A Total Maximum Daily Load Analysis for Southport Harbor Shellfishing Areas - Fairfield, Connecticut

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This document has been established pursuant to the requirements of Section 303(d) of the Federal Clean Water Act

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INTRODUCTION

A Total Maximum Daily Load (TMDL) analysis was prepared for indicator bacteria at Southport Harbor located in Fairfield County, Connecticut (Figure 1). Southport Harbor is included on the 2006 *List of Connecticut Waterbodies Not Meeting Water Quality Standards*[1] (2006 *List* - Appendix C of the 2006 Water Quality Report to Congress) due to exceedences of the indicator bacteria criteria for fecal coliform contained within the State *Water Quality Standards*[2] (WQS). Exceedence of the bacteria criteria resulted in closure of the Southport Beach shellfishing area in August 2002 (Figure 2). In response to the initial closure at Southport Beach, the Connecticut Department of Environmental Protection (CTDEP) partnered with the Connecticut Department of Agriculture, Bureau of Aquaculture (DA/BA), the Environmental Protection Agency (EPA), and Town of Fairfield to conduct a modeling study[3] (SH Study) in 2004 in order to better understand the transport and loading of bacteria throughout the harbor. In May 2006, DA/BA downgraded several of the harbor shellfishing area classifications based upon its 2005 Annual Assessment Report[4] (Figure 3). With the information obtained in the modeling study, as well as monitoring data provided by DA/BA, the CTDEP developed TMDLs at two locations that empty into outer Southport Harbor, where shellfishing area classifications have been downgraded. Attainment of the TMDL targets is expected to result in improvement to these impaired shellfishing areas and attainment of the bacteria criteria established in the WQS. (For more information regarding assessed and impaired waterbodies throughout the state, please refer to the 2006 *Water Quality Report to Congress*[1].)

Under section 303(d) of the Federal Clean Water Act (CWA), States are required to develop TMDLs for waters impacted by pollutants, are included on their Impaired Waters Lists, and for which technology-based controls are insufficient to achieve water quality standards. In general, the TMDL represents the maximum loading that a waterbody can receive without exceeding the water quality criteria, which have been adopted into the WQS for that parameter. Federal regulations (40CFR, section 130.2(i)) specify that TMDL loadings may be expressed as a mass per time, toxicity, or other appropriate measure[5]. For the Southport Harbor TMDLs, loadings are expressed as the percent reductions necessary at specific locations in order to achieve the water quality standards and support shellfishing at Southport Beach. EPA's most recent guidance[6] recommends that all TMDLs and associated load allocations and wasteload allocations be expressed in terms of daily time increments. The percent reduction TMDLs for Southport Harbor are applicable each and every day until shellfishing use goals are attained. Federal regulations require that the TMDL analysis identify the portion of the total loading which is allocated to point source discharges (termed the Wasteload Allocation or WLA) and the portion attributed to nonpoint sources (termed the Load Allocation or LA), which contribute the TMDL pollutant to the waterbody. In addition, TMDLs must include a Margin of Safety (MOS) to account for uncertainty in establishing the relationship between pollutant loadings and water quality. Seasonal variability in the relationship between pollutant loadings and WQS attainment was also considered in the TMDL analyses.

Southport Harbor receives freshwater from the Mill River and Sasco Brook. The bottom portions of both rivers are diluted with estuarine water from Long Island Sound during flood tides. TMDLs for indicator bacteria have been developed and approved for the freshwater portions of both the Mill River and Sasco Brook[7] (Figure 4) to achieve and maintain recreational uses. The Mill River TMDL includes the area from Easton Reservoir to the inlet at Samp Mortar Reservoir. Sampling station (M1), which is representative of the section from Samp Mortar Reservoir to Sturges Road, did not exceed the criteria for recreational uses and therefore, a TMDL was not necessary. This is the lower freshwater portion of the river that empties directly into inner Southport Harbor. The Sasco Brook TMDL includes the area from the headwaters to the Bulkley Pond dam. Below Bulkley Pond dam, Sasco Brook is estuarine and travels for approximately 0.8 miles before it empties into outer Southport Harbor, immediately adjacent to Southport Beach.

TMDLs that have been established by States are submitted to the Regional Office of the Federal Environmental Protection Agency (EPA) for review. The EPA can either approve the TMDL or disapprove the TMDL and act in lieu of the State. TMDLs provide a scientific basis for developing and implementing a Water Quality Management Plan or TMDL Implementation Plan (Plan), which describes the control measures necessary to achieve acceptable water quality conditions. Plans derived from TMDLs typically include an implementation schedule and a description of ongoing monitoring activities to confirm that the TMDL will be effectively implemented and that WQS are achieved and maintained where technically and economically feasible. Public participation during development of the TMDL analysis and subsequent preparation of the Plan is vital to the success of resolving water quality impairments.

TMDL analyses for indicator bacteria in Southport Harbor are provided herein. As required in a TMDL analysis, load allocations have been determined, a margin of safety has been included, and seasonal variation has been considered. This document also includes recommendations for TMDL implementation as well as a water quality monitoring plan.

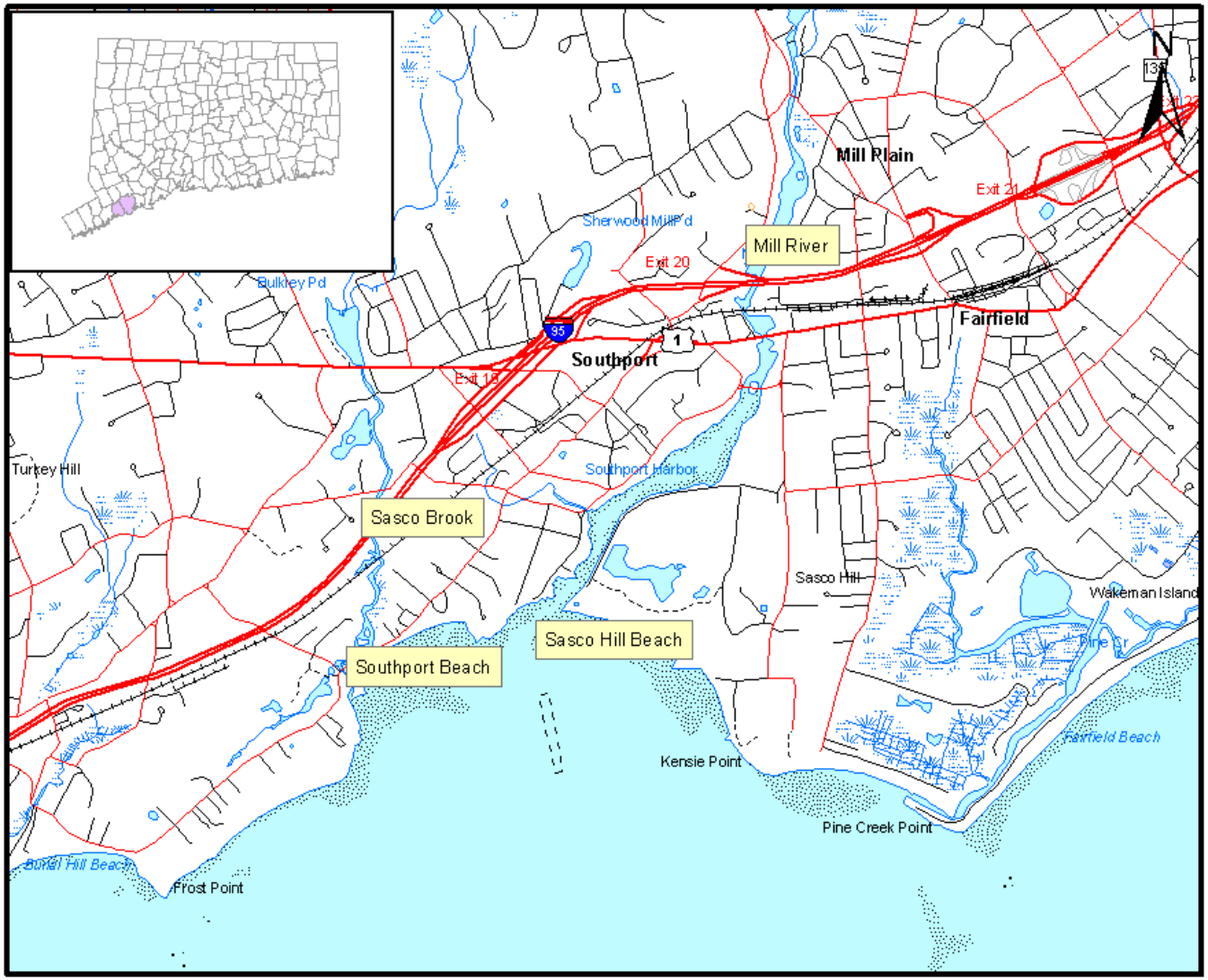

Figure 1 - Location Map of Southport Harbor

