations at and near the North Common Area on Pantigo road, Hook Mill Road, Accabonac Road, Main Street and North Main Street. These filters will contribute to removal of the pollutants of concern. Detailed quote provided.

Project 2: Village Green at Town Pond: Design and implementation of micropools/swales.

This effort will improve an open lawn area locally known as the Village Green to better control stormwater runoff. This lawn area receives extensive stormwater runoff from SR27, SR114 and the Main Street Core Commercial area. The Green area overflows into Town Pond which is connected by culvert to a feeder stream of Hook Pond. Please refer to the attached conceptual plans and cost estimate. The location of the existing Green and the proposed micropools/swales is shown below.

The project would excavate areas in the green to create micropools/swales during wet weather. Approximately 0.25 acres of the Green would be excavated to a depth of 12 to 18 inches and replanted with turf grass. The Green is already managed using organic landscaping methods. During dry antecedent conditions, the swale would promote infiltration and filtering of stormwater and attenuate peak stormwater velocities with extended detention. During wet antecedent conditions, the swale would function as a shallow wetland and provide treatment and peak flow attenuation of stormwater runoff. The project will be designed with the guidance of the NYSDEC Stormwater Management Manual. Please see the attachments to this application for further detail.

Concurrently with Project 2, eight (8) stormwater filters will be installed at existing storm basins at the Village Green. Please see the attached detailed quote.

Budget: Design costs are estimated by the Village Engineer to comprise 5% of the development cost for each of Projects 1 and 2. The budget is therefore broken down as follows: North Hook Mill Green: Design $1,400; Development $26,600. Total $28,000.

Village Green/Town Pond: Design $2,250; Development $42,750. Total $46,000.
Filters: North Hook Mill Green: $11,350. Town Pond Village Green: $8,400.

Total project cost $92, 750.

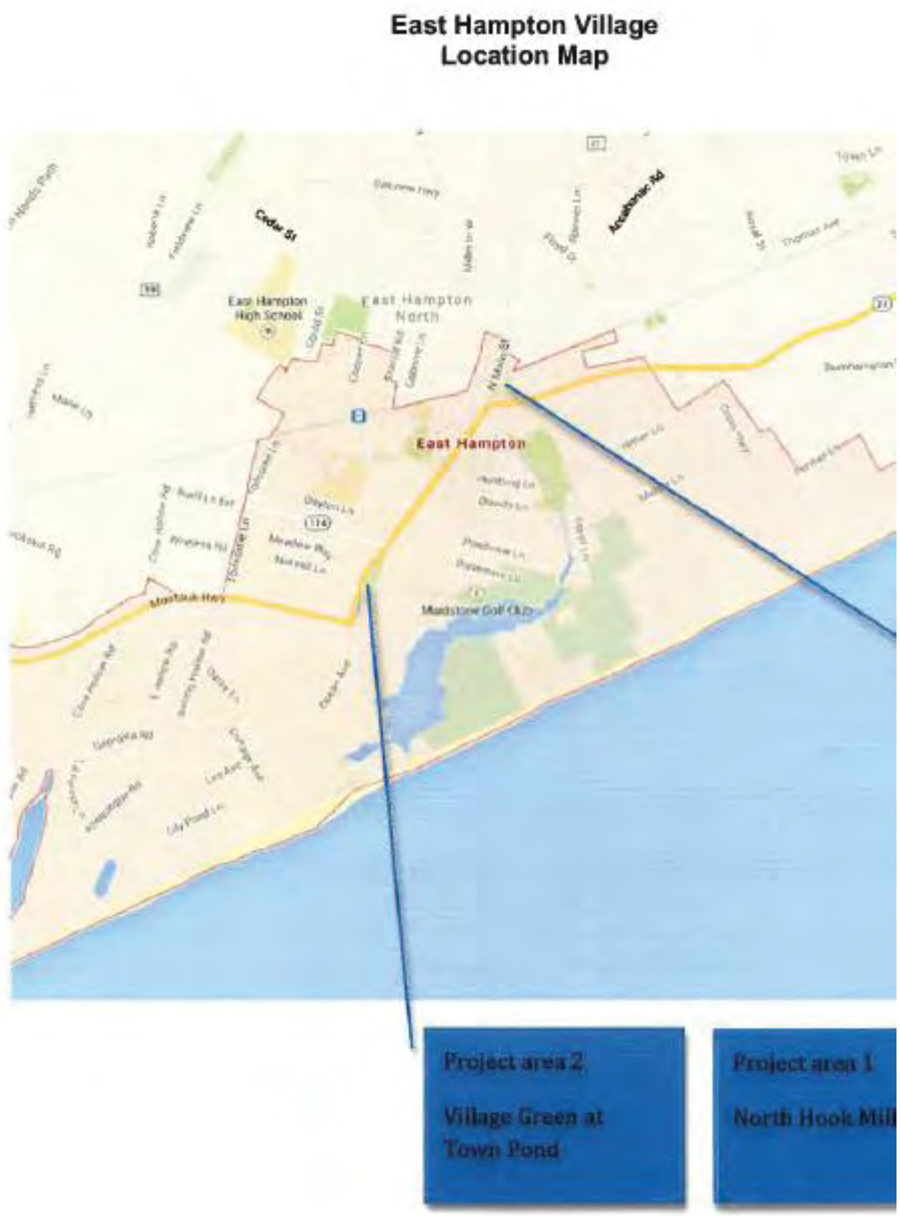
Water quality benefits:

The Village Consulting Engineer estimates POC reduction of 40-60% in N and P by the bioswales. The drain inserts are shown to be 80% effective in removing bacteria.

The Village has coordinated a Hook Pond Water Quality Committee that is fully supportive of these projects, and is actively involved in the current watershed plan being completed by the Village. Maintenance will be conducted by the Village Department of Public Works as part of its ongoing, routine maintenance program as follows:

* Inserts will need to be cleaned annually at a minimum with a vac-truck. The Village has such a truck and will perform such work in house.

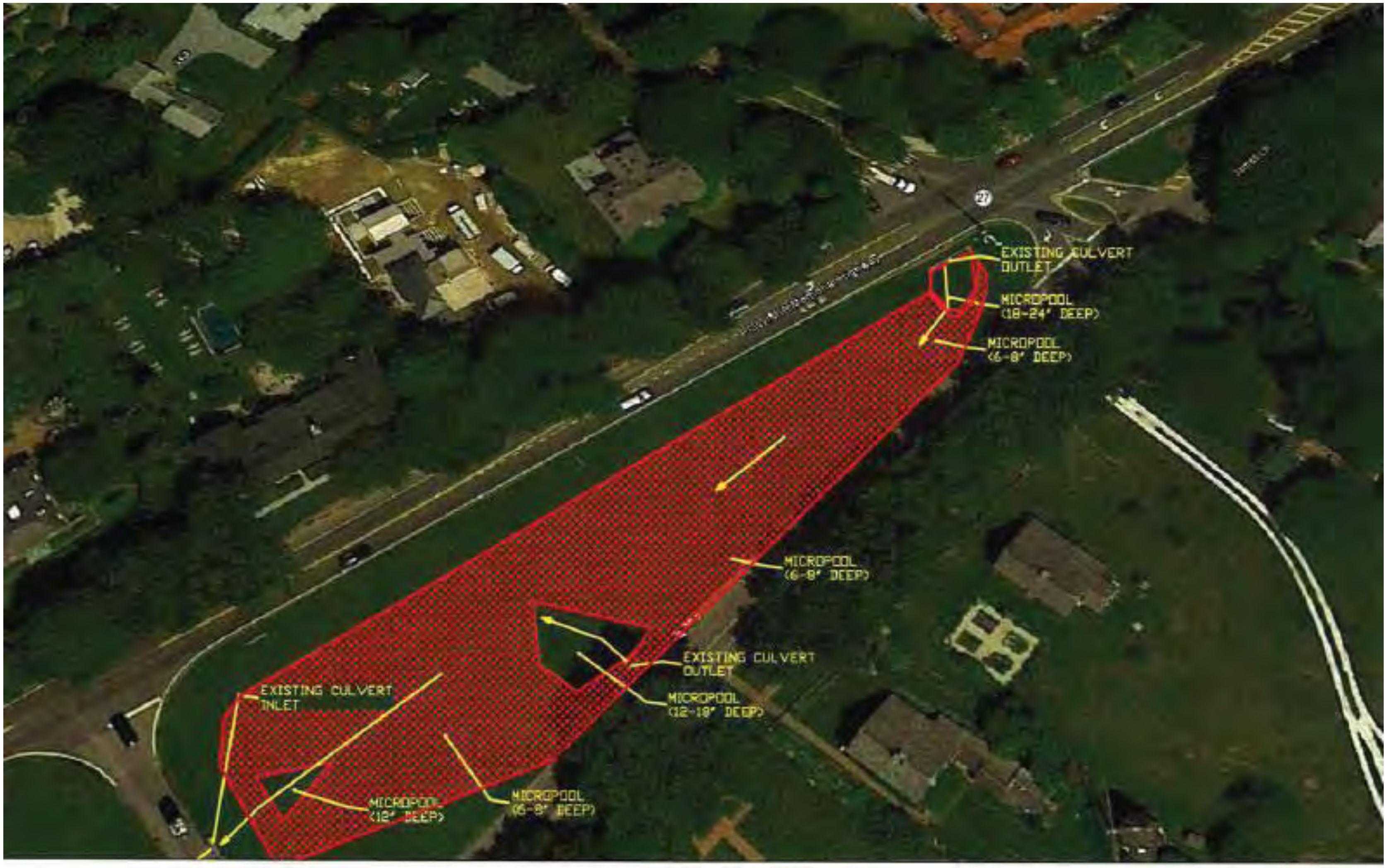
* Inserts will need cartridges replaced annually at a minimum, those cost will be included in our



annual stormwater budget as we use the inserts elsewhere.

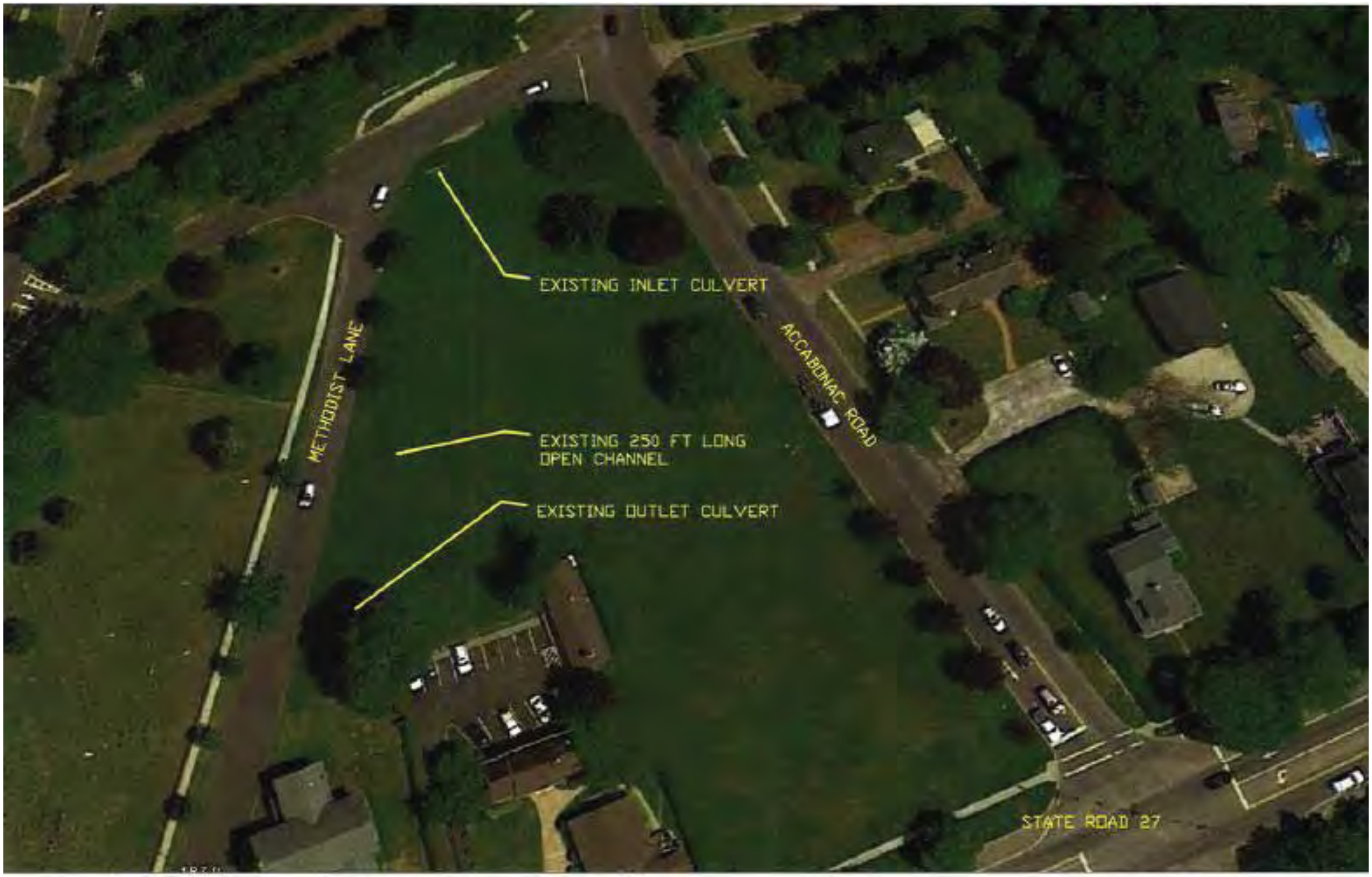
* Bio-swales will be mowed as appropriate weekly.

* Locations where new plants are introduced will need to be monitored to control invasive and non-native species to allow new plants to establish themselves. Areas will also be monitored for debris and function with corrective measures taken when appropriate.



SHEET		SCALE	DATE		
1	RETROFIT GREEN	AS NOTED	02.17.15	**VILLAGE GREEN - MICROPOOLS/SWALES** HOOK POND WATER QUALITY IMPROVEMENT PROJECT #2 INC. VILLAGE OF EAST HAMPTON, NEW YORK	**D.B. Bennett, P.E., P.C. | Consulting Engineer** 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

SHEET		SCALE	DATE		
2	WATERSHED	AS NOTED	02.17.15	**VILLAGE GREEN - MICROPOOL/SWALES** HOOK POND WATER QUALITY IMPROVEMENT PROJECT #2 INC. VILLAGE OF EAST HAMPTON, NEW YORK	**D.B. Bennett, P.E., P.C. | Consulting Engineer** 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)



SHEET		SCALE	DATE		
1	EXISTING OPEN CHANNEL	AS NOTED	02.17.15	NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	D.B. Bennett, P.E., P.C. | Consulting Engineer 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

SHEET		SCALE	DATE		
2	PROPOSED BIOSWALE/WETLAND	AS NOTED	02.17.15	**NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND** HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	**D.B. Bennett, P.E., P.C. | Consulting Engineer** 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

SHEET		SCALE	DATE		
3	WATERSHED	AS NOTED	02.17.16	**NORTH HOOK MILL GREEN - BIOSWALE/SHALLOW WETLAND** HOOK POND WATER QUALITY IMPROVEMENT PROJECT #1 INC. VILLAGE OF EAST HAMPTON, NEW YORK	**D.B. Bennett, P.E., P.C. | Consulting Engineer** 3 Railroad Avenue, P.O. Box 1442 East Hampton, NY 11937 631-907-0023(T) 631-329-0324(F)

APPENDIX G – PHRAGMITES REMOVAL PROJECT

New York State Department of Environmental Conservation
Division of Environmental Permits, Region One
Building 40 - SUNY, Stony Brook, New York 11790-2356
Phone: (631) 444-0365 • **FAX:** (631) 444-0360
Website: www.dec.state.ny.us

INC VILLAGE Received OCT 29 2007 OF E HAMPTON

Denise Sheehan
Commissioner

MODIFICATION TO PERMIT

Date: October 24 2007

To: Village of East Hampton
86 Main St
East Hampton NY 11937

DEC No.: 1-4724-01510/00001

Permit(s): Article 24 : Freshwater Wetlands

Project Location: Hook Pond, Ocean Avenue, & Dunmere Lane, East Hampton

The Department of Environmental Conservation has completed its review of your request to amend the referenced permit. This permit authorizes the removal of *Phragmites australis* and control of future growth by both mechanical (hydro-rake) and manual means.

We have determined, pursuant to the Uniform Procedures Act and Tidal Wetlands Land Use Regulations (6NYCRR Parts 621 and 661 respectively) that the requested changes will not exceed the scope of the original permit and can, therefore, be approved.

The permit is hereby amended expand the scope of the permitted work to additional areas of Hook Pond, specifically to use the hydro-rake at locations designated 2A, 2B, 2C and 2D and to manually cut Phragmites at other areas along the shoreline. The permit if further amended to allow the use of a land-based excavator at location 1 on the original approved plan (a copy of which is enclosed) All features shall conform to the attached site plans prepared by The Nature Conservancy and dated March 2006 and March 2005. The latter was stamped approved on 9/19/2006.

All other terms and conditions remain as written in the original permit and its amendment dated November 3 2006. In addition, the following Special Conditions have been added:

7. The long reach excavator may be used in the high or low marsh only with the use of crane mats.

8. Without the use of crane mats the long reach excavator must be kept on existing paved areas, grass, or previously cleared sandy areas.

9. No natural vegetation other than Phragmites may be disturbed.

10. The biomass created by removing Phragmites must be removed from the work areas to allow for the regrowth of native vegetation.

This document is an amendment to the original permit, and, as such, must be available on the project site with the original permit and approved plans whenever authorized work is being conducted.

If you have any questions or wish to discuss this determination, please contact your Project Manager, Karen Westerlind, at 631-444-0365.

Very truly yours,

George W. Hammarth

George W. Hammarth
Deputy Regional Permit Administrator

ksw

Enclosures: 2

cc: Bureau of Habitat
The Nature Conservancy

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 1
SUNY @ Stony Brook 50 Circle Road, Stony Brook, NY 11790-3409
Phone: (631) 444-0365 • **Fax:** (631) 444-0360
Website: www.dec.ny.gov

Joe Martens
Commissioner

PERMIT RENEWAL

August 29, 2011

Mr. Larry Cantwell, Village Administrator
Village of East Hampton
86 Main Street
East Hampton, NY 11937-2730

Re: Permit # 1-4724-01510/00001
Hook Pond Phragmites Removal
Ocean Avenue & Dunemere Lane East Hampton

Dear Permittee:

The Department of Environmental Conservation (DEC) is in receipt of your request to renew or extend the above referenced permit and the request has been reviewed pursuant to the Uniform Procedures Regulations (6NYCRR Part 621). In order to continue to conduct authorized activities the permit is hereby extended to **September 30, 2016**.

This letter is a modification to the original permit and must be available at the permitted site whenever authorized work is in progress.

All other terms and conditions remain as written in the original permit and subsequent modifications.

Sincerely,

Laura Scovazzo
Permit Administrator

cc: D. Lewis/BOH
File

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 1
SUNY @ Stony Brook
50 Circle Road, Stony Brook, NY 11790-3409
Phone: (631) 444-0365 • **Fax:** (631) 444-0360
Website: www.dec.ny.gov

Joe Martens
Commissioner

Modification of Permit

The Maidstone Club
PO Box 5110 50 Old Beach La.
East Hampton, NY 11937

January 14, 2015

Re: Permit # 1-4724-00075 / 00014 Maidstone Club Golf Course Vegetation Control Permit

Dear Permittee:

The Department of Environmental Conservation has completed its review of your September 22, 2014 request for reissuance and expiration date extension of the referenced Freshwater Wetlands permit; which authorizes the mowing, trimming and clearing of vegetation in the adjacent area of the freshwater wetland associated with the Hook Pond system as part of the maintenance of the existing Maidstone Club golf course.

We have determined, pursuant to the Uniform Procedures Regulations and the Freshwater Wetlands Permit Requirements Regulations (6 NYCRR Parts 621 & 663, respectively), that the permit may be reissued and extended. Accordingly, the permit is hereby reissued and extended to its final expiration date of June 7, 2015.

All terms and conditions remain as written in the original permit and previous modifications. This letter is a modification of the permit, and, as such, must be available with the original permit and all approved plans whenever regulated activities are being conducted on the site.

I can be reached at (631) 444-0371 or george.hammarth@dec.ny.gov if you have any questions or need to discuss this determination. Thank you for your attention in this matter.

Sincerely,

George W. Hammarth
Deputy Regional Permit
Administrator

Enclosure
cc: BOH-FW
file

95-20-1 (11/03) -9d

New York State

Department of Environmental Conservation

NOTICE

The Department of Environmental Conservation (DEC) has issued permit(s) pursuant to the Environmental Conservation Law for work being conducted at this site. For further information regarding the nature and extent of the approved work and any Department conditions applied to the approval, contact the Regional Permit Administrator listed below. Please refer to the permit number shown when contacting the DEC.

Permit Number 1-4724-00075/00014 Regional Permit Administrator

JOHN W. PAVACIC

Expiration Date 6/30/2014

Extended to June 15, 2015

NOTE: This notice is **NOT** a permit

Hook Pond, East Hampton, NY

Attachment 4

Phragmites and Natural Vegetation On The Shoreline

Hook Pond Restoration Project

February 2007 Status Report

Prepared by The Nature Conservancy

Little Hook Pond Shoreline Before Start of Project—11/2006

Little Hook Pond Shoreline after Cutting and Digging Phragmites-12/2006

BACKGROUND

The Hook Pond Association, the Maidstone Club, the Village of East Hampton and The Nature Conservancy joined forces in 2005 on a program to restore the health of Hook Pond. This work began with a study of land use practices impacting the water and shoreline that are contributing to the dominance of an invasive plant, phragmites. The aerial below dated March 2006 (Figure 1) shows how widespread phragmites was on the pond at the onset of this project. Approximately 40% of the shoreline had natural vegetation, less than 5% of the shore was classified as mixed vegetation, about 2% had bulkhead, lawn or fairway directly in contact with the pond waters, and at least half of the shoreline contained a monoculture of phragmites, virtually devoid of other plants. Much of this phragmites is a narrow fringe at the water-land interface, with natural vegetation occurring landward of the phragmites band. In addition to destroying viewsheds, this invasive plant is displacing native vegetation, and in the process, diminishing not only plant diversity, but the diversity of insects, birds and fish.

Figure 1

At Maidstone Club hole 6 (see Figure 2b below), the low-impact cutter cut 3.7 acres of the approximate 5.1 acres of dense phragmites. As at Little Hook Pond, the remaining phragmites could not be cut mechanically because they are interspersed with native vegetation.

Figure 2b

LOW-IMPACT CUTTER AT MAIDSTONE CLUB HOLE 6, BEFORE (LEFT) AND AFTER (RIGHT). 11/2006

The hydro-rake and transporter could not be launched in the pond on November 6-7 because of low water levels (16.5 inches as measured at the culvert), so they were transported back to Allied's home base in New Jersey

The machines returned on November 20 when rains had raised the water level enough to launch the machines (the water level has to be approximately 22 inches or higher). Between November 20 and December 20, the hydro-rake and transporter operated a little over 100 hours, digging phragmites and transporting it to shore, where it was offloaded for the East Hampton Village pay-loader to collect and remove.

The hydro-rake seemed to work well overall in Little Hook Pond, removing phragmites from much of the 2,546 foot shoreline. In some cases, the machine was able to remove a significant amount of phragmites roots and rhizomes; in other cases, it had trouble digging into the ground. In particular, it had trouble working in the shallow sections (<10 inches deep), because of limited access. As we explain below, we won't know how much phragmites was successfully removed until next growing season during late April or early May.


LITTLE HOOK POND - HYDRO-RAKE WITH FULL LOAD OF PHRAGMITES ROOTS AND RHIZOMES (LEFT); AND THEN TRANSFERRING DUG MATERIAL TO TRANSPORTER (RIGHT). 12/2006


LITTLE HOOK POND, LOOKING NORTH FROM VILLAGE PARKING LOT, BEFORE HYDRO-RAKING, 11/2006 (LEFT); AND AFTER HYDRO-RAKING, 12/2006 (RIGHT)

Outside of Little Hook Pond, in the area marked "C" on the aerial (see Figure 3 below), the pond bottom was too hard for the machine to dig well, at least initially. More material could be dug a few days later during a second pass at that site, presumably because the early digging allowed water to infiltrate and soften the pond bottom. Approximately half of the .32 acre phragmites stand was removed along the 311-foot shoreline in this area.

Figure 3

The same situation existed for the Maidstone Club property around hole 6, i.e., exploratory digging by the hydro-rake during the fall encountered hard ground. For this reason, and because of the high cost of transporting any dug material to a location on the shore accessible by dump truck, very little time was spent hydro-raking at hole 6.

Instead, Allied focused on removing phragmites on the shoreline from hole 6 southwest to the culvert ("D" to "E" on the aerial in Figure 3, above). Again, we won't know how thoroughly the hydro-rake removed the underground portion of the phragmites until next growing season, but we think it was effective on much of this 1,323 foot shoreline, as it appears to have been in Little Hook Pond.

LESSONS LEARNED AND IMPLICATIONS FOR FUTURE WORK: This report will be used to review the project with stakeholders and determine how best to proceed with a plan for spring 2007 and beyond. As stated above, the agencies that granted the permits recognize that this work is a pilot and is experimental in nature, and therefore it is important that the project be based on an adaptive management approach as each phase progresses.

- We will contract with two landscaping companies this winter to manually cut the remaining phragmites in Little Hook Pond and Maidstone Club hole 6. The landscaping companies will hand-clip the phragmites that could not be mowed by the low-impact cutter because they are interspersed with native plants (i.e. they are not pure stands of phragmites). Even though cutting these phragmites will not kill them at this time of year, it is worth doing for aesthetic and programmatic reasons.

- Also this winter, we will contact those Hook Pond property owners affected by phragmites to develop a site specific control program that will include a combination of mechanical and manual cutting and digging. Note that this work must be done under the auspices of East Hampton Village and The Nature Conservancy, the permitee and agent respectively, for the existing permits.

- We know that the low-impact cutter works quickly and efficiently. It cut 5 acres of pure phragmites stands (1.3 acres at Little Hook Pond and 3.7 acres at Maidstone Club hole 6) in less than two days. We should plan on using the low-impact cutter again this spring, either by contracting with Allied, or renting/purchasing one for the project. Frequent mowing (weekly or bi-weekly during the growing season) would weaken, and possibly eventually kill, the phragmites.

- In terms of future use of the hydro-rake, as mentioned above, we won't know how much phragmites remains in the treated areas until the growing season is underway in late April or early May. If at this time, results look to be positive, then Allied could do the work in the spring rather than wait until the fall.

- If we decide to use the hydro-rake at Maidstone Club hole 6, we need to find a way to get trucks onto the course to collect the material (temporary plywood "road"), and/or find a more efficient transporter.

- We will monitor how much phragmites versus native vegetation re-colonizes and if natural re-establishment by native species seems to be occurring too slowly, we are allowed to replant selected areas.

In October 2006, The Nature Conservancy, acting as agent for the Village of East Hampton (the permitee), obtained the necessary permits to begin restoration work in Hook Pond from the New York State Department of Environmental Conservation (NYDEC) as well as the East Hampton Town Trustees. The permits allow for the cutting and digging of phragmites for a period of five (5) years: cutting can be done manually or by a machine called a low-impact cutter; digging also can be done either manually or by a machine called a hydro-rake. Hydro-raking actually involves the use of two machines: the hydro-rake, and a transporter that receives dug material from the hydro-rake and transports it to shore. The machinery cannot be used in areas where it would destroy native vegetation in the process of digging out the phragmites. It is important to note that this project is experimental in nature; the permitting agencies recognize that future work will be based on an adaptive management approach.

STATUS REPORT: The Conservancy contracted with Allied Biological, Inc. ("Allied"), a company that specializes in lake and pond restoration, and phragmites control in both fresh and salt water environments. Allied performed work during the period November 6 to December 20, 2006. On November 6 and 7, a low-impact cutter was used on the shore of Little Hook Pond ("A" on Figure 1) and Maidstone Club hole 6 ("B" on Figure 1). This machine, working on the shore and in the water to a depth of about 12 inches, cut the phragmites stems at ground level.

At Little Hook Pond (see Figure 2a below), the low-impact cutter cut 1.3 acres of the approximate 1.67 acres of dense phragmites. Remaining stands of phragmites could not be cut mechanically because they are interspersed with native vegetation.

Figure 2a

APPENDIX H - GUIDANCE VALUES FOR RECREATIONAL WATERWAYS IN U.S STATES

State	Recreational Water Guidance/Action Level	Recommended Action
California	Microcystin: 0.8 µg/L Anatoxin-a: 90 µg/L Cylindrospermopsin: 4 µg/L	Advisory
Connecticut	-Visual Rank Category 1: Visible Material is not likely cyanobacteria or water is generally clear. -Visual Rank Category 2: Cyanobacteria present in low numbers. There are visible small accumulations but water is generally clear. -Visual Rank Category 3: Cyanobacteria present in high numbers. Scums may or may not be present. Water is discolored throughout. Large areas affected. Color assists to rule out sediment and other algae.	-Visual Rank Category 3, or blue-green algae cells > 100k/ml: POSTED BEACH CLOSURE (If public has beach access, alert water users that a blue-green algae bloom is present), POSTED ADVISORY (At other impacted access points)
Illinois	Microcystin-LR concentration results approach or exceed 10 µg/L	Reporter of HAB event and the local lake management entity will be informed immediately.
Indiana	Level 1: very low/no risk < 4 µg/L microcystin-LR Level 2: low to moderate risk 4 to 20 µg/L microcystin-LR Level 3: serious risk > 20 µg/L microcystin-LR Warning Level: Cylindrospermopsin: 5 ppb	Level 1: use common sense practices Level 2: reduce recreational contact with water Level 3: consider avoiding contact with water until levels of toxin decrease
Iowa	Microcystin ≥ 20 µg/L	Caution - bloom present no toxin data available Warning - when toxin levels exceed 20 µg/L
Kansas	PHA: >4 µg/L to <20 µg/L for microcystin or > 20,000 cell/mL to <100,000 cell/mL cyanobacteria cell counts PHW: > 20 µg/L or > 100,000 cell/mL cyanobacterial cell counts and visible scum present	Public Health Advisory (PHA): avoid contact Public Health Warning (PHW): all contact with water is restricted
Kentucky (Louisville District)	Advisory: >20,000 cells/mL of cyanobacteria cell counts Caution: > 100,000 cells/mL of cyanobacteria cell counts	Advisory: contact discourage, water may be unsafe Caution: Closure, contact prohibited
Massachusetts	14 µg/L for microcystin-LR and ≥ 70,000 cells/mL for cyanobacteria cell counts	Advisory - Avoid contact with water
Nebraska	Microcystin ≥ 20 µg/L	Health Alert
New Hampshire	>50% of cell counts from toxigenic cyanobacteria	Public Health Advisory

North Carolina	Visible discoloration of the water or a surface scum may be considered for microcystin testing	Advisory/Closure
Ohio	Microcystin-LR: PHA: 6 µg/L; NCA: 20 µg/L Anatoxin-a: PHA: 80 µg/L; NCA: 300 µg/L Saxitoxin: PHA: 0.8 µg/L; NCA: 3 µg/L Cylindrospermopsin: PHA: 5 µg/L; NCA: 20 µg/L	Public Health Advisory (PHA) - swimming and wading are not recommended, water should not be swallowed and surface scum should be avoided. No Contact Advisory (NCA) -recommend the public avoid all contact with the water
Oklahoma	100,000 cell/mL of cyanobacteria cell counts and > 20µg/L for microcystin	Blue-Green Algae Awareness Level Advisory
Oregon	Option 1: Visible scum and cell count or toxicity Option 2: Toxigenic species >100,000 cells/mL Option 3: Microcystis or Planktothrix > 40,000 cells/mL Option 4: Toxin Testing Microcystin: 10µg/L Anatoxin-a: 20 µg/L Cylindrospermopsin: 6µg/L Saxitoxin: 100 µg/L	Public Health Advisory
Rhode Island	Visible cyanobacteria scum or mat and/or cyanobacteria cell count > 70,000 cells/mL and/or ≥14 µg/L of microcystin-LR	Health Advisories
Texas	>100,000 cell/mL of cyanobacteria cell counts and >20µg/L microcystin	Blue-Green Algae Awareness Level Advisory
Vermont	4,000 cells/mL cyanobacteria cell counts or ≥ 6µg/L microcystin-LR and the visible presence of cyanobacterial scum Anatoxin-a ≥ 10 µg/L	Beach Closure
Virginia	5,000 to <20,000 Microcystis cells/mL 20,000 to 100,000 Microcystis cells/mL > 100,000 Microcystis cells /mL, or > 6 µg/L microcystin concentration, or Blue-green algal "scum" or "mats" on water surface	Local agency notification; initiate bi-weekly water sampling Public notification indicating a harmful algal bloom is present in recreational water; initiate weekly sampling Immediate public notification to avoid all recreational water contact where bloom is present; continue weekly sampling
Washington	Microcystin-LR: 6 µg/L Anatoxin-a: 1 µg/L Cylindrospermopsin: 4.5 µg/L Saxitoxin: 75 µg/L	Tier 1. Caution: when a bloom is forming or a bloom scum is visible (toxic algae may be present) Tier 2. Warning: Toxic algae present Tier 3. Danger: Lake closed
Wisconsin	> 100,000 cells/mL or scum layer	Advisory/Closure