Final Report

To

The Manhasset Bay Protection Committee

Concerning Historic and Future Water Quality Monitoring

December, 2008

From

LabLite LLC

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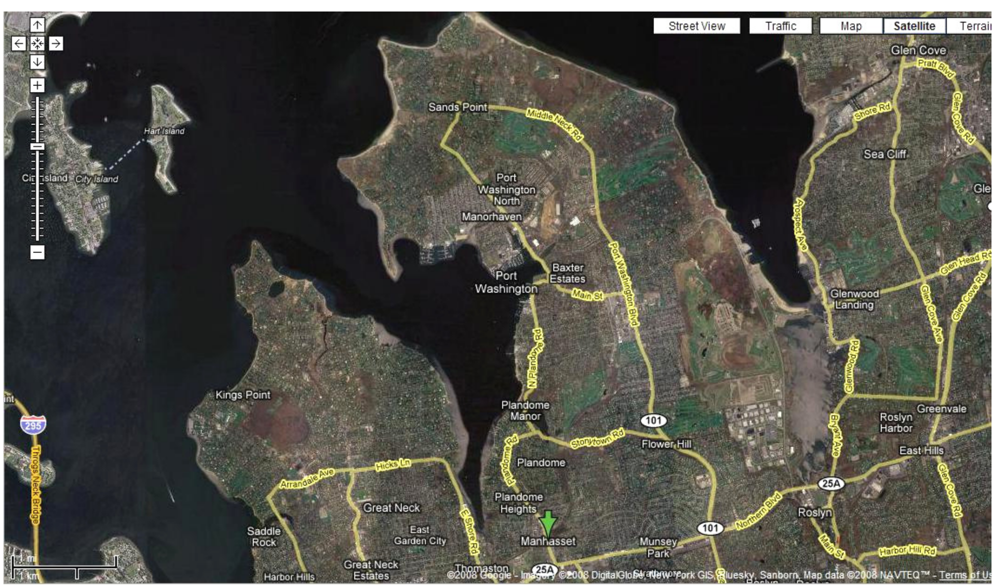


Executive Summary

From 1996 to 2004 the Nassau County Department of Health and/or the local sewer districts conducted a seasonal water quality monitoring program by taking samples and recording observations by boat from six locations (sometimes more) around the Bay. Since 2005 the Manhasset Bay Protection Committee with help from the Town of North Hempstead and the Little Neck Power Squadron has continued to take samples that were sent to the Nassau County Department of Health Laboratory for analysis. Some of the results were handwritten on paper and more recently recorded on spreadsheets.

LabLite LLC has transcribed and imported this data into a software program that allows users to mine the data and generate graphs to discern trends and possibly answer the question as to whether water quality is improving, declining or remaining consistent. Analytes recorded included: wave height, wind direction, wind speed, weather conditions, water temperature, air temperature, total coliform bacteria, fecal coliform bacteria and enterococcus bacteria.

When reviewing all the historic data and looking for trends and correlations, we would hope to come to some definitive conclusions about what areas are problematic or when water quality is more impaired. Unfortunately, the data is scattered and inconsistent and does not easily indicate any clear cut trends. This does not imply that the data is unimportant, but it does indicate that water quality is variable from year to year, week to week and site to site.

We believe that the MBPC should revise its monitoring program by selecting some alternate parameters to monitor that may allow for better possibilities for correlations. A revised program should also be similar to other monitoring programs found in New York Harbor, Hempstead Harbor, Oyster Bay/Cold Spring Harbor, Long Island Sound and Connecticut.

A revised list of parameters could include: sampler's observations (color, smell, floatables), recent rainfall events and severity, Secchi disk transparency, conductivity (salinity), dissolved oxygen (@ three depths), tidal stage, water temperature and nutrients (if affordable) along with historically tested fecal coliform bacteria and enterococcus bacteria (if necessary).

A new site at the mouth of the bay could be added to determine how much influence incoming tides from Long Island Sound have on the bay. After all, there are many large sewage treatment plants and storm water outfalls discharging nearby that could impact water quality much more than local sources.

Therefore, we would strongly recommend that the MBPC revise its monitoring program to be more consistent with other regional programs and allow for direct comparison of data with other discreet locations. The proposed program would be inexpensive and easy to manage. The ongoing data will be stored in a "user friendly" database that can be compared to historic results or accessed via reports, data mining tools, or trend graphs.

These revisions to the monitoring program and use of LabLite PC LIMS software will become an ongoing resource for scientists, students and the interested public.

Acknowledgements

LabLite would like to thank the member municipalities of the Manhasset Bay Protection Committee and their representatives for their ongoing work to improve the water quality in the estuary and educate users of this resource. Both Patrice Benneward and Jennifer Wilson-Pines have been able coordinators and points of communication leading us to appropriate contacts and resources.

We would also like to thank Mal Nathan, Town of North Hempstead Bay Constable, and Joel Ziev, Town of North Hempstead's Water Advisory Commission, for the time they took showing the harbor by boat on two occasions.

Andy Hyman, Town of North Hempstead Legal Department, was in charge of contractual details.

John Jacobs, Nassau County Department of Health was also instrumental in backing this project and providing testing services.

The Town of North Hempstead's IT staff have been and will continue to be the point of contact for the LabLite PC LIMS software program that holds the historic testing results and will be the repository for future information.

The Port Washington Water Pollution Control Authority (Bob Breslin), The Great Neck Water Pollution Control District and the Village of Great Neck Water Pollution Control District provided data on the three sewage treatment plant design and discharges.

Peter Sattler from the Interstate Environmental Commission, Long Island Sound Study provided test results and sources of data that were invaluable in gaining a broader knowledge of trends for water quality in New York Harbor and Long Island Sound.

Although there may be other names that should be mentioned, we regret the oversight of your contributions to this project.

Introduction & Scope of Work Description

Manhasset Bay suffers from impaired water quality. We know that the waters could be cleaner, but this is a tall order for everyone who strives to improve the resource. With the highly developed watershed around the bay and the tidal flows bringing in water that is already influenced by New York City, Connecticut and their discharges and run-offs, one can only expect incremental improvements over time.

The MBPC has been monitoring the bay for many years to help identify sources of contamination and the degree and seasonality of water quality impairments that negatively impact the public's use and enjoyment of the water resource.

In 2007 the MBPC contracted LabLite LLC, a water quality consulting and data analysis firm based in Connecticut to perform the following scope of work:

Project Description: *(from contract language)*

The goal of the analysis is to identify gaps in data, describe discernable trends, outline future monitoring needs, and suggest three possible water quality monitoring strategies in the context of their cost and the new information they are likely to reveal. Toward this end, the report should address (but not be limited to) the following questions:

1) Are there temporal trends (differences among years or within particular years) that may provide information about the status of conditions over time (i.e., is water quality improving, declining, or remaining static) or that indicate the desirability of a monitoring program that targets specific months or seasons?

2) Are there spatial trends (differences among sampling locations) that might indicate that different monitoring sites should be selected or that the number of samples collected should be increased?

3) How do factors such as precipitation and tidal stage affect parameters; should these factors be targeted for study?

Once these and other questions that become evident during the analysis are addressed, the information will be used to design three monitoring strategies that will describe the parameters to be measured, where and when samples should be collected, and how often monitoring should occur. The recommended programs should identify what gaps the program can be expected to close and how much the program is likely to cost.

Materials & Methods

LabLite LLC was awarded the contract to perform the work above. In order to accomplish the deliverables, we proposed as a first step that all the historic testing data that was available be entered into our software program, LabLite Process Control SQL LIMS. The historic data was both on handwritten sheets (1996-2001) and MS Excel files (2002-2007).

We configured our LabLite PC software to accept this data and spent many days of labor to both hand enter and import the data. Once the set-up and data input were complete, we reviewed the data for accuracy, normalized how it was recorded and converted text to numeric values so that meaningful trends and correlations could be easily discerned.

The LabLite PC program will be installed on a Town of North Hempstead server so that researchers can use the data mining tools and reports to analyze the history of water quality in Manhasset Bay. Some users will be trained on how to use the LabLite PC screens, graphing and report generation tools. All the historic data provided is now available and should be accurate.

Going forward, the LabLite PC software will be used for entering results and can be readily configured to reflect any changes in the monitoring program. LabLite staff will identify qualified individuals to be assigned the role of "administrator" and will provide extra training so that security, user access rights and back-up plans are in place.

Reclaimed waterfront from Shore Road

Comments on current monitoring program:

Data gaps are noted in that not all sites have been consistently monitored since 1996. For instance, several beaches have been added in both 2001 and 2003. We also were not given data for many of the non-beach sites after 2002. These include Broadlawn Harbor Yacht Club, Leed's Pond, Mill Pond, etc.

The current parameters being measured have limited efficacy for evaluating the health of the Bay. The most important of these, fecal coliform bacteria and enterococci, determine if beach closings are necessary and are monitored by the Nassau County Dep't of Health.

LabLite PC data includes information from the following sampling sites: some in Manhasset Bay and others in nearby harbors and the South Shore. The data can be used for comparative analyses, if needed by researchers. Nassau County Dep't of Health site codes correlate to specific sampling locations.

Kennelworth	MB-2 (MBPC.)	MB
Manorhaven	MB-3	MB
Nun 4	MB-4	MB
Baxter Beach	MB-5	MB
Shelter Harbor Marina	NSA- 1 (North Shore)	MB
Broadlawn Harbor	NSA- 2	MB
Leeds Pond	NSA- 3	MB
Manhasset Bay Estates	NSA- 4	MB
Baxter Pond	NSA- 5	MB
Mill Pond	NSA- 6	MB
Baxter Estates Beach	NSA- 7	MB
Roslyn Pond Spillway	NSA- 8	HH
Roslyn Viaduct	NSA- 9	HH
Powerhouse Drain	NSA-10	HH
Scudder's Pond	NSA-11	HH
Cedar Swamp Creek	NSA-12	Merrick, South Shore
ManorHaven Beach	NSB-1 (North Shore Beaches)	MB
ManorHaven Beach - Right	NSB-1A	MB
ManorHaven Beach - Left	NSB-1B	MB
IBM Beach	NSB-2	HH
IBM Beach - Right	NSB-2A	HH
IBM Beach - Left	NSB-2B	HH
Bar Beach	NSB-3	HH
Bar Beach - E End	NSB-3A	HH
Bar Beach - W End	NSB-3B	HH
Hempstead Harbor Beach	NSB-4	HH
Hempstead Harbor Beach-N End	NSB-4A	HH
Hempstead Harbor Beach-S End	NSB-4B	HH
Tappen Beach	NSB-5	HH
Tappen Beach - N End	NSB-5A	HH
Tappen Beach - S End	NSB-5B	HH
Sea Cliff Village Beach	NSB-6	HH
Sea Cliff Beach - W End	NSB-6A	HH
Sea Cliff Beach - E End	NSB-6B	HH
Laurel Hollow Beach - East End	OB-1 (Oyster Bay)	OB
Laurel Hollow Beach - West End	OB-1A	OB
Laurel Hollow Beach	OBA-4	OB

Roosevelt Beach	OBA-5	OB
Hewlett Point Beach	SSB-1 (South Shore Beaches)	
Hewlett Point Beach - Right	SSB-1A	
Hewlett Point Beach - Left	SSB-1B	
Island Park Village Beach	SSB-2	
Harbor Isle Beach Club	SSB-3	
Harbor Isle Beach Club - Right	SSB-3A	
Harbor Isle Beach Club - Left	SSB-3B	
Merrick Estates Civic Assoc.	SSB-4	
Florence Ave Beach	SSB-6	
Florence Ave Beach - Far Right	SSB-6A	
Florence Ave Beach - Right	SSB-6A	
Florence Ave Beach - Far Left	SSB-6B	
Florence Ave Beach - Left	SSB-6B	
Biltmore Beach Club	SSB-7	
Biltmore Beach Club - Right	SSB-7A	
Biltmore Beach Club - Left	SSB-7B	

Monitoring Parameters & Methods

Bacteria - Water samples are collected in sterile bottles approximately one foot below the water surface. The bottles are then stored in a cooler with ice and transported immediately to a contract laboratory for analysis.

Bacteria are ubiquitous in the environment. Certain types, however, can be used to indicate the possible presence of human pathogens. Common environmental indicator bacteria include fecal and total coliform and enterococci. Bacteria are introduced in the marine environment through various point and non-point sources such as surface water runoff, industrial and agricultural discharges or wastewater discharges. The New York Code of Rules and Regulations (NYCRR) specify levels of total and fecal coliform bacteria that should be met in bodies of water designated for different purposes. Waters used for shellfish cultivation and harvest have to meet the most stringent bacteriological criteria.

Each beach season, samples for bacteria testing are collected twice a week by the Nassau County Department of Health (NCDH) at five beaches around the harbor. These bacteria samples are analyzed at the NCDH laboratory, currently for fecal coliform and enterococci, in (This would describe HH, not MB)

Each beach season, samples for bacteria testing are collected once a week by the MBPC, in cooperation with the TNH Bay Constable and the Little Neck Power Squadron at five locations around the Bay. These bacteria samples are analyzed at the NCDH laboratory, currently for fecal coliform and enterococci.

In 2000 NCDH initiated a preemptive beach-closure program; that is, in addition to beach closings based on bacteria sample results, NCDH instituted preemptive or administrative beach closings following rain events that exceed a threshold level and duration of precipitation. That threshold is established at the beginning of each season based on previous sample results (often ½ inch of rain or more). Therefore, even though water quality has improved remarkably, beach closures started to increase because of the preemptive closure program. As an example, in 2007 the beaches around Hempstead Harbor were closed preemptively for eight days (as was the case in 2006), related to six rain events. The beach closings occurred on 6/28, 6/29, 7/5, 7/18, 7/23, 7/24, 8/8, 8/21, based on a threshold of ½-inch of precipitation over a 24-hour period. It is unknown whether beaches were also closed preemptively in Manhasset Bay.

Beach Closure Standards
In October 2000, Congress enacted the Beaches Environmental Assessment and Coastal Act of 2000 (BEACH Act), which gave EPA the authority to set and impose water-quality standards for coastal beaches throughout the United States and compelled all states to adopt new criteria for determining beach closures by April 2004. The NCDH began doing parallel testing in 2002, using the state's then-current indicator coliform (both total and fecal) along with the proposed indicator, enterococcus. Both coliform and enterococcus are naturally present in the human intestine and, therefore, could indicate the presence of other potentially harmful organisms. (Both coliform and enterococci are present also in the intestines of warm-blooded animals and birds.) EPA considers the enterococcus standard to be more closely correlated with gastrointestinal illnesses and, therefore, more protective of human health. However, there have been only limited studies as to the effectiveness of using the enterococcus standard. A primary advantage in switching to the enterococcus standard is that it takes only 24 hours to obtain results, whereas it takes 48 hours to obtain results using the coliform standard.

The NYS Coliform Bacteria Standards for swimming safety, effective 2004
Total Coliform - LOG AVG 30 days < 2,400 MPN/100ml
Fecal Coliform - LOG AVG 30 days < 200 MPN/100ml, and no sample greater than 1,000 MPN/100ml
Enterococci - LOG AVG 30 days <35 MPN/100 ml, and no sample greater than 104 MPN per 100 ml

Dissolved Oxygen and Water Temperature – Historically, dissolved oxygen (DO) has not been routinely measured by the MBPC. DO and water temperature should be measured at selected monitoring sites. At each station, depth permitting, dissolved oxygen readings could be taken at approximately one half-meter above the bay bottom, one-half meter below the water's surface, and one meter below the surface. The DO data would be measured and recorded in milligrams per liter (mg/l), which is equivalent to parts per million (ppm). The measured values can then compared to ranges that describe the effects of dissolved oxygen on aquatic life, which are well established. In general, dissolved oxygen levels above 5 mg/l are preferred. Levels between 4 and 5 mg/l can cause harm to some species of organisms, especially the larvae of crustaceans such as lobster and crabs. Levels between 2 and 4 mg/l can cause harm to many organisms if exposure is prolonged. When dissolved oxygen levels decline below 2 mg/l, many organisms can be harmed quickly. Few organisms can survive exposure to levels below 1 mg/L for more than very short periods.

According to Interstate Environmental Commission (IEC) Water Quality Regulations, a water body classified as "Class A", as are all the stations included in the IEC survey, must have a minimum dissolved oxygen content of 5 mg/l at all times. Waters of this type are suitable for primary contact recreation, fish propagation and, in designated areas, shellfish harvesting.

Hypoxia (low oxygen) and anoxia (no oxygen) are common water-quality problems that occur during the summer in areas in and around Long Island Sound, particularly in the western sound. DO is indirectly affected by nutrient enrichment, particularly nitrogen, which can enter Manhasset Bay through storm-water runoff, discharges from sewage treatment plants, or leaching from failing septic systems. DO is also influenced by higher water temperatures and stratification.

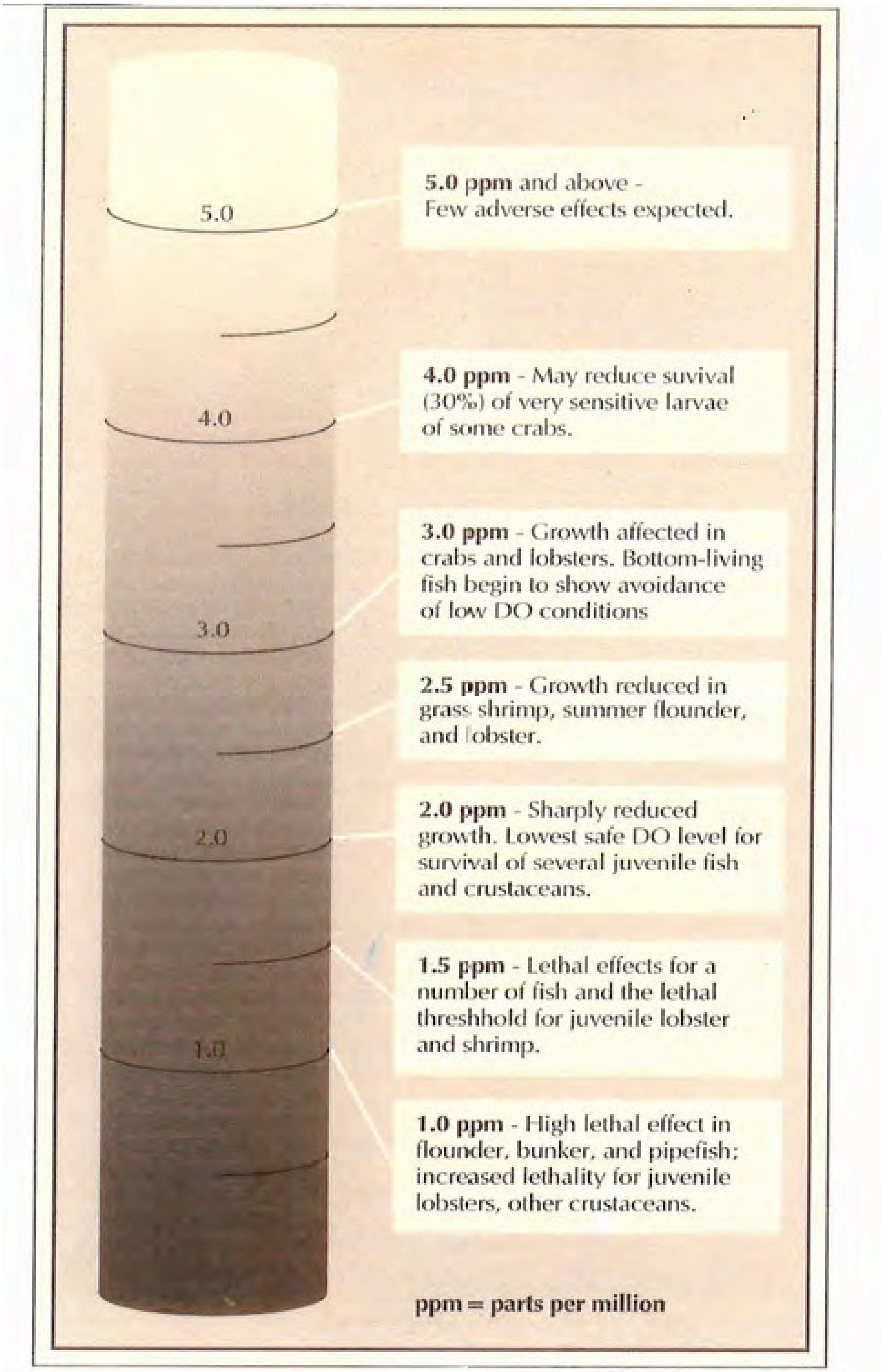
Nitrogen accelerates the growth of phytoplankton or algae and increases the density of organisms that grow. The increased number and growth rate causes frequent or prolonged "blooms". When the cells in the plankton blooms die off, the decomposition process depletes dissolved oxygen that fish, shellfish, and other aquatic organisms need to survive. The larvae of these organisms are often especially sensitive to low DO concentrations. In addition to these direct effects of low DO levels, indirect effects can also occur. Low DO levels can cause some bacteria to produce hydrogen sulfide, which is a gas that can be toxic to fish. Although many algal species produce oxygen during their growth stage through photosynthesis, algal mortality and subsequent decay generally influence DO levels more strongly, especially later in the summer when more organic matter is decaying and rates of photosynthesis are declining. Therefore, productive aquatic ecosystems with larger nutrient loads are more prone to low DO levels.

The impact of temperature and salinity on DO levels in these ecosystems is generally of secondary importance. As temperature and salinity increase, the dissolved oxygen concentration decreases. Since the majority of organic-matter decay occurs at the estuary bottom, DO levels tend to be higher at the surface and lower at the bottom of the water column. Density-dependent stratification, such as elevated salinity levels at the harbor bottom, inhibits mixing and exaggerates this affect.

The following figure presents some of the effects of decreasing dissolved oxygen levels on common aquatic organisms. The severity of impacts, and threshold DO levels where impacts occur, are strongly species dependent. A new dissolved oxygen standard was implemented by the New York State Department of Environmental Conservation on February 16, 2008. For estuarine waters such as Manhasset Bay, the chronic, or long-term DO standard is 4.8 ppm. The standard allows levels to fall below 4.8 ppm for short periods of time; the lower the level, the shorter the time interval allowable. The acute DO standard is 3.0 ppm, meaning that the estuary is considered impaired if DO measurements ever fall below this level. However, states often interpret effects of environmental conditions on marine life differently; for example, Connecticut has established a standard of 5.0 ppm, and defined maximum periods for which exposure to low DO is allowed. These standards are similar to the New York standards, although not completely consistent. Critical levels of DO, below 3.0 ppm, can be lethal for certain marine species.

Percent saturation of dissolved oxygen should also monitored in Manhasset Bay. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water, and is influenced by variability in water temperature and salinity. In a marine system with abundant nutrients and organisms, such as

Manhasset Bay, dissolved oxygen levels near the surface can be oversaturated during the day (greater than 100%) due to photosynthesis by algae, and under saturated at night (50% or lower) due to decay of dead organic matter (respiration).



The cause of low DO is difficult to discern. Anthropogenic factors that may be reducing DO levels at the bottom of Manhasset Bay and Long Island Sound include nutrient enrichment from wastewater-treatment-plant discharges; overuse of fertilizers in home gardening, and golf-course maintenance; and residual oxygen demand in bottom sediments from past industrial activities.

Likewise, the cause of apparently improved DO levels in 2007 could be the result of natural and human factors, such as mixing of the water column by wind, reduced nitrogen discharges from the sewage treatment plant, improved storm-water quality resulting from watershed initiatives, and others that are not known. Changes in air and water temperature and the physical nature and chemistry of the water can also influence DO levels, although typical effects are relatively minor. It is also possible that differences in wind patterns could affect vertical mixing within the water column, resulting in a well-mixed water column during some years, and a more stratified water column in others.

Water temperature is monitored to record seasonal and annual changes of temperature within the bay, and to determine whether temperature could be affecting marine life, especially organisms that are in the southernmost limit of their habitat in the harbor. Although a warming trend has been observed in Long Island Sound (about 1-1.1ºC warmer over the last 15 years at bottom and surface, respectively), when temperatures are averaged throughout the sound, a difference is also observed between the western and eastern portion of the sound: the western portion, influenced most by fresh water inputs, is cooler than the eastern portion, influenced most by ocean water. The effects of climate change are not discernible in Manhasset Bay probably because the shallower water and tidal flushing are affected most by the cooler water of western Long Island Sound.

Water temperature is also used to determine the percent saturation of DO within the bay, as described earlier in this report. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water. Percent saturation is strongly influenced by temperature. For example, at 32ºF (0 ºC), the saturation concentration of DO in water (meaning that the water is 100% saturated) is 14.6 ppm, whereas at 86ºF (30 ºC), the DO saturation concentration is 7.6 ppm.
Additionally, temperature monitoring determines whether the water column is stratified or well mixed. Stratification is the process through which water at the surface of the harbor can warm while water at the bottom stays cold. Since the colder water is denser, it stays at the bottom and cannot mix easily with the warmer water. This colder water becomes isolated from the surface where the majority of oxygen transfer occurs, which prevents replacement of DO lost through consumption by organisms. Manhasset Bay may not generally exhibit pronounced stratification; since the bay is relatively shallow and strongly influenced by tides, vertical mixing continues through much of the season.

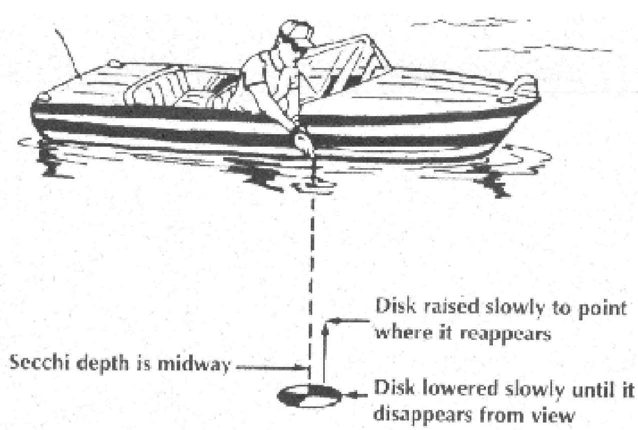
Title: Impact of Summer Ambient Temperatures on Elevated Levels, Persistence and Regrowth of the Enterococcus Indicator Bacteria at the Silver Sands State Park Beach in Milford, CT in the Long Island Sound Coastal Area.

Prepared by: INTERSTATE ENVIRONMENTAL COMMISSION - February 2008

The focus of this study was to examine the specific impact of summer temperatures - as well as pH, total suspended solids (TSS), turbidity and salinity - on the concentration, persistence and potential regrowth of indicator bacteria in sediments and the water column during summer months.
Findings: The results of this study show no significant correlation between either water or sediment temperature and *Enterococcus* levels. The results also indicated that birds are significant contributors to bacterial pollution of beach water. There is limited indication of humans as a possible source, and no indication of dogs or deer as sources of pollution.

Salinity - Salinity is the measurement of the concentration of dissolved salts in the water with a conductivity meter, which measures specific conductivity (a direct measurement of the ease with which electricity passes through water) and converts that measurement to salinity.

Water Clarity - Water clarity is measured with a Secchi disk. The 8-inch diameter disk is divided into alternating black and white quadrants. The disk is lowered into the water with the sun at the sampler's back. The point at which the disk becomes completely obscured is noted. The disk is then raised and the point at which the disk becomes visible again is noted. The average of these two numbers is the Secchi Depth, recorded to the nearest tenth of a meter.
Measuring Secchi disk depth is an indication of water clarity. Light that penetrates the surface of the water passes through the water column, reflects off the disk, and passes back through the water column to the eye of the observer. The Secchi disk depth is the depth where enough light is scattered (by objects, such as sediment particles) or absorbed (by being converted to heat or chemical energy, such as by plankton and algae) within the water column that the light reflected by the disk can no longer return to the surface. Dissolved solids, particulate solids, algae, and other biota can impact clarity in a water column. A large amount of plankton in the water also gives the harbor its usual green to brown color. Secchi readings are typically 1 to 2 meters for embayments during the summer months but can range from 0.25 m to 3 m during the monitoring season.



The Secchi disk is used to measure how deep a person can see into the water. It is lowered into the water by unwinding the waterproof tape to which it is attached and until the observer loses sight of it. The disk is then raised until it reappears. The depth of the water where the disk vanishes and reappears is the Secchi disk reading. The depth level reading on the tape at the surface level of the lake is recorded to the nearest foot.

The greatest value of the Secchi disc measurements occurs when one compares readings from week to week, month to month and season to season. Several factors are involved, such as the eyesight of the viewer, the time of day the readings are taken (midday- between 10 and 2 is preferred), the reflectance of the disc, the color of the water, clay particles or other materials suspended in the water, etc.

If the Secchi Disk transparency depths are getting shallower during the summer season, it may be due to one or more of the following:

1. Increased abundance of free floating algae.
2. Erosion of the shoreline or erosion from site development near the bay.
3. Recirculation of bottom sediment from motorboat activity.
4. Discoloration of the water from wetland runoff and/or plant decomposition.
5. Increased turbidity.
6. Reduced zooplankton populations.

Long Island Sound and Manhasset Bay will experience increased boat activity on weekends and holidays. Taking Secchi readings on Mondays and the day following a holiday, and comparing these readings with other readings at other times may reveal the affect of boating activity on transparency depths.

Significant storm events within the watershed with the resultant stormwater runoff could cause lower Secchi disk readings. Comparing Secchi disc readings immediately after a storm with readings between storms may suggest that runoff is increasing turbidity and, therefore, shallower transparency readings. If the zooplankton populations have dropped off reducing the grazing of algae, the increase of algae will result in reduced Secchi disk readings.

Nutrients - Nitrogen species water samples are collected from the water surface in plastic bottles containing sulfuric acid and placed into a cooler with ice packs. They are then transported to a lab. The water samples are analyzed for common forms of nitrogen, including nitrate/nitrite, ammonia, and organic nitrogen, collectively called nitrogen species.

A common rule of thumb is that the ratio of nitrogen to phosphorus in biomass is approximately 7 to 2. This means that, if the nitrogen concentration divided by the available phosphorus is less than 3.5, biological growth will be limited by the amount of nitrogen in the water. If this ratio is greater than 3.5, then phosphorus will limit biological growth (other nutrients, such as silica, are known to limit growth as well in less common instances). In marine ecosystems, such as the Manhasset Bay, phosphorus is generally abundant. The amount of biological growth that occurs is directly related to the amount of nitrogen that is present in the water. For this reason, Friends of the Bay monitors nitrogen parameters in the estuary. Several algal blooms may occur during the year, depleting the nutrient concentrations within the water column. When the nutrients are depleted, phytoplankton populations die off and sink to the bottom, contributing to large amounts of organic matter in the water column. This organic matter decays while sinking and is further decomposed by bacteria in the estuarine sediments. While decomposing dead phytoplankton, bacteria consume oxygen. This depletion of oxygen may result in hypoxia (DO less than 3 mg/l) at the harbor bottom. Typically, hypoxia occurs in summer, when the water column stratification hinders oxygen replenishment in deep water. There are four nitrogen species commonly present in marine waters: ammonia-N, nitrate, nitrite and organic nitrogen.

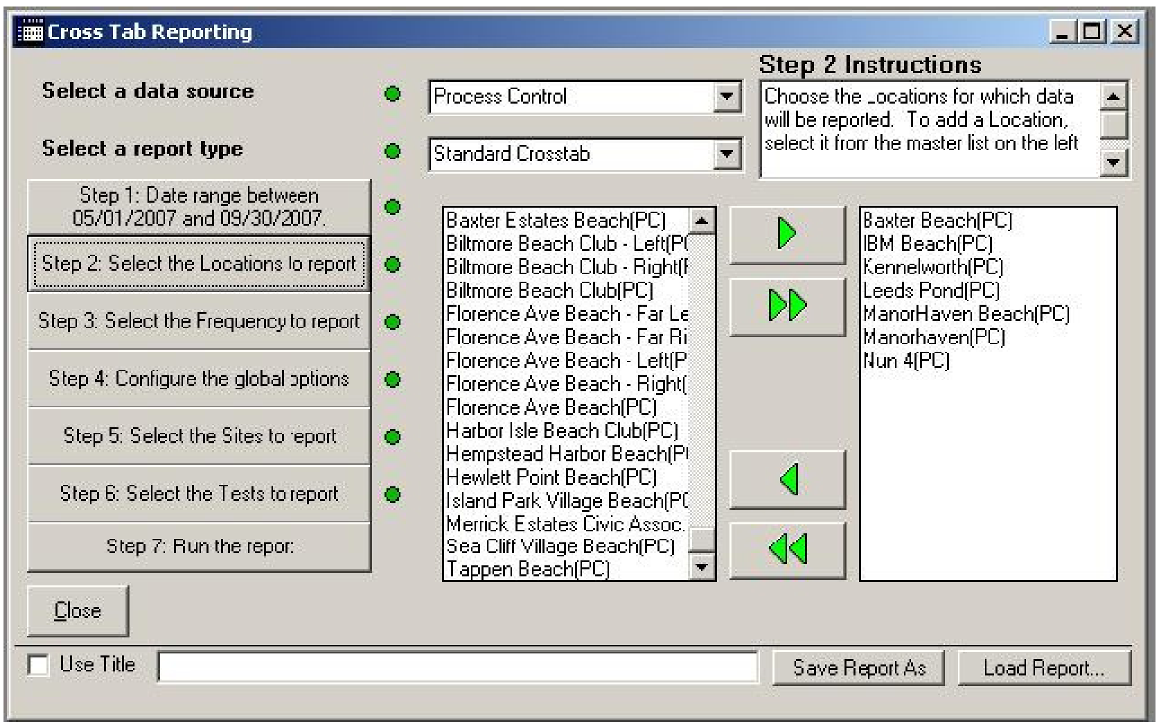
Other Parameters - Other information collected at the sites include: the time the sample was collected; qualitative description of rainfall in the previous 24 hours; tidal stage (scale of 1-4), air temperature (°C); wind direction (1 of 8 directions); wind speed (estimated in 5-mph increments); wave height (subjective, on a scale of 0-5); weather conditions (on a predetermined 1-6 scale); water color (subjective color, e.g. yellowbrown), cloud cover (0-5 scale) and any unusual conditions (i.e., odors, fish kills, debris).

Precipitation affects Manhasset Bay water quality through direct precipitation and through storm-water runoff. Although both of these inputs can reduce salinity, direct precipitation will tend to dilute the quantity of pollutants, whereas storm-water runoff will tend to increase pollutant loads by washing bacteria, chemicals, and nutrients that have accumulated on the ground surface in the watershed into the harbor.

Apparent color - Apparent color is an easy way to get general information about what material is dissolved or suspended in the water, and would thus be a beneficial parameter to monitor. Water with very little dissolved or suspended material appears blue in color. The presence of dissolved organic matter such as decaying plant matter can result in water color of yellow or brown. The presence of dinoflagellates can produce a reddish or deep yellow color. Water that is rich in phytoplankton and algae appears green. Runoff can result in a variety of colors including yellow, red, brown or gray.

LabLite Software Capabilities

LABLITE PC LIMS software is specifically designed to manage complex workflow and data requirements for any kind of repetitive process or testing. Design Criteria requires an intuitive user-friendly interface for the powerful features being offered. The source code is written in MS Visual Basic and is open, annotated and modular. All versions are rigorously tested in-house and by Alpha and Beta working labs prior to release. The programs include comprehensive written and visual documentation. Managers like to have the flexibility to view data in many ways. The included Cross Tab reporting tool guides you through many sorting and filtering options to create reports and graphs. Cross Tab sends your choices to MS Excel for display. Once you have formatted a report you like, you are able to save the selected criteria and name the report so you can recall it later. It is also possible to further analyze, enhance and save these reports as Excel files.
One example of Cross Tab output is following. With just a few simple steps when using this tool, you are able to create professional reports.

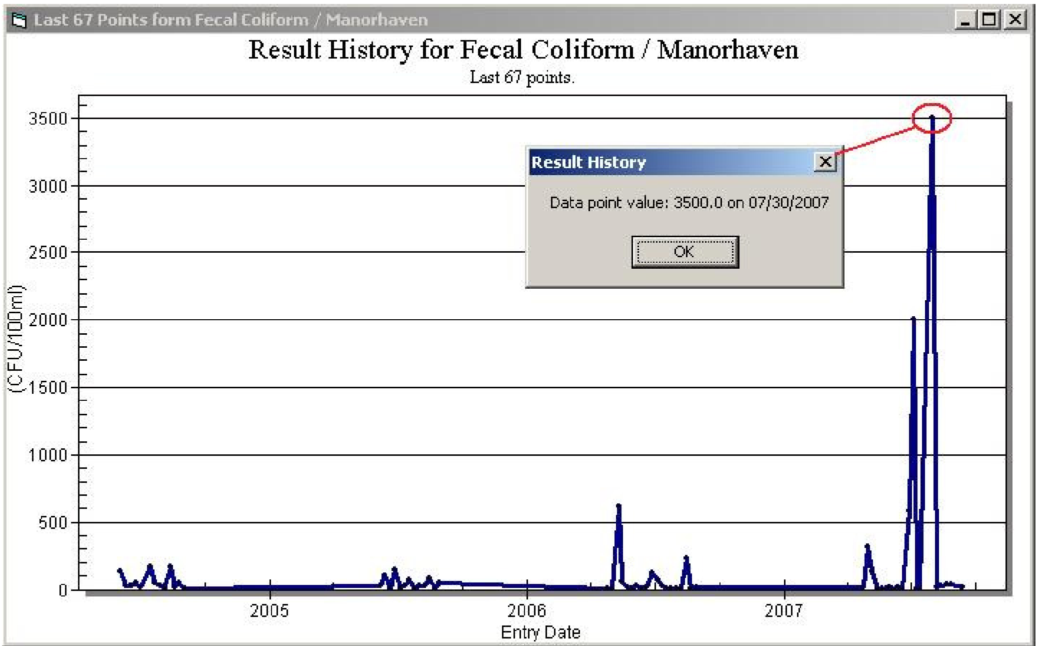


A finished Crosstab Report example from LabLite PC LIMS software

3								
4		Fecal Coliform Bacteria in cfu/100mls						
5		Baxter Beach	IBM Beach	Kennelworth	Leeds Pond	Manorhaven	ManorHaven	Nun 4
6		Result	Result	Result	Result	Result	Result	Result
7	05/02/2007		12				5	
8	05/07/2007	11	8	1	2	136	7	1
9	05/14/2007	14	4	37	26	8	10	5
10	05/16/2007		1				110	
11	05/18/2007		210				52	
12	05/21/2007	2	1	2	4	4		3
13	05/23/2007		1				240	
14	05/30/2007		5				28	
15	05/31/2007	27	24	1	310	12	15	23
16	06/04/2007	4		3	180	1	190	440
17	06/05/2007						600	
18	06/06/2007		49				116	
19	06/07/2007		32				140	
20	06/11/2007	9	90	8	2	11	15	30
21	06/13/2007		200				22	
22	06/18/2007	39	4	4	2	7	1	3
23	06/20/2007		4				8	
24	06/27/2007		6				12	
25	06/28/2007	3900	12	110	420	580	1100	120
26	07/02/2007		270				26	
27	07/05/2007		17	430	2500	2000	160	220
28	07/09/2007	28	55	4	6	5	56	44
29	07/11/2007		380				240	
30	07/13/2007					4		
31	07/16/2007		150	21	7		17	15
32	07/19/2007		5700				2800	
33	07/25/2007		460				17	
34	07/30/2007	1400	90	2800	300	3500	250	28
35	08/01/2007		600				340	
36	08/06/2007	29	21	7	7	12	17	27
37	08/10/2007		230				140	
38	08/13/2007	18	140		27	24	17	48
39	08/15/2007		32				180	
40	08/20/2007		43	14	17	33	25	24
41	08/20/2007					38		
42	08/22/2007		150				39	
43	08/27/2007	26	240	15	14	33	41	15
44	08/29/2007		38				180	
45	09/12/2007	11		10	22	16	290	9
46								
47	Mean	394	273	217	226	357	209	62
48	Minimum	2.	1.	1.	2.	1.	1.	1.
49	Maximum	3900.	5700.	2800.	2500.	3500.	2800.	440.
50	Data Points	14	34	16	17	18	36	17
51								

Analysts or Operators can use their right mouse button to get an instant trend graph on the parameter/site data. The graph opens with one click and can be refined to use bars, points, colors, fonts, etc. of your own choosing. This can be saved in any format and e-mailed.

An "Instant" Trend Graph



Discussion of Results

Nassau County Department of Health sampled four and eventually five beach sites consistently via wade in sampling between 1996 and 2002. In 2003 only Manorhaven Beach was sampled by the NCDoH. Starting in 2004, four additional sites were monitored by MBPC by boat; Baxter Beach, Manorhaven, Kennelworth and Nun 4. NCDoH continues to monitor Manorhaven Beach and Baxter Beach for beach closure parameters.

Location Sampling Activity by Year

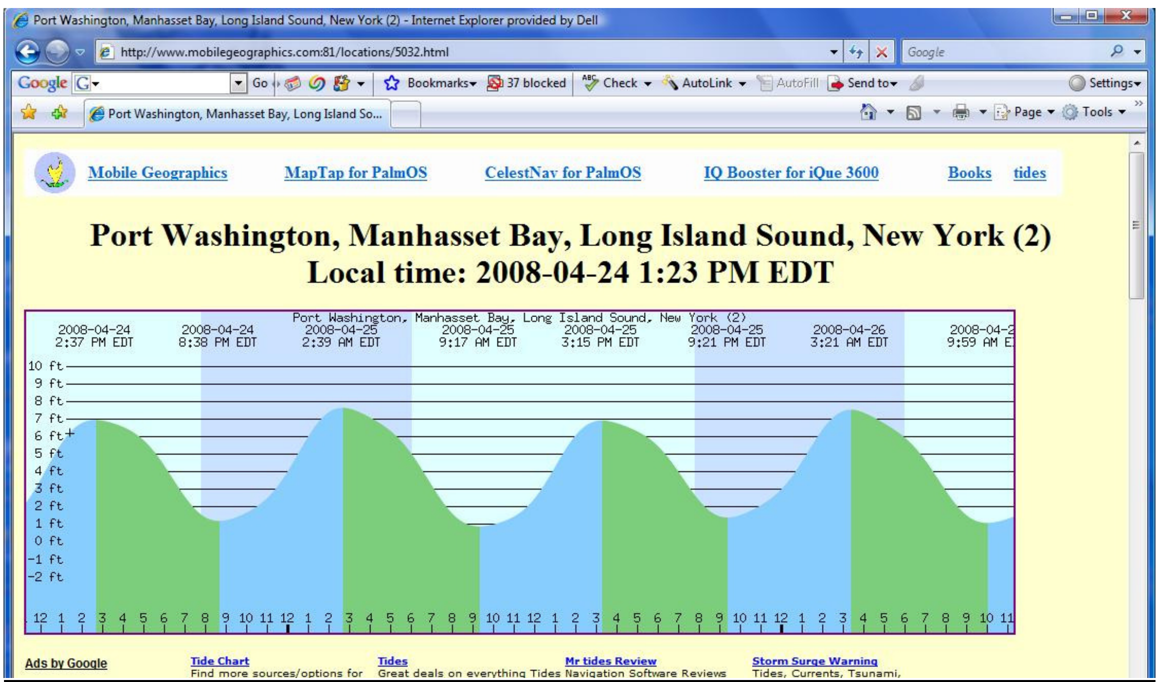
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Baxter Beach										X	X	X
Manhasset Bay Estates	X	X	X	X	X	X	X					
Baxter Estates Beach	X	X	X	X	X	X	X			X	X	X
ManorHaven Beach						X	X	X	X	X	X	X
Kennelworth										X	X	X
Nun 4									X	X	X	X
Manorhaven									X	X	X	X
Leeds Pond	X	X	X	X	X	X	X		X	X	X	X
Baxter Pond	X	X	X	X	X	X	X					

X = Less Records than Normal

Across all these sites, the most consistent and valuable monitoring parameters are fecal coliform and enterococci bacteria. When reviewing the historic data and comparing trends it was helpful to "normalize" some elevated bacteria results. For instance, A fecal coliform result for 340,000 cfu/100 mls does not average without bias considering the three previous results below fifty. Therefore, for some graphs shown below elevated levels were capped (normalized) at 1,000 cfu/100mls to maintain linear scales as opposed to logarithmic graphs which are often misleading for most readers of this report.

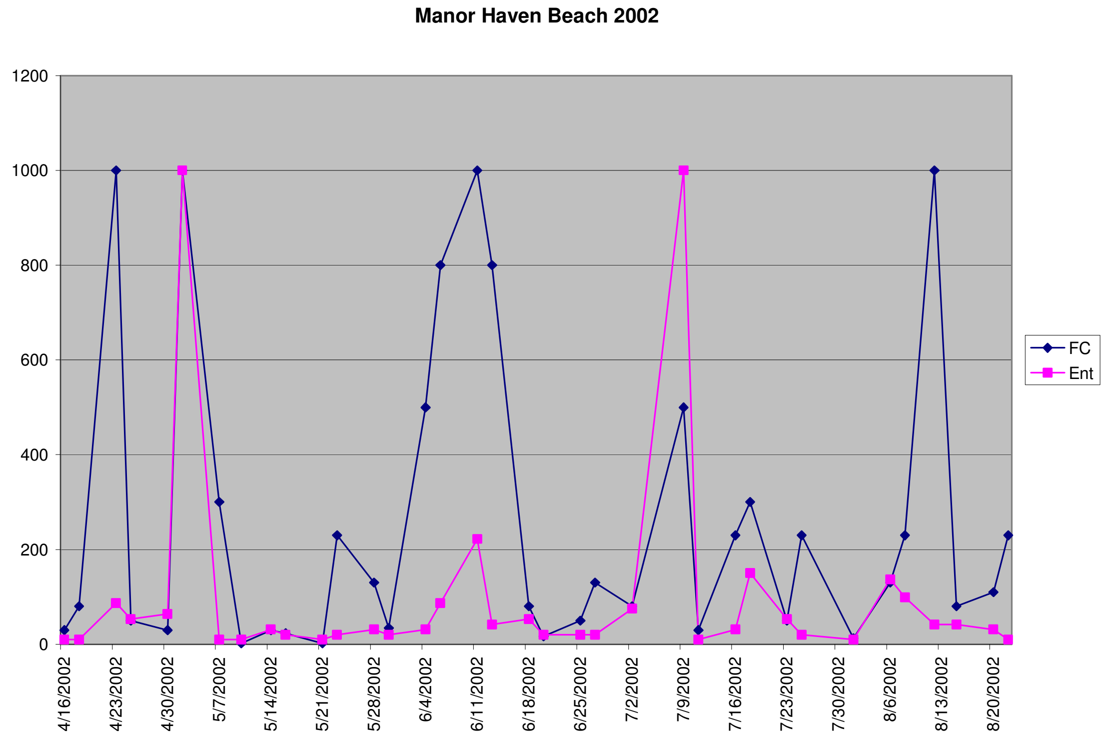
Below are examples from Manorhaven as graphed annually since 2002 for fecal coliform and enterococci bacteria. These results do not show any improvement in bacteria levels from year to year, but do indicate that levels rise during July and August when the water is warm and boating traffic is at its peak. Baxter Beach, Kennelworth and Leed's Pond show different trends than found at Manorhaven.

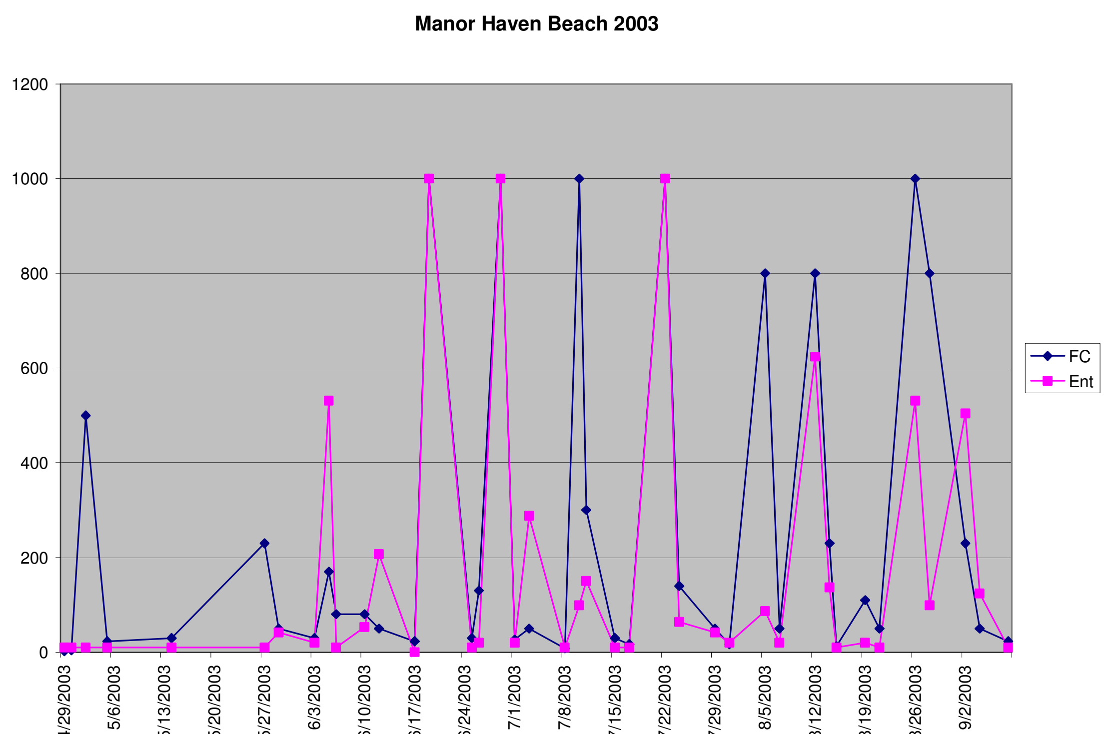
How much of the variation in results is due to stormwater, tidal or water temperature difference is not able to be determined from the data collected and analyzed.



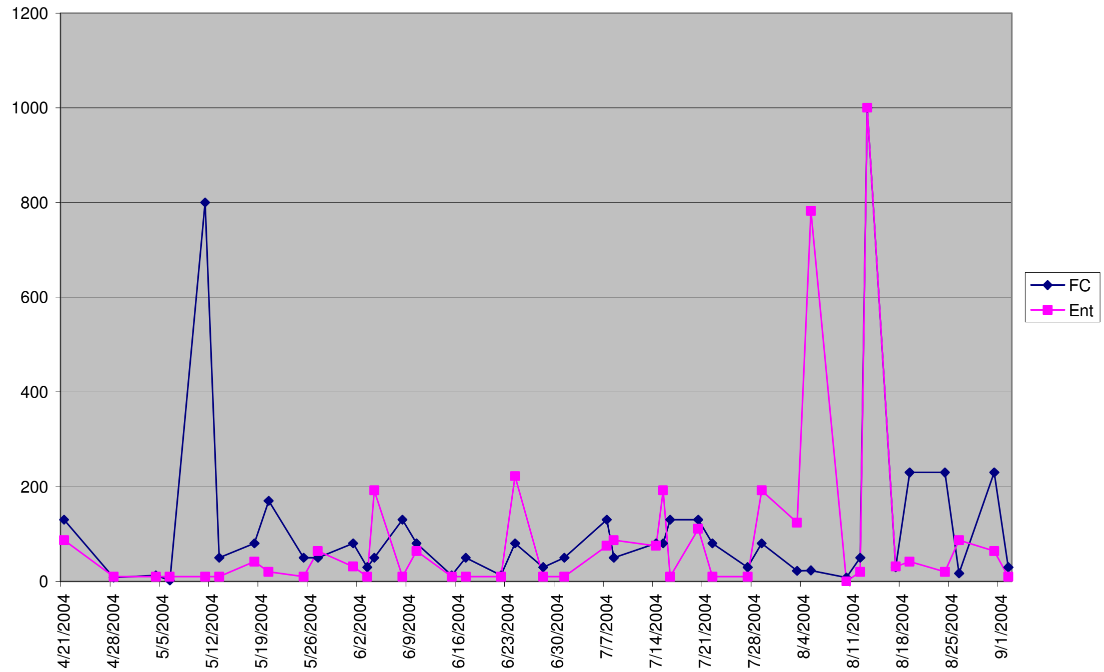
Tide Chart http://www.mobilegeographics.com:81/locations/5032.html

The next set of graphs shows the annual relationships between Fecal Coliform and Entercocci from 2002-2007. It appears that 2004-05 results were lower than average.

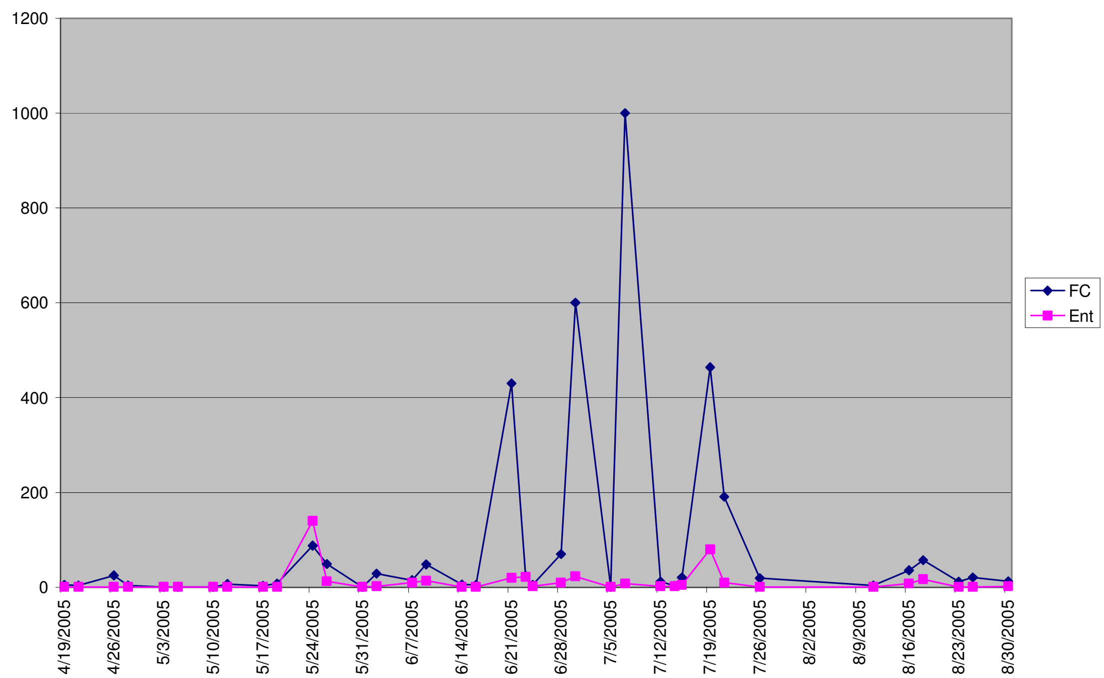




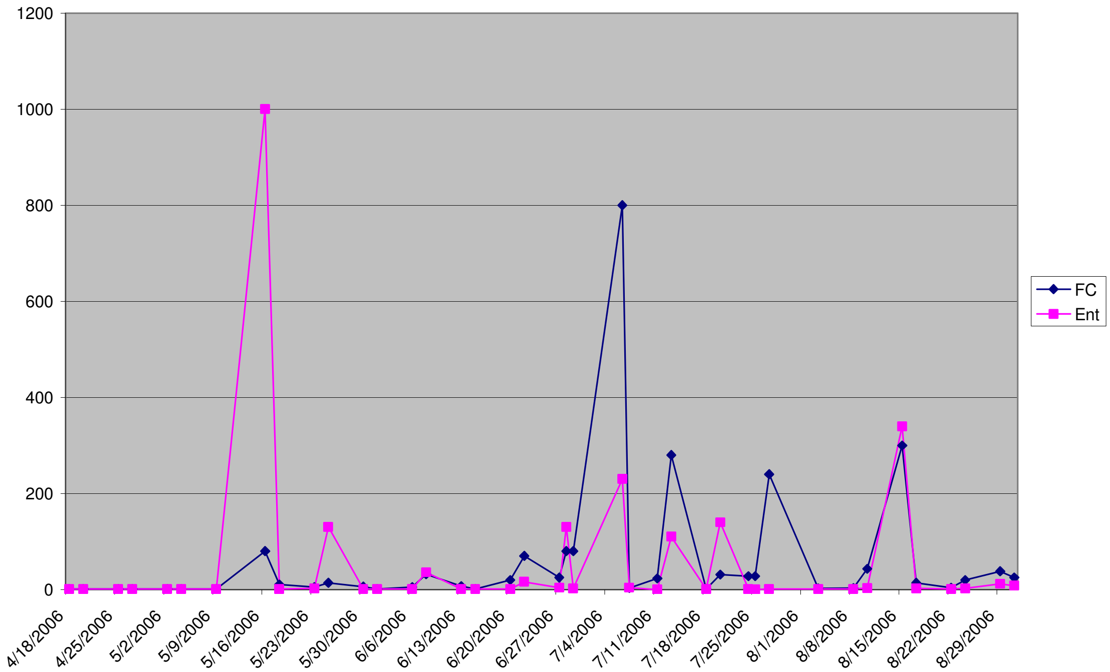
Manor Haven Beach 2004



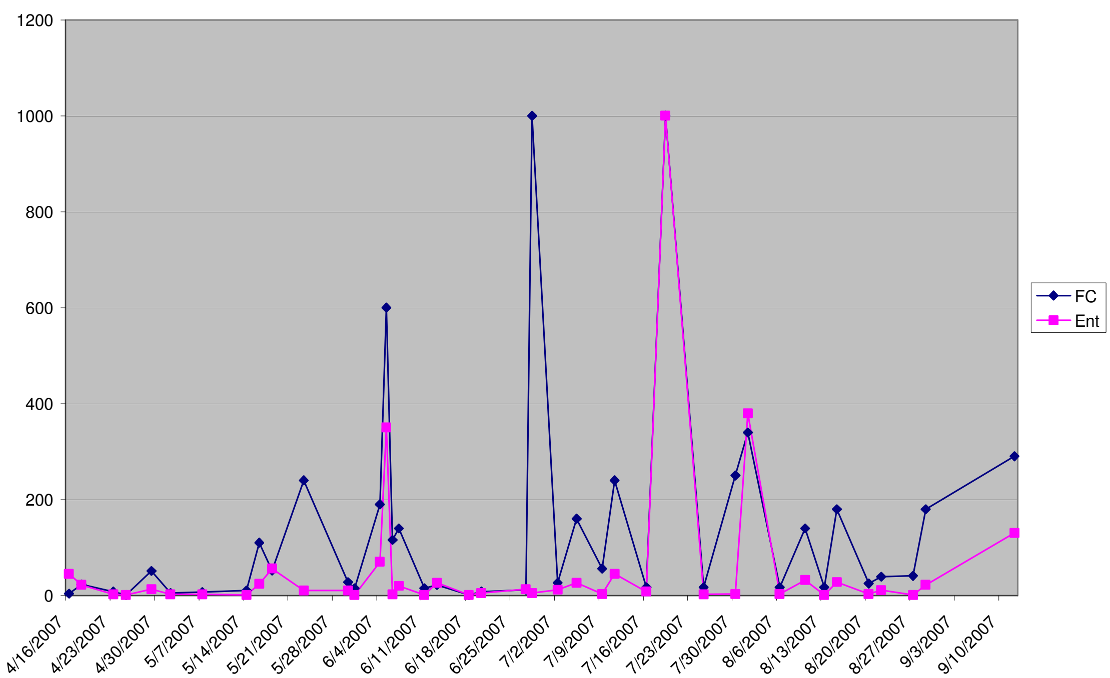
Manor Haven Beach 2005



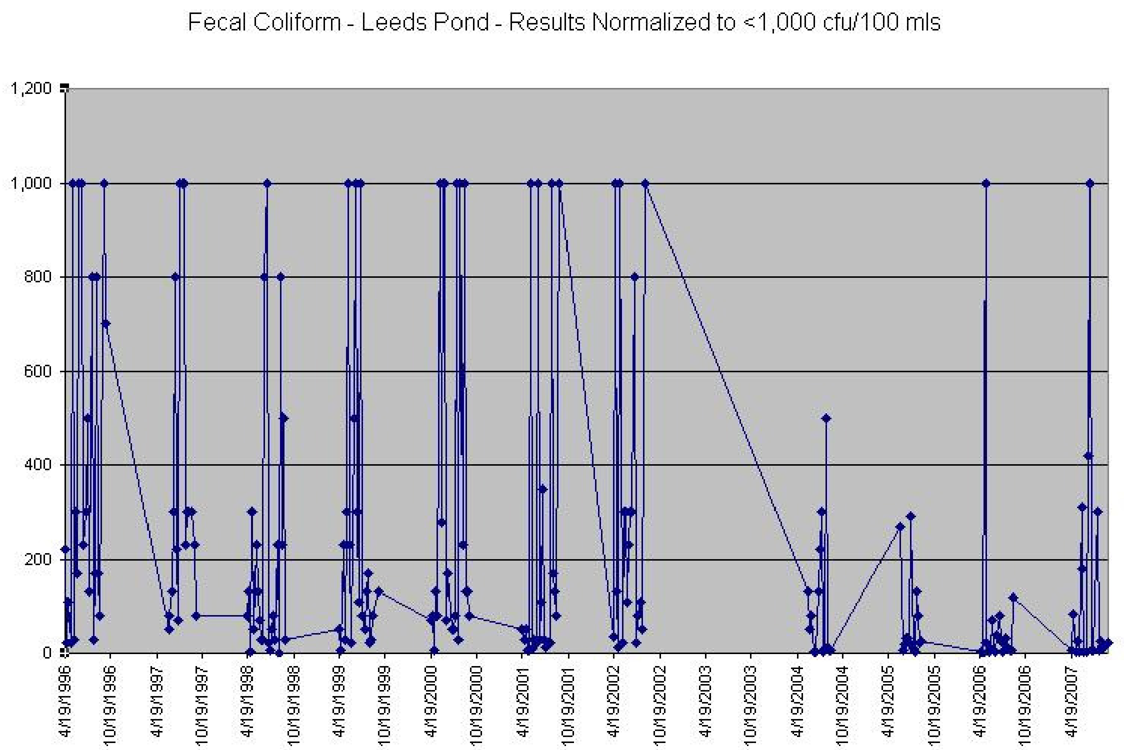
Manor Haven Beach 2006

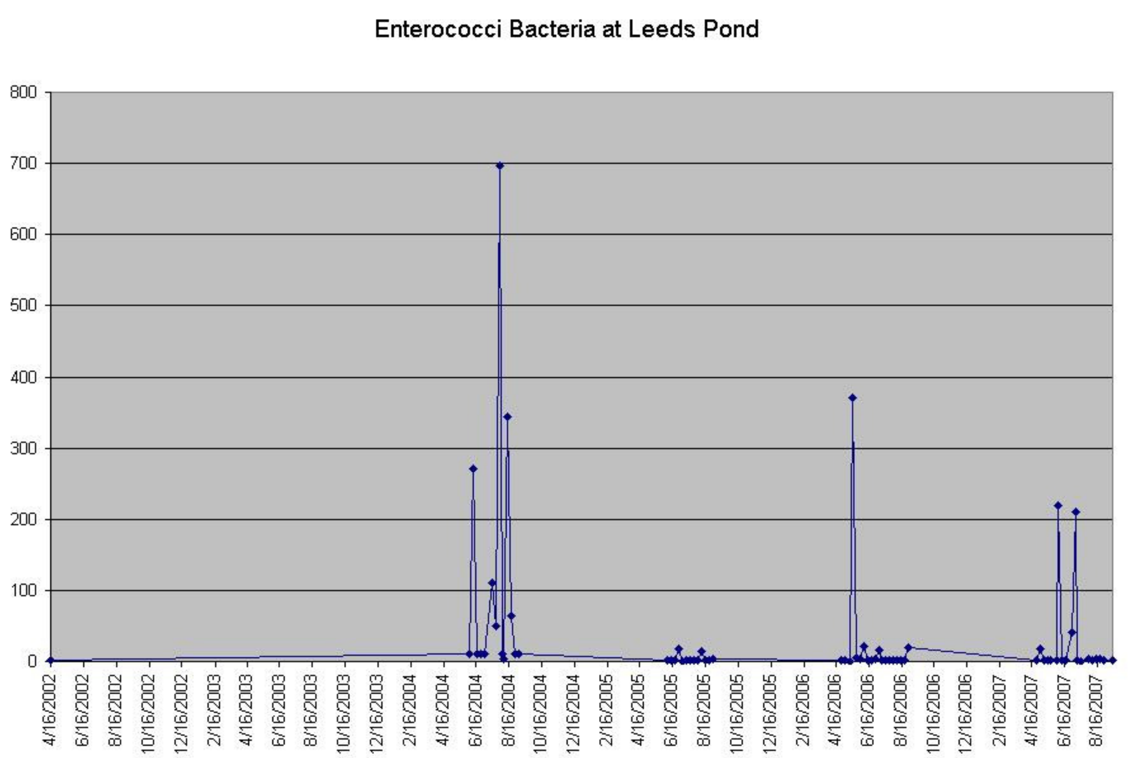


Manor Haven Beach 2007

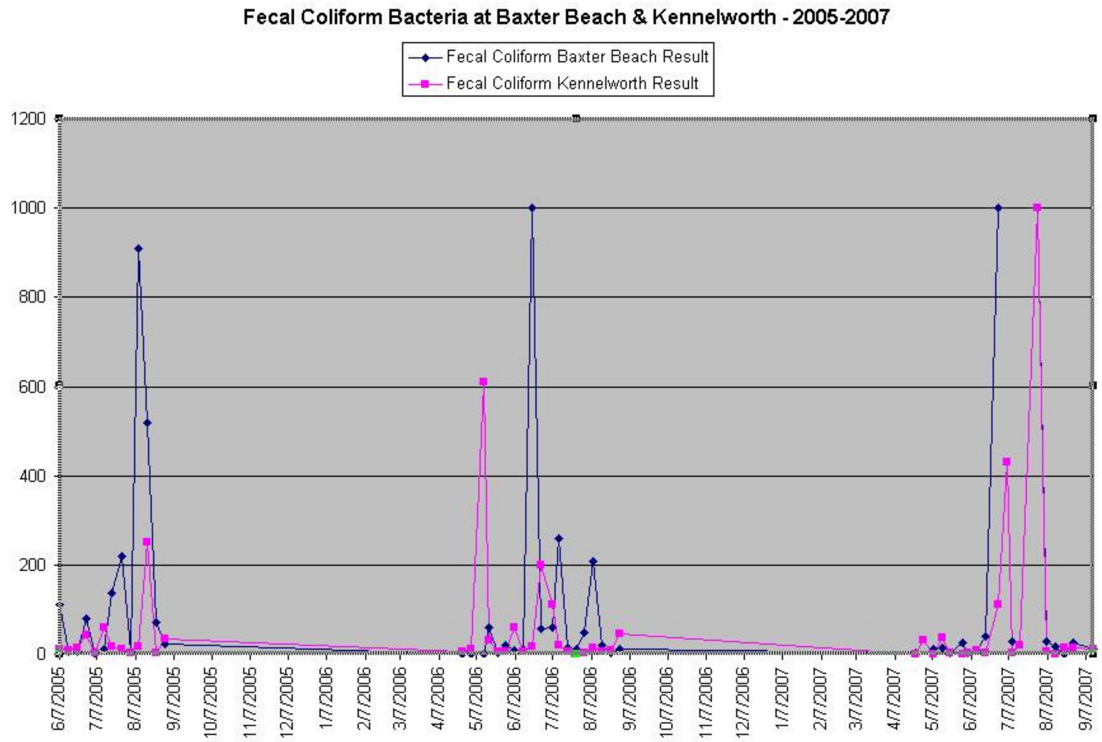


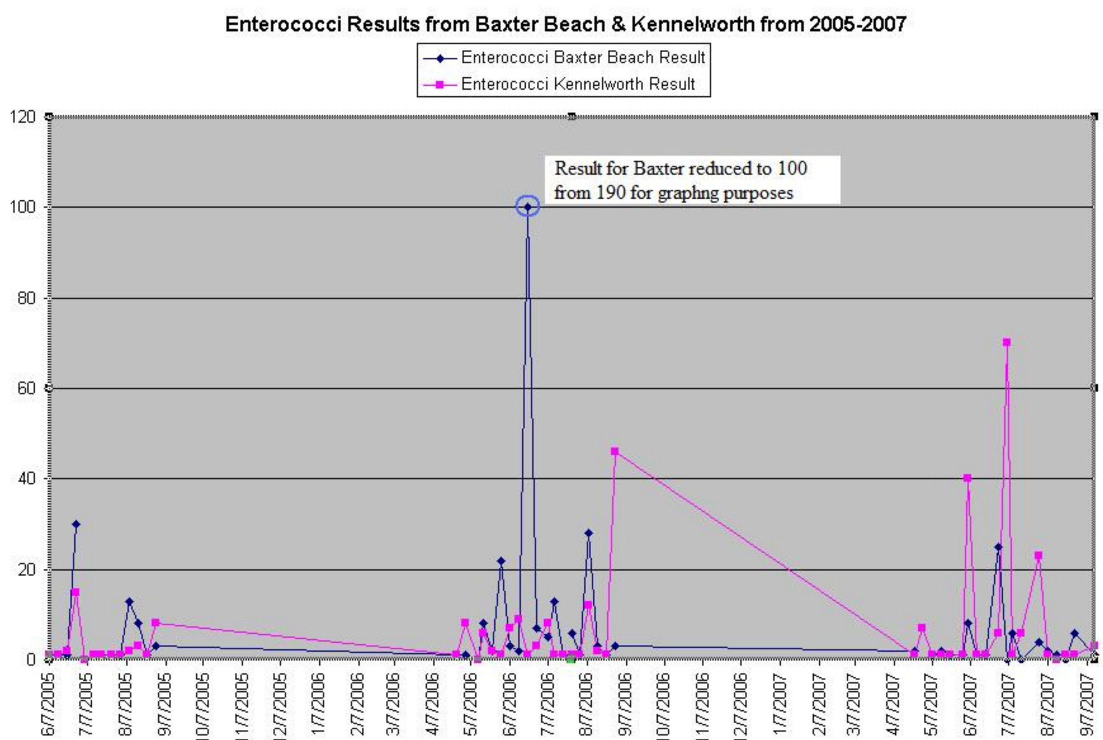
There appears to be a slight downward trend (improvement) at the Leed's Pond site as noted in the following two graphs.





The two graphs below indicate that both fecal coliform and enterococci levels rose at Baxter Beach and Kennelworth sites from 2005 to 2007.

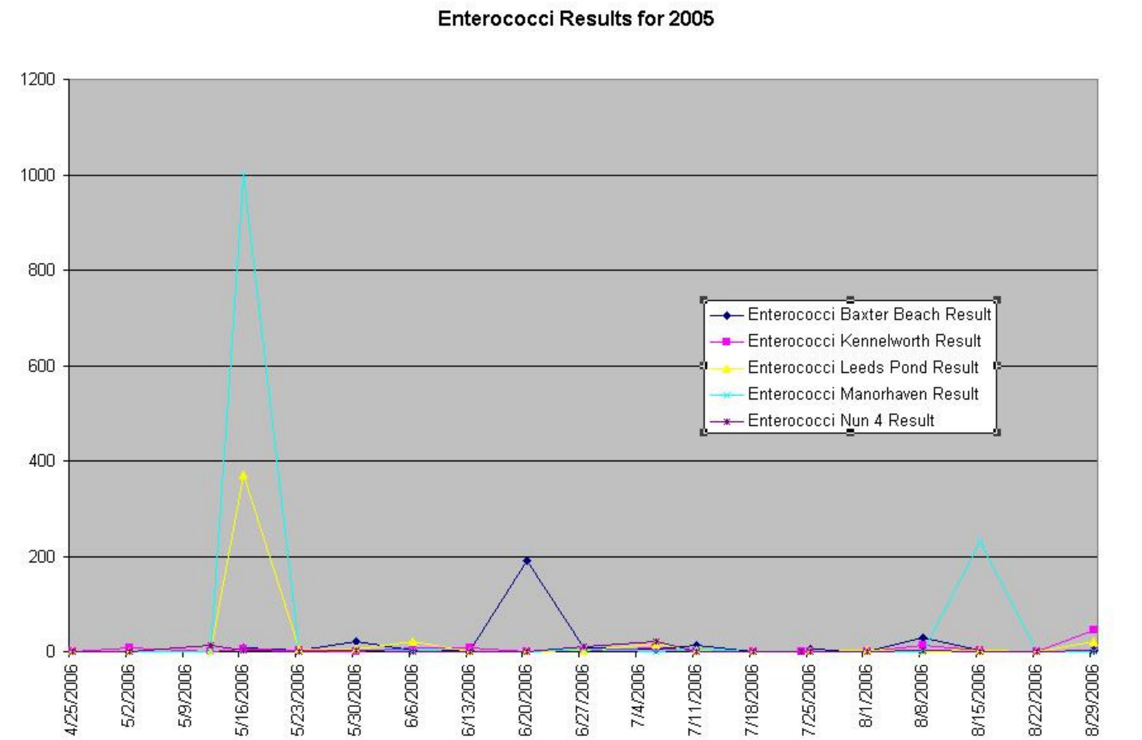


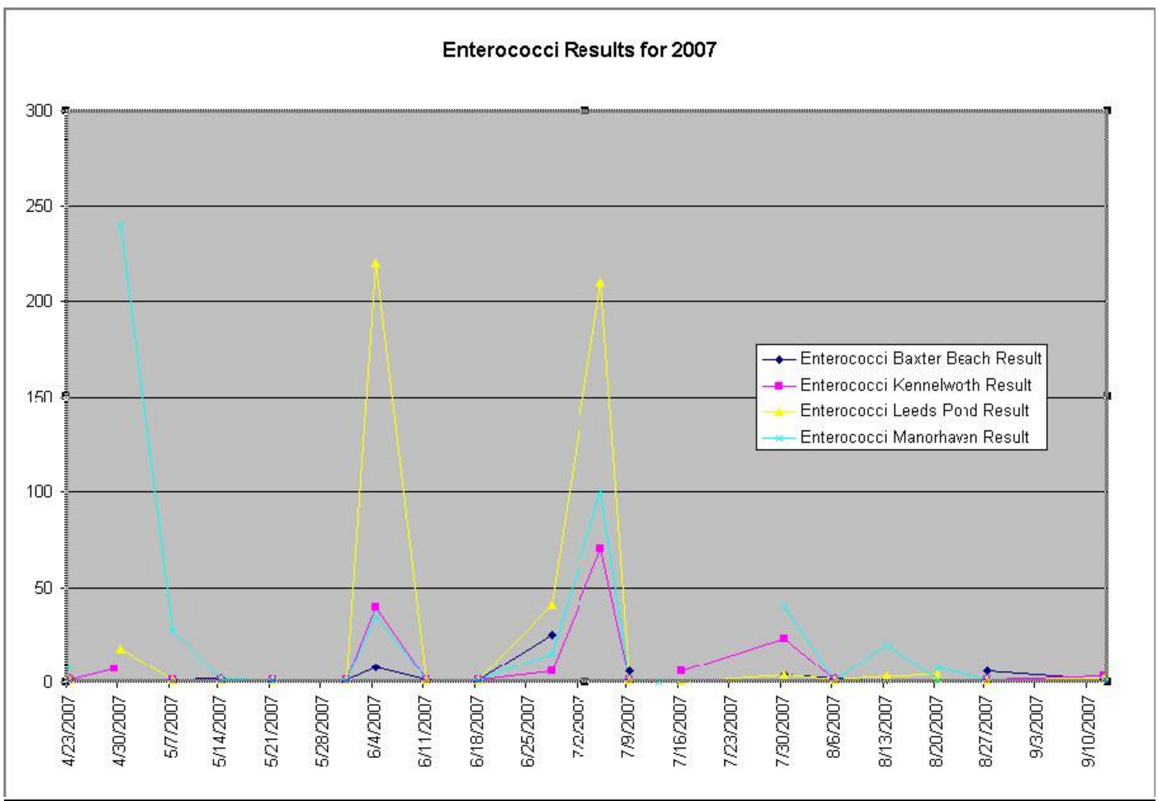


Displayed below is a table of summary data for all the MBPC routinely monitored sites. Manorhaven has the highest mean level (37) for Enterococci while Baxter Beach shows the highest mean level for Fecal Coliform. This table summarizes all recorded data for the sites and target parameters since 1996.

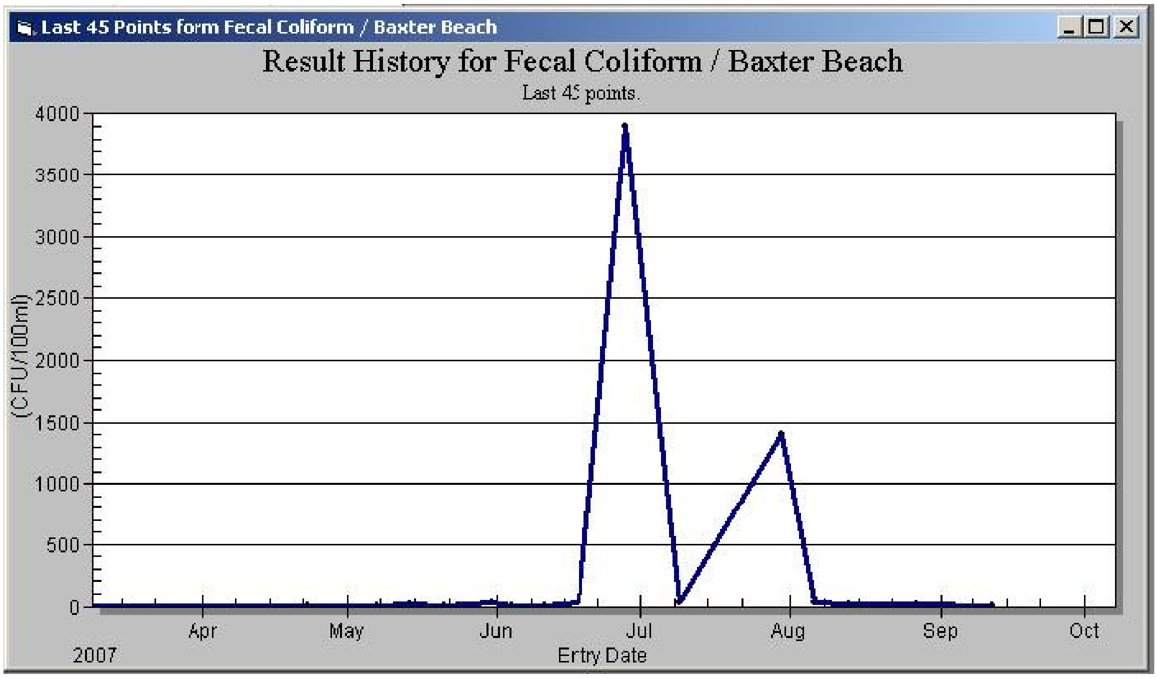
Notes on bacterial influences:
Leeds Pond and Sheets Creek North (adjacent to Manorhaven Beach) have large resident populations of Canada Geese.
Manorhaven Beach has two large (42") storm water outfall pipes immediately to the south of the beach, the primary discharge points for subwatershed #2, Toms and Plum Point, (most of the Village of Manorhaven.)
The outfall for the Port Washington Water Pollution Control (Sewer) District is offshore of Baxter (Estates) Beach.
Subwatershed #3, Sheets Creek (Sands Point, Port Washington North Soundview area, and half of Manhasset Isle) and #4, Baxter and Mill Pond, (Baxter Estates, Port Washington North, Sands Point and unincorporated Port Washington) discharge to the Baxter (Estates) Beach area.
The Leeds Pond outfall is the discharge point for subwatershed #6, Leeds Pond (Plandome Manor, unincorporated Port Washington, Flower Hill, portions of Plandome Heights, Plandome and Munsey Park.)

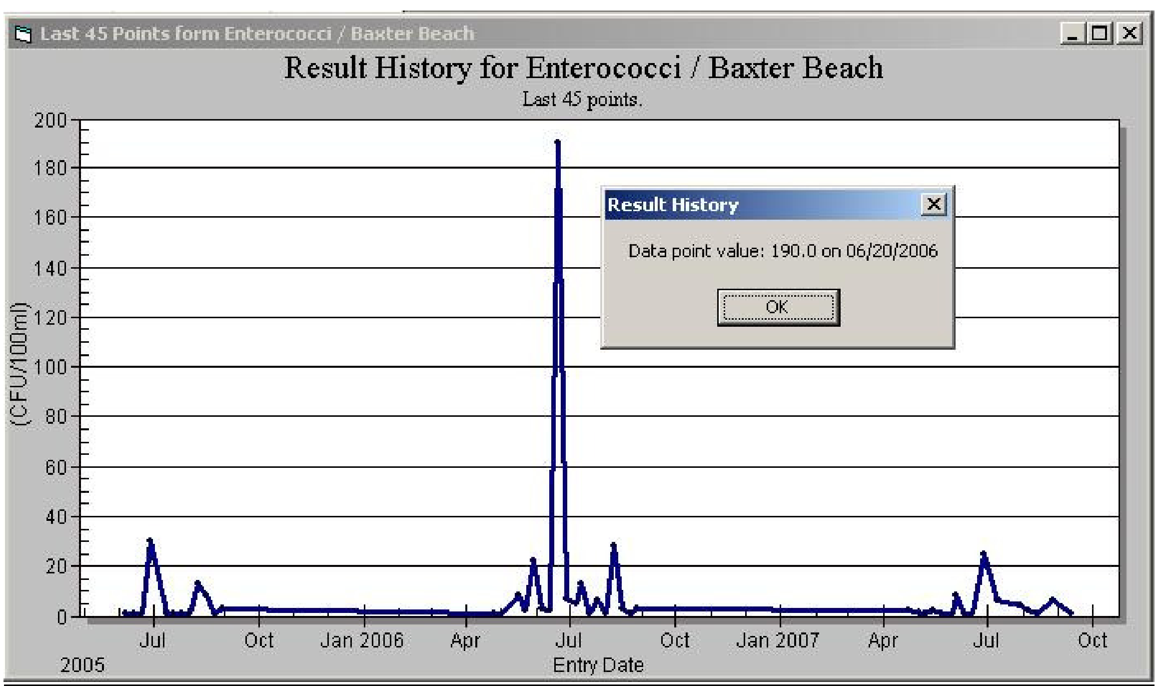
	Enterococci				Fecal Coliform			
	Baxter Beach	Kennelworth	Manorhaven	Nun 4	Baxter Beach	Kennelworth	Manorhaven	Nun 4
	Result	Result	Result	Result	Result	Result	Result	Result
Mean	12	6	37	18	294	65	87	45
Minimum	0.1	0.1	0.1	0.1	0.1	1.	1.	1.
Maximum	190.	70.	1000.	510.	1000.	1000.	1000.	500.
Data Points	90	51	67	66	213	51	67	66

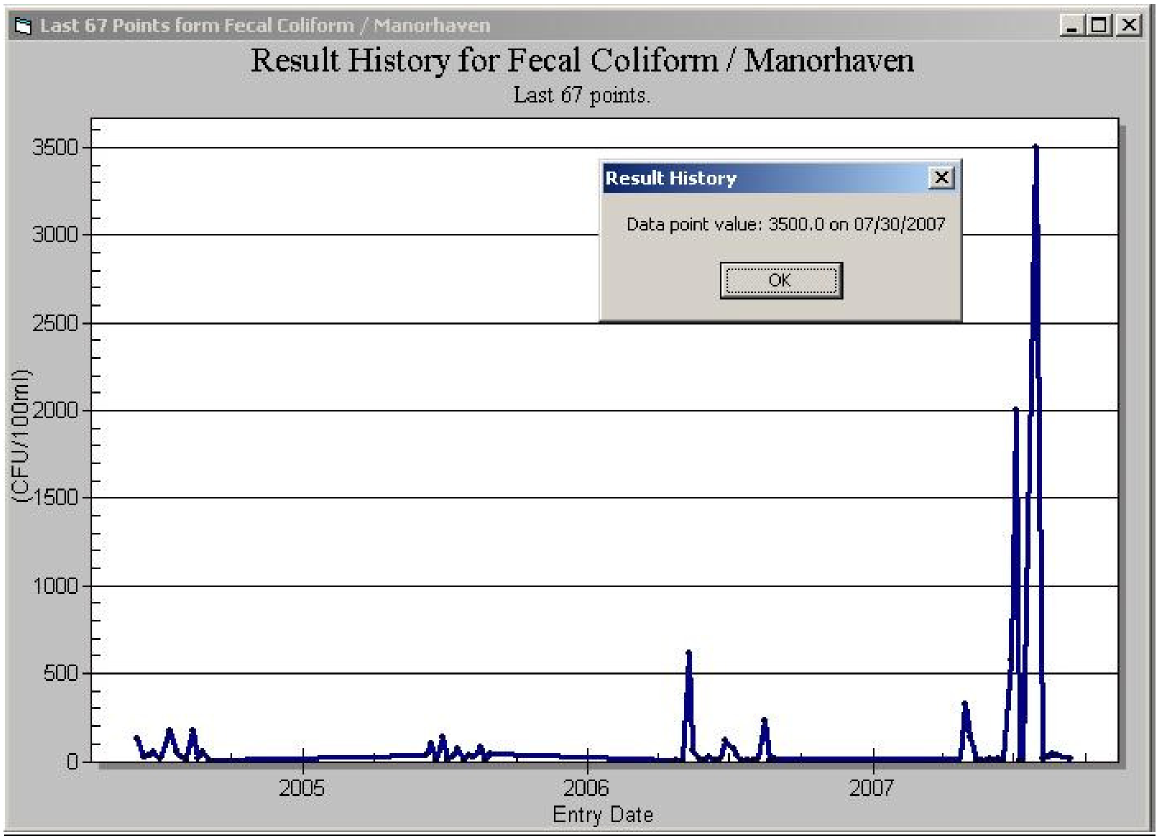

Enterococci Results for 2005
1200
1000
800
600
400
200
0
Enterococci Baxter Beach Result
Enterococci Kennelworth Result
Enterococci Leeds Pond Result
Enterococci Manorhaven Result
Enterococci Nun 4 Result
4/25/2006
5/2/2006
5/9/2006
5/16/2006
5/23/2006
5/30/2006
6/6/2006
6/13/2006
6/20/2006
6/27/2006
7/4/2006
7/11/2006
7/18/2006
7/25/2006
8/1/2006
8/8/2006
8/15/2006
8/22/2006
8/29/2006

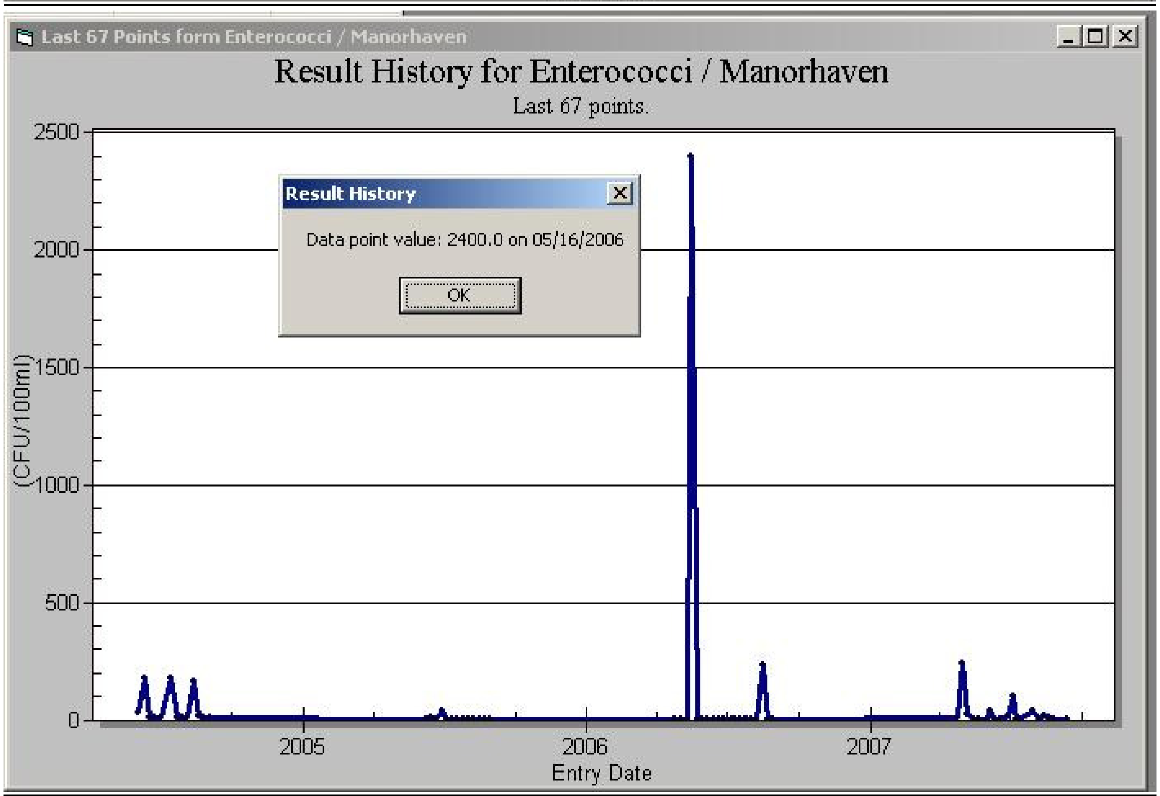

Enterococci Results for 2007
300
250
200
150
100
50
0
Enterococci Baxter Beach Result
Enterococci Kennelworth Result
Enterococci Leeds Pond Result
Enterococci Manorhaven Result
4/23/2007
4/30/2007
5/7/2007
5/14/2007
5/21/2007
5/28/2007
6/4/2007
6/11/2007
6/18/2007
6/25/2007
7/2/2007
7/9/2007
7/16/2007
7/23/2007
7/30/2007
8/6/2007
8/13/2007
8/20/2007
8/27/2007
9/3/2007
9/10/2007

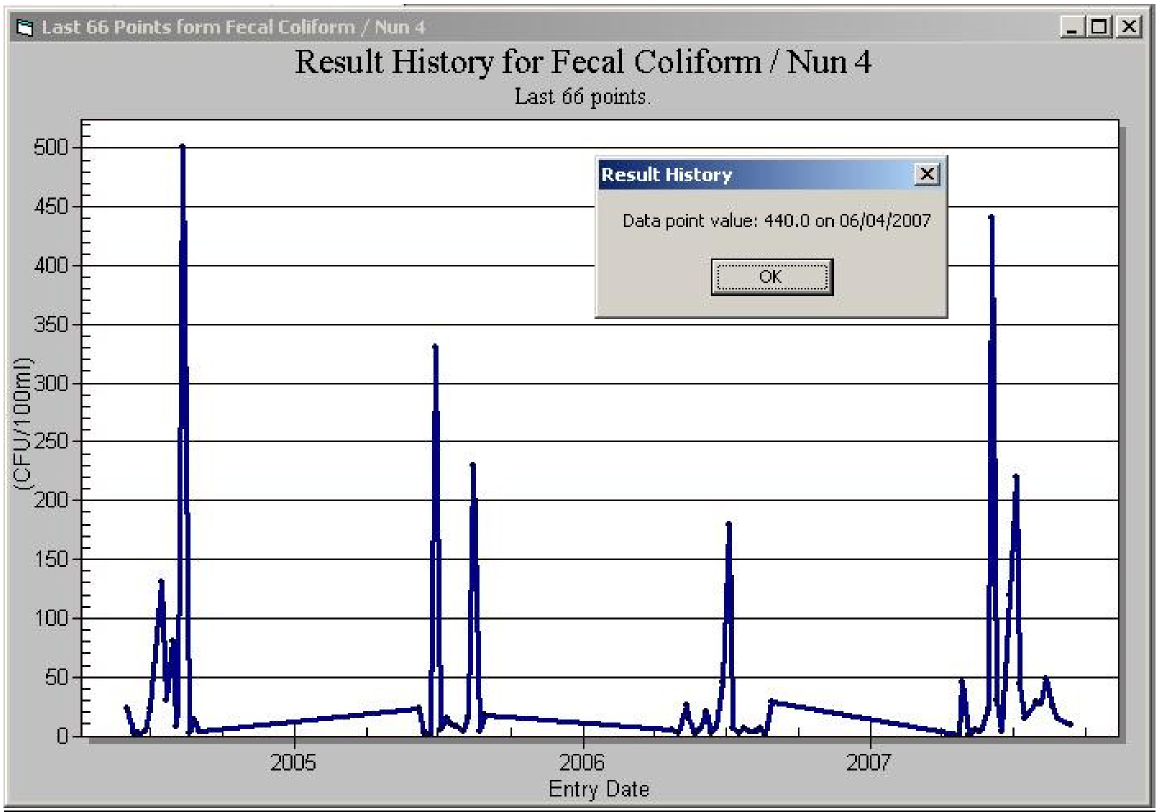
Below are some graphs showing trends at various sites and specific parameters. These graphs are produced in the LabLite PC software as "instant trend graphs". The data shown in these graphs are not "normalized" in that elevated bacteria levels were not reduced to 1,000 cfu/100mls.

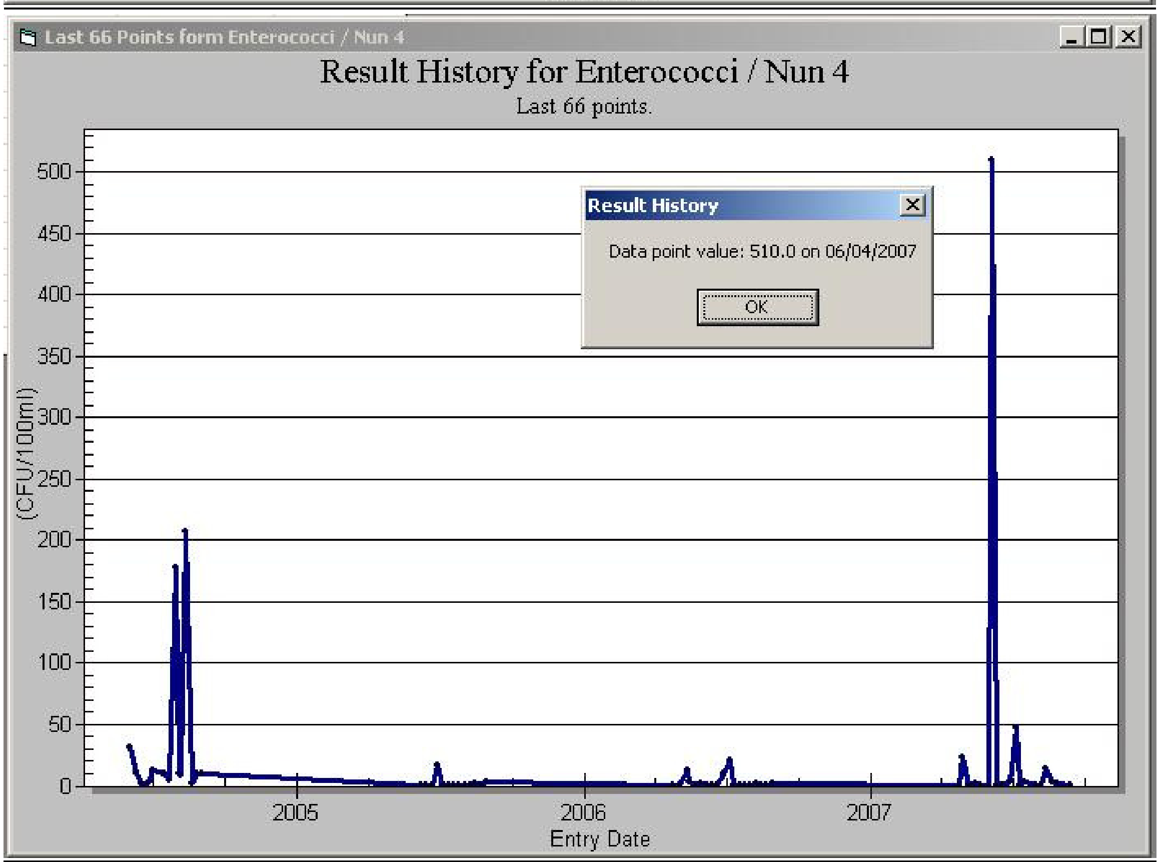





Last 67 Points form Fecal Coliform / Manorhaven
Result History for Fecal Coliform / Manorhaven
Last 67 points.
Result History
Data point value: 3500.0 on 07/30/2007
OK
(CFU/100ml)
3500
3000
2500
2000
1500
1000
500
0
2005
2006
2007
Entry Date


Last 67 Points form Enterococci / Manorhaven
Result History for Enterococci / Manorhaven
Last 67 points.
Result History
Data point value: 2400.0 on 05/16/2006
OK
(CFU/100ml)
2500
2000
1500
1000
500
0
2005
2006
2007
Entry Date


Last 66 Points form Fecal Coliform / Nun 4
Result History for Fecal Coliform / Nun 4
Last 66 points.
Result History
Data point value: 440.0 on 06/04/2007
OK
(CFU/100ml)
500
450
400
350
300
250
200
150
100
50
0
2005
2006
2007
Entry Date


Last 66 Points form Enterococci / Nun 4
Result History for Enterococci / Nun 4
Last 66 points.
Result History
Data point value: 510.0 on 06/04/2007
OK
(CFU/100ml)
500
450
400
350
300
250
200
150
100
50
0
2005
2006
2007
Entry Date

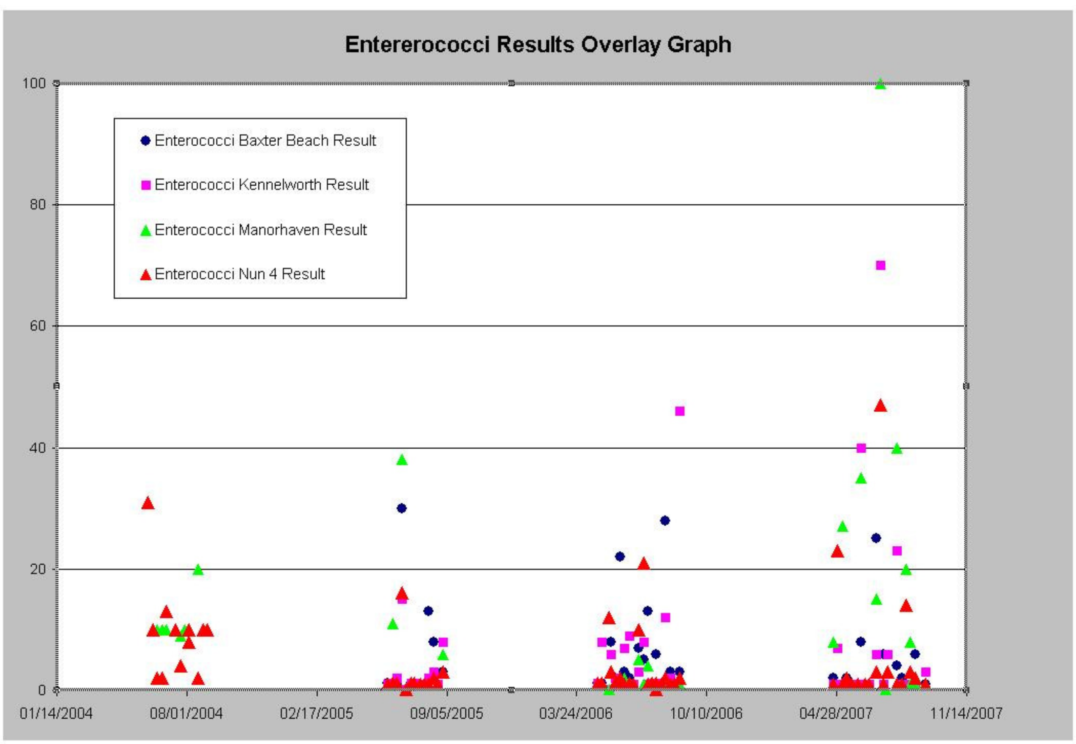
The table below does not correct elevated results that are greater than 1,000 but uses the numbers actually recorded. It can be argued that any results for bacteria samples that are greater than 1,000 are "too numerous to count".

Tappen Beach in Hempstead Harbor for comparison

Enterococci	Baxter Beach	IBM Beach	Kennelworth	Leeds Pond	Manorhaven	Nun 4	Tappen Beach
Mean	9	85	6	40	58	18	60
Minimum	1.	1.	0.1	0.1	0.1	0.1	1.
Maximum	190.	2000.	70.	697.	2400.	510.	1920.
Data Points	45	156	51	65	67	66	162

Fecal Coliform	Baxter Beach	IBM Beach	Kennelworth	Leeds Pond	Manorhaven	Nun 4	Tappen Beach
Mean	267	145	101	155	139	45	226
Minimum	1.	1.	1.	1.1	1.	1.	1.
Maximum	3900.	5700.	2800.	3240.	3500.	500.	3100.
Data Points	45	157	51	65	67	66	162

In the following scatter graph for Enterococci results from 2004-2007 from the primary MBPC sites there does not appear to be any significant trends noted for basing any conclusions. Three elevated points were omitted to maintain scale.

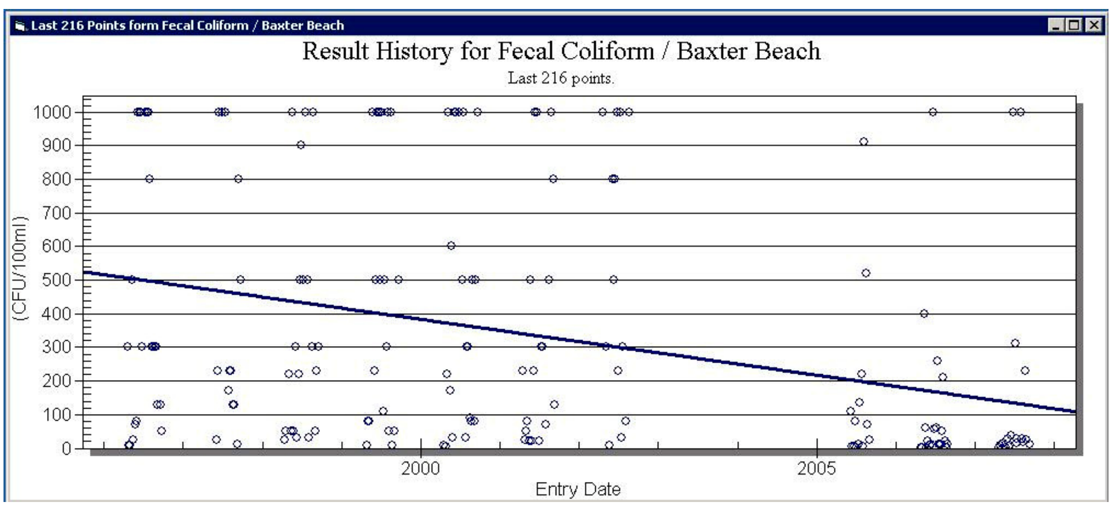


Conclusions & Recommendations

The LabLite PC software that will be installed at the Town of North Hempstead can be remotely accessed by secure users. Appropriate users can mine the historic data for Manhasset Bay and also other sites formerly monitored by the Nassau County Dep't of Health since 1996. LabLite personnel have looked at this data very carefully and have asked an environmental laboratory director to review some data to help discern both temporal and spatial trends.

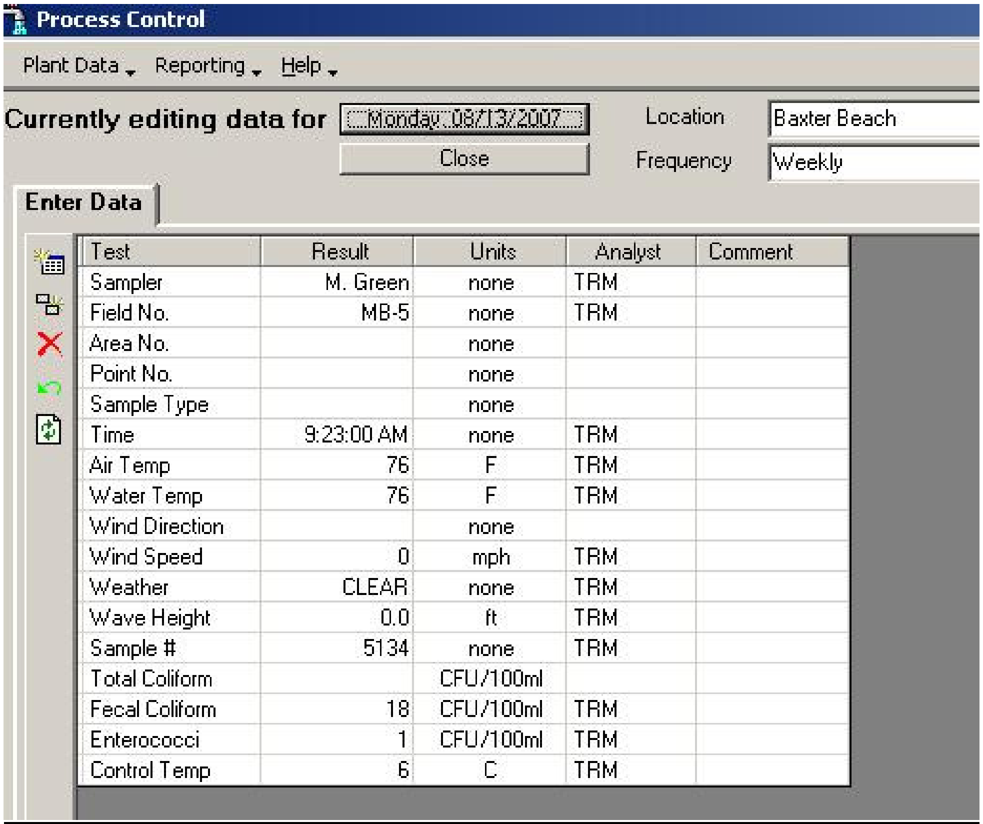
Our conclusions are that there are few definitive temporal or spatial trends evident in the raw data. We can't say Manhasset Bay is cleaner or better over time because this would be a subjective judgment based on parameters that vary widely (fecal coliform) from year to year and within each summer season and at each location.

The graph below shows that Baxter Beach may be improving as judged by a trend line derived from 216 scatter points of data collected since 1996.



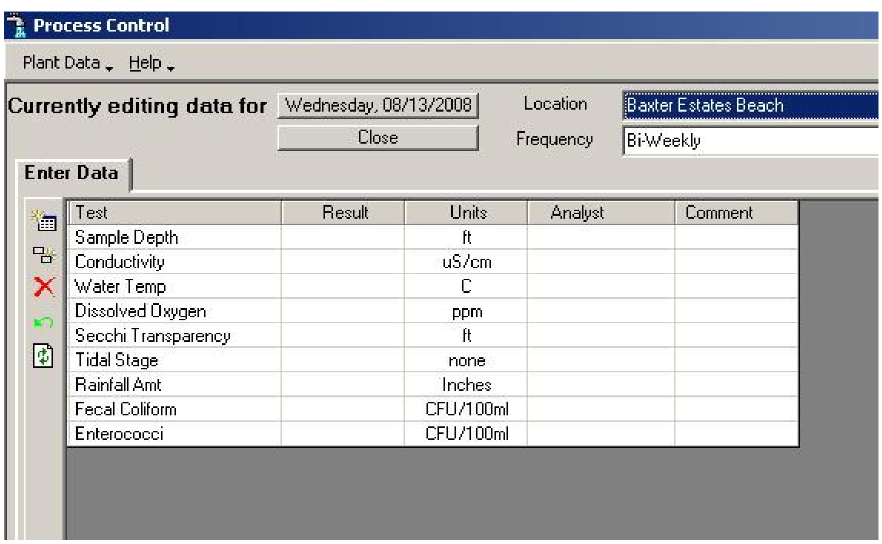
This conclusion points to a rationale to change the parameters being monitored and to revise the locations so that monitoring going forward will have the potential to clearly evaluate the environmental health of the bay. It is possible that other reviewers will discern statistical trends in the historic data by mining data with LabLite PC. We urge you to explore possible scenarios by comparing sites and parameters over time with the included data mining tools. This exercise will also serve to train users on program use.

Historic Testing Parameters (noted on screen below)



Test	Result	Units	Analyst	Comment
Sampler	M. Green	none	TRM	
Field No.	MB-5	none	TRM	
Area No.		none		
Point No.		none		
Sample Type		none		
Time	9:23:00 AM	none	TRM	
Air Temp	76	F	TRM	
Water Temp	76	F	TRM	
Wind Direction		none		
Wind Speed	0	mph	TRM	
Weather	CLEAR	none	TRM	
Wave Height	0.0	ft	TRM	
Sample #	5134	none	TRM	
Total Coliform		CFU/100ml		
Fecal Coliform	18	CFU/100ml	TRM	
Enterococci	1	CFU/100ml	TRM	
Control Temp	6	C	TRM	

Potential Additions to Monitoring Parameters and Sites:



Test	Result	Units	Analyst	Comment
Sample Depth		ft		
Conductivity		uS/cm		
Water Temp		C		
Dissolved Oxygen		ppm		
Secchi Transparency		ft		
Tidal Stage		none		
Rainfall Amt		Inches		
Fecal Coliform		CFU/100ml		
Enterococci		CFU/100ml		

The current beach sites could be continued to help ensure safety for swimming. This is a regulatory requirement during the seasonal use period that is monitored by the Nassau County Dep't of Health.

New Sites would replace some of the sites in the Bay and should be determined with the help of local authorities. All sites should be marked with GPS points and easily found. Data associated with the GPS locations could be tied to GIS maps for visual analysis.

Potential new sites could include:

- Near outfalls of sewage treatment plants
- Major stormwater outfalls for sub-watersheds to be collected during rain events
- At entrance to Bay (east shore, center, west shore)
- Sampling at two or three depths in fewer locations

Tidal influences (~7 ft.) on water quality are complex and may point to a monitoring plan at selected locations that grabs samples at flood, ebb and slack stages on the same day. This could help answer the questions surrounding the degree to which pollution is coming from Long Island Sound or the Bay sources.

Some of the negative influences that come from treatment plants on the shallow south end of the Bay may not be flushing out with tidal exchange and mixing. The tidal current charts will need to be reviewed.

We could also consider the harmonic constituents that include amplitude, phase and speed especially at the Bay entrance. In order to minimize variation, the sampling times should not be driven by convenience, but rather tidal stage and exact locations.

Another consideration in developing a sampling plan is water temperature at different depths and locations. The shallow end of the bay will be warmer than the entrance. Water that is exchanged and mixed from tidal flows will tend to stratify. Cold water may flow in at lower depths. Warm water from the south end may tend to stay suspended and be drawn out at beach elevations.

One should also consider that bacteria survival times are longer in warm waters. This is one reason the fecal coliform and enterococci bacteria levels tend to spike in warmest summer months.

Potential Monitoring Strategies:

Any selected strategy should have a design that dovetails with other monitoring programs so that data generated can be shared and compared. For instance, the IEC tests waters in the Bay several times during the summer and data is housed in the STORET database along with other data from the region. MBPC should also strive for consistency with other nearby harbors (Hempstead & Oyster Bay) by selecting similar parameters and sampling frequencies. Below are three potential alternatives.

<u>Alternative I</u>: It may make sense to have a two phase monitoring plan for Manhasset Bay. The goal is to determine how much of the Manhasset Bay's problems come from local negative influences as opposed to the Sound waters and tidal exchanges.

The first phase should collect samples at selected stations documented with GPS locations during different tidal stages and depths. The initial sites would include areas near sewage treatment plant discharges, stormwater outfalls, east, west and center at Bay mouth, middle bay existing sites and off public swimming beaches.

The recommended list of parameters includes: fecal coliform bacteria, enterococcus bacteria, Secchi disk clarity (cost of Secchi disk is $65), dissolved oxygen, water temperature, conductivity/salinity, tidal stage, days since last significant rainfall event and sampling depth.

The results from initial samples should be evaluated to see if significant differences are present. If not, some sites could be removed. The important sites will be assigned to a realistic and affordable monitoring plan for one complete season of sampling and analysis. All data would be recorded in LabLite PC SQL and compared to historic results and results from other harbors, bays and Long Island Sound. This data can be linked to a GIS map and database and serve as an ongoing way to present findings to scientists and the public.

If negative influences are identified at local sites, you will be able to institute appropriate and effective correction measures to make the Bay as clean as possible.

Alternative II: This alternative is similar to the first one in that a two phase approach to define permanent monitoring locations documented with GPS points is strongly suggested. To expedite the sampling site selection process and ongoing monitoring, the MBPC would purchase a YSI meter to aid samplers in data collection. This meter, specified below, is handheld and is equipped with a multi parameter probe that would provide instantaneous readings for dissolved oxygen, pH and temperature (cost = $1,419). It can also be fitted with other probes for conductivity. We would recommend the same list of parameters as noted in Alternative I. However, the fecal coliform bacteria and enterococcus could be omitted since the Nassau County Department of Health is responsible for beach monitoring and closures. This would reduce the overall cost and time delays for results.

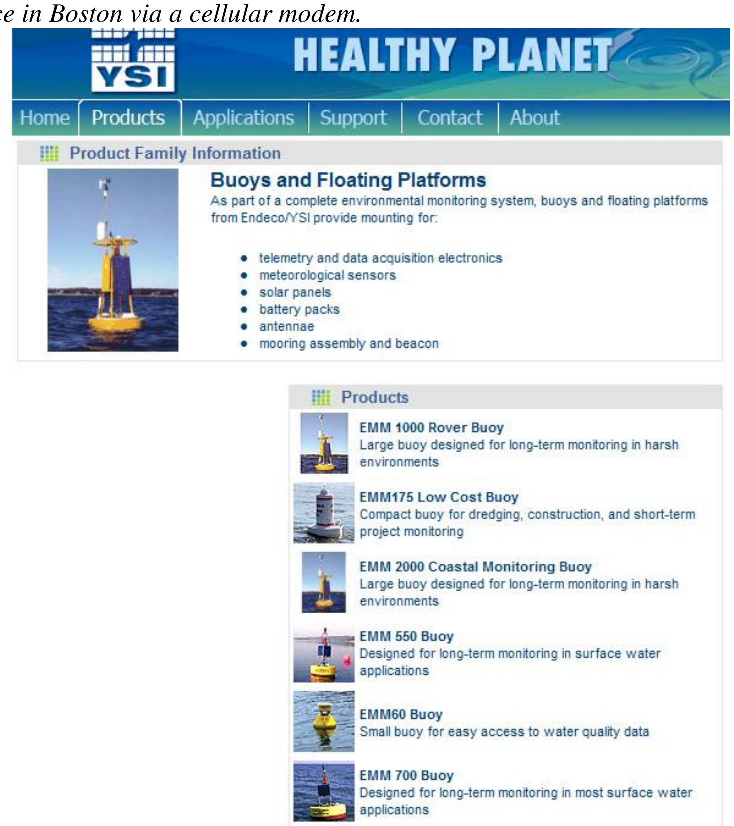
“AS AN **ANTHORIZED YSI DISTRIBUTOR** FOR YOUR REGION, NORTH EAST SCIENTIFIC, LOCATED IN PENNA, WAS NOTIFIED BY THE MANUFACTURER OF YOUR EQUIPMENT REQUEST. BELOW, PLEASE FIND YOUR QUOTE, AT A DISCOUNTED PRICE FOR THE FOLLOWING YSI INSTRUMENATION.

6050000	PROPLUS METER	$	685 EA
6051020-10	33FT CABLE FOR DO/PH/ºC		404 EA
605101	PH SENSOR		106 EA
605202	GALVANIC DO SENSOR		112 EA
605203	POLAROGRAPHIC DO SENSOR		112 EA

IF I CAN BE OF FURTHER ASSISTANCE, PLEASE CONTACT ME TOLL FREE AT JAMES E. TROOP, NORTH EAST SCIENTIFIC, 1-888-674-8647.” (from e-mail contact)

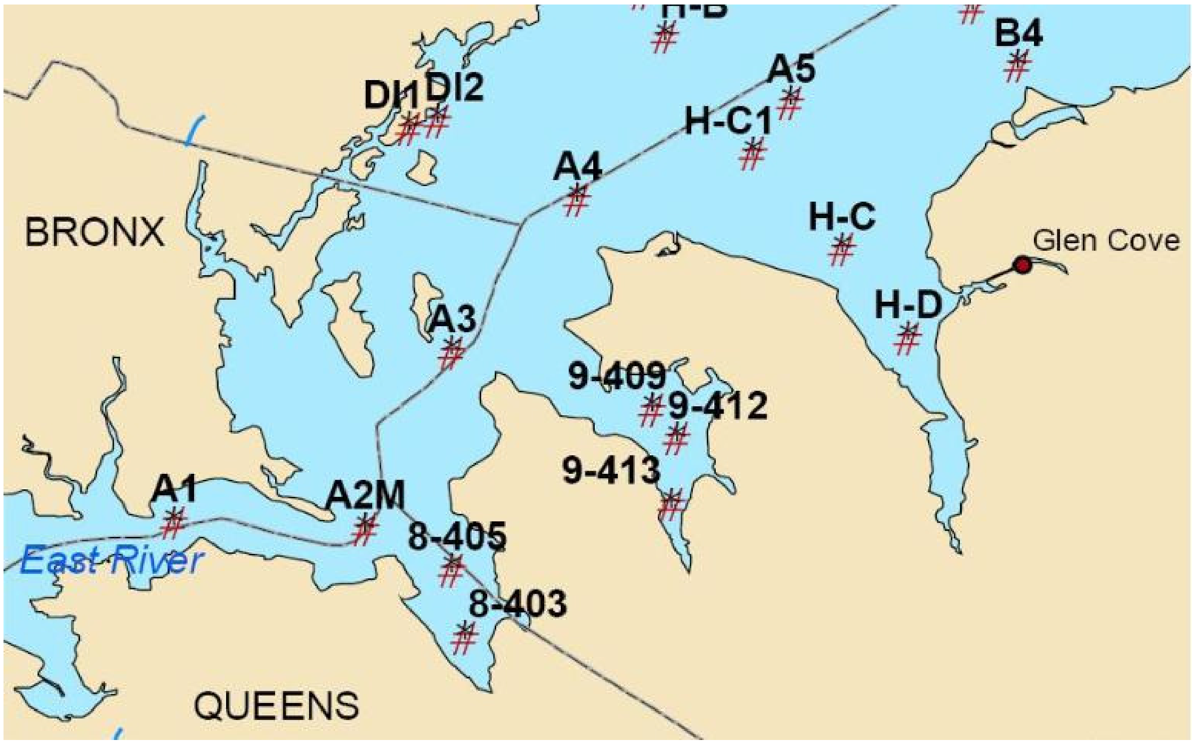
Alternative III: A water quality monitoring buoy is the most expensive option that would provide a constant stream of data. The cost of this option would depend on the model selected and number of probes, but would range from $10,000 to $20,000. One of these buoys could be placed in the middle of the bay to give MBPC continuous readings for Dissolved Oxygen (DO), temperature and conductivity/salinity. This data could be supplemented by other locations on a lesser sampling frequency. The buoy may be vulnerable to vandalism and would require some servicing by trained personnel. Some of the manufacturer information is quoted below.

YSI environmental monitoring systems have been recording data that indicates the health of the bay. A YSI 6-Series sonde is hung in mid-water column from a YSI EMM550 buoy. The sonde records dissolved oxygen, temperature, and conductivity. It sends the information in fifteen-minute intervals to a YSI 6200 Data Acquisition System that is installed in the buoy. The data is uploaded daily to the Coastal Zone Management’s office in Boston via a cellular modem.



Supporting Documentation

Interstate Environmental Commission Monitoring Sites noted in map below.



Interstate Environmental Commission - 2007 Data

Temp in Centigrade

Sample Date	6/26/07	7/2/07	7/9/07	7/16/07	7/30/07	8/6/07	8/13/07	8/20/07	8/27/07	9/4/07	**AVG**
Site*											
9-409	19.9	18.8	21.1	20.8	21.7	23.6		21.9	22.7	23.1	**21.5**
9-409	16.8	18.1	19.7	19.6	21.4	23.4		21.9	22.2	22.9	**20.7**
9-409	16.3		18.4		21.4	22.6	23.2	21.9	22.2	22.8	**21.1**
9-412	19.6	19.0	21.2	21.1	22.5	23.5		21.9	23.3	23.2	**21.7**
9-412	18.3	18.5	20.3	20.0	21.8	23.5		21.9	22.9	23.2	**21.2**
9-412	16.4		19.1		21.7	22.8	23.1	22.0	22.4	22.9	**21.3**
9-413	19.6	19.6	21.8	21.3	23.2	23.6		21.5	23.5	23.0	**21.9**
9-413	18.8		21.2		22.4	23.0	23.1	22.2	23.2	22.9	**22.1**
9-413	17.6				22.1				23.0		**20.9**

AVG	**18.1**	**18.8**	**20.4**	**20.6**	**22.0**	**23.3**	**23.1**	**21.9**	**22.8**	**23.0**	**21.4**

Dissolved Oxygen in mg/L

Site											
9-409	12.3	10.2	10.4	7.8	6.5	8.5	7.5	3.8	5.9	11.7	**8.5**
9-409	6.5	6.8	7.2	2.5	4.5	8.1	6.6	3.8	4.5	11.6	**6.2**
9-409	4.8		4.8		4.3	4.8	6.6	4.0	4.5	8.4	**5.3**
9-412	10.0	10.6	10.6	6.9	8.2	8.2	8.7	3.1	7.4	10.8	**8.5**
9-412	7.4	7.4	8.0	2.8	5.7	7.5	7.2	3.1	5.6	10.7	**6.5**
9-412	5.1		5.1		4.2	5.1	4.5	3.0	2.6	7.8	**4.7**
9-413	11.3	11.8	12.1	7.2	9.0	5.5	7.3	2.2	7.9	8.3	**8.3**
9-413	7.9		4.8		8.2	3.3	7.0	2.3	6.8	6.3	**5.8**
9-413	4.6				3.1		6.9		3.0		**4.4**
AVG	**7.8**	**9.4**	**7.9**	**5.4**	**6.0**	**6.4**	**6.9**	**3.2**	**5.4**	**9.5**	**6.5**

Secchi Disk Clarity in Meters

Site											
9-409		0.9	0.9	0.8	1.2	0.8	0.8	2.0	1.5	1.1	**1.11**
9-409											
9-409											
9-412		1.2	0.5	1	1.4	0.9	0.7	2.0	1.4	1.1	**1.13**
9-412											
9-412											
9-413		1.4	0.8	0.8	1.2	0.9	0.6	1.4	1.1	1.1	**1.03**
9-413											
9-413											
AVG		**1.17**	**0.73**	**0.87**	**1.27**	**0.87**	**0.70**	**1.80**	**1.33**	**1.10**	**1.09**
Sample Date	6/26/07	7/2/07	7/9/07	7/16/07	7/30/07	8/6/07	8/13/07	8/20/07	8/27/07	9/4/07	**AVG**

* IEC Sites in Manhasset Bay have multiple measurements that are taken one meter below the surface, at mid-depth, and one meter above the bottom on each sample date, if possible on that day.

* Site 9-409 is located near Nun 4 off Manorhaven
Site 9-412 is located in center of bay off Plandome
Site 9-413 is located in head of bay near sewage treatment discharges

Interstate Environmental Commission 2003 Report excerpts:

The Commission has long advocated adequate infrastructure as a necessity for maintaining and improving receiving water quality, as well as for minimizing use impairments. These tremendous expenditures on the infrastructure have resulted in significant water quality improvements throughout the District these past years; however, much remains to be done.

With secondary treatment virtually in place since 1994 throughout the Interstate Environmental District, control of the region's combined sewer overflows, stormwater runoff, and municipal separate storm sewer systems is necessary in order to achieve further significant water quality improvements. Communities throughout the District have ongoing CSO control programs and projects that range from sewer separation to swirl concentrators to booming and skimming to in-line and off-line storage. The National Estuary Programs in the District have identified major problems affecting water quality which are exacerbated by anthropogenic impacts, namely, nutrient enrichment, historic sediment contamination, pathogens, habitat loss and floatables. These issues must be addressed in order to maintain and improve commercial and recreational maritime activities, living marine resources, land use, and wetland creation/remediation.

STORET

Throughout its history, the Commission has amassed a huge data base of ambient and effluent water quality data. These data have been collected for a variety of reasons which have been highlighted throughout this report, previous Annual Reports, and in special reports. The Commission has been a depository and advocate of water quality data collection, analysis and dissemination for the tri-state region. Originally under the auspices of the Public Health Service, the US EPA has the responsibility for the computerized National Water STOrage and RETrieval (STORET) data base for housing and managing data and metadata on air, sediment, soils and water. The water matrix contains end-of-pipe water quality, groundwater, saline and freshwater quality data. The system promotes data sharing among federal, state, interstate, and local agencies, as well as the private sector. Commission data as far back as 1970 and as recent as 2007 exists in the STORET system.

The original data base underwent a modernization and overhaul between 1991 and 1998. The Commission's input to the modernized STORET is represented by over 40,000 parametric recordings, which include dissolved oxygen, temperature, salinity, chlorophyll a, and fecal and total coliform bacteria. The modernized version of STORET has been enhanced to contain ancillary information such as climate and tidal data, type of monitoring instrumentation, personnel expertise and visual observations.

Combined Sewer Overflows

Since the passage of the Clean Water Act and the implementation of secondary treatment, the quality of the region's waters has improved dramatically. However, water bodies are still negatively impacted by urban and suburban stormwater runoff. Combined sewer overflows and municipal separate storm sewer systems are major sources of pollution and are allowed to discharge only during wet weather.

Manhasset Bay Wastewater Treatment Plants Documentation

Village of Great Neck, 2003

An engineering study is being proposed with a five-year plan for upgrading the treatment plant by adding four new pump stations and nutrient reduction retrofits at a cost of about $100,000 per year. Other feasible alternatives involve combining flows with the Great Neck Water Pollution Control District and/or convert both plants to pump stations and divert all flows for treatment at a regional facility located on the south shore of Nassau County.

Village of Great Neck, 2007

This facility is operating under a 2005 State Consent Order to update the facility or divert flows. Completion of substantial construction is required by August 9, 2011. An engineering study is ongoing which addresses upgrading the treatment plant by adding four new pump stations and nutrient reduction retrofits. Other feasible alternatives involve combining flows with the Great Neck Water Pollution Control District and/or converting both plants to pump stations and diverting all flows for treatment at a regional facility located on the south shore of Nassau County. Another ongoing study will determine the ability of the District's 2.8 MGD plant to process the Village flow while the Village constructs the treatment plant improvements to meet the Long Island Sound Study (LISS-III), Phase III nitrogen reduction targets. The grit chamber will be rehabilitated with new chains, sprockets, rails, shafts and wear shoes. Actual costs and final time schedule are pending. The installation of Biological Nutrient Removal (BNR) facilities and UV disinfection is also pending. Bids will be accepted during November 2007 for collection system rehabilitation which involves lining of 1,200 LF of 12-inch diameter and 300 LF of 8-inch diameter gravity sewers.

Great Neck Water Pollution Control District, 2003

An infiltration/inflow (I/I) study is ongoing (50% complete) in certain areas of the collection system to evaluate hydraulic capacity and eliminate extraneous flows.

It is estimated that over $16 million will be spent to retrofit or build new tanks for nitrogen reduction at this facility. The nutrient reduction requirement is mandated by the LISS Phase III nitrogen reduction plan. An engineering study is under way to evaluate the feasibility of upgrading or diverting to another plant. The Feasibility Diversion Study, funded with $36,000 of Bond Act grants, was completed about two years ago and concluded that the diversion of the entire effluent from this plant and the Village of Great Neck to a regional plant on the south shore is technically feasible. Early this past year, the District and the Village of Great Neck were selected to receive a $18.7 Clean Water/Clean Air Bond Act Grant for the diversion project. Both parties are currently working together to confirm that the diversionary concept is cost-effective by initiating a detailed design and cost analysis.

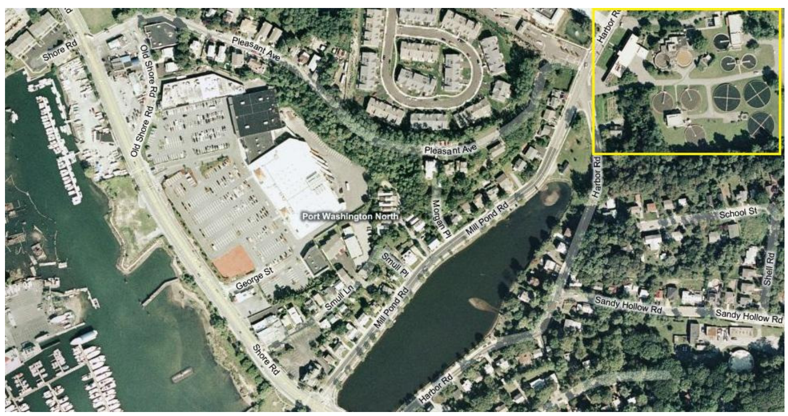
Great Neck Water Pollution Control District, 2007

An I/I study in certain areas of the collection system to evaluate hydraulic capacity and eliminate extraneous flows was completed during 2007. This involved manhole inspections and televising of sewer lines. Installation of water barrier manhole inserts was completed during May. The District-wide installations incurred costs of about $60,000.

The Feasibility Diversion Study, funded with $36,000 of CW/CA Bond Act grants, was completed approximately six years ago and concluded that the diversion of the entire effluent from this plant and the Village of Great Neck plant to a regional plant on the south shore is technically feasible. However, the study indicated that the diversion would be more costly and not as environmentally responsible as compared to other onsite upgrades. An engineering design is currently under way for a facility upgrade to achieve nitrogen removal. The plant design will utilize oxidation ditch technology. Another I/I study is ongoing in certain areas of the collection system to evaluate hydraulic capacity and eliminate extraneous flows. This involves manhole inspections and televising of sewer lines. This facility is operating under a 2006 State Consent Order to further the goals of the Environmental Conservation Law and the federal Clean Water Act. The plant is in compliance with all Order dates and is required to have substantial construction completed by December 31, 2011.

The nutrient reduction retrofit for this facility mandated by the LISS Phase III nitrogen reduction plan is estimated at over $32 million. An approximate construction start is December 31, 2008, with an anticipated operational start date of June 30, 2012.

Port Washington, 2003



The Port Washington Water Pollution Control District is undertaking a nitrogen removal demonstration project by utilizing existing tanks to create separate nitrification/de-nitrification zones to demonstrate nitrogen removal. The construction of the pilot project was completed and has been denitrifying about 1 MGD (millions of gallons per day) of the plant's wastewater since 2002. In early 2003, the District was selected to receive an $11 million grant from the 1996 Clean Water/Clean Air Bond Act for the Biological Nutrient Removal (BNR) upgrade. Based on the results of effluent quality, the plant is currently meeting the August 2004 nitrogen loading limit.

Rescheduled to begin during the spring season of 2004, refurbishing of two pump stations and plant-wide repairs and preventive maintenance, such as roofing and various architectural replacements, will be addressed. Costs are re-estimated at $2 million. During the same season, additional collection system upgrades will include the installation of 4,000 linear feet of six-inch diameter force main from one of the aforementioned pump stations. This work is estimated to cost $500,000.

Port Washington, 2007

Scheduled to begin during the fall season of 2007, the nitrogen removal capabilities will be expanded to provide full scale Biological Nutrient Removal (BNR) for the facility's design flow of 4 MGD. Costs were estimated at $18 million during 2006. The District has completed the Facility Plan and the Plan was subsequently approved by the NYS DEC in January 2006. The District's engineer is presently in the design phase. The BNR facilities are planned to be on-line during 2010. An oxidation ditch which typically operates in an extended aeration mode with long detention and solids retention times is the technology selected by the District to provide denitrification.

INTERSTATE ENVIRONMENTAL COMMISSION ORGANIZATION AND REGULATIONS

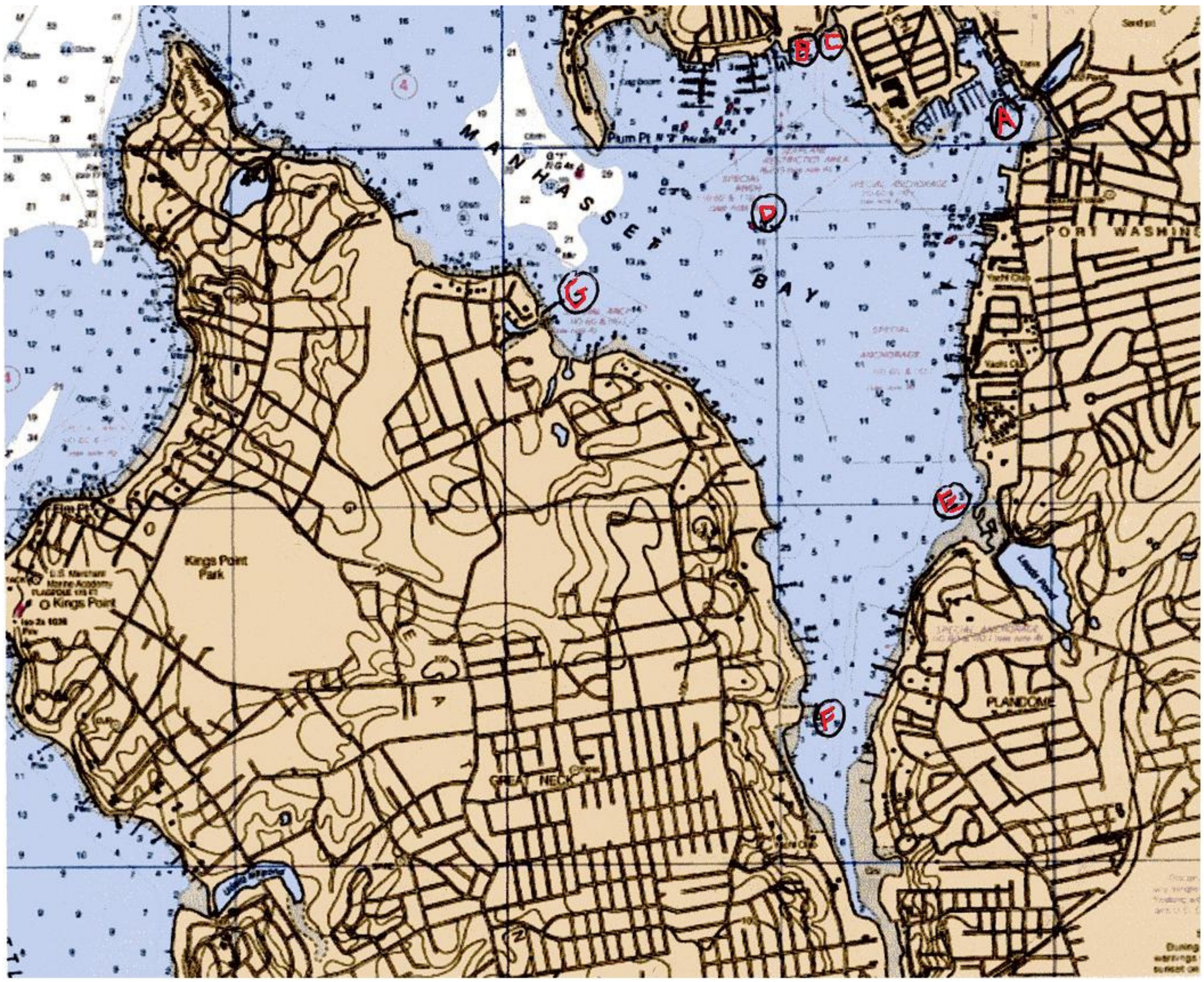
A: Suitable for all forms of primary and secondary contact recreation and for fish propagation. In designated areas, they also shall be suitable for shellfish harvesting.

2.04(a). "Primary Contact Recreation" means recreational activity that involves significant ingestion risk, including but not limited to wading, swimming, diving, surfing, and waterskiing.
3.01(a). The following waters of the Interstate Environmental District are hereby classified as Class A: the East River east of the Whitestone Bridge and extending out and including the Long Island Sound waters west of a line from the easterly side of New Haven Harbor at Morgan Point in Connecticut to the easterly side of Port Jefferson Harbor in New York.

Useful Web Links:

http://www.mysound.uconn.edu/mys_view.html - Long Island Sound Tide Information
http://www.mobilegeographics.com:81/locations/5032.html - Manhasset Bay Tide Info
http://friendsofthebay.org - Oyster Bay monitoring information
http://www.iec-nynjct.org/default.htm - Interstate Environmental Commission
http://www.nassaucountyny.gov/agencies/Health - Nassau County Health Dep't
http://www.epa.gov/region01/eco/lis - Long Island Sound Study Info
https://www.ysi.com/ysi/Products/Product_Family?prodFamID=SYS_BUOYS - Buoys
http://hempsteadharbor.org – Hempstead Harbor Information

Map of Manhasset Bay Protection Committee Current Monitoring Sites



Key	Site A -	Baxter Beach
	Site B -	Manorhaven Beach
	Site C -	Manorhaven
	Site D -	Nun #4
	Site E -	Leeds Pond
	Site F -	Great Neck
	Site G -	Kennelworth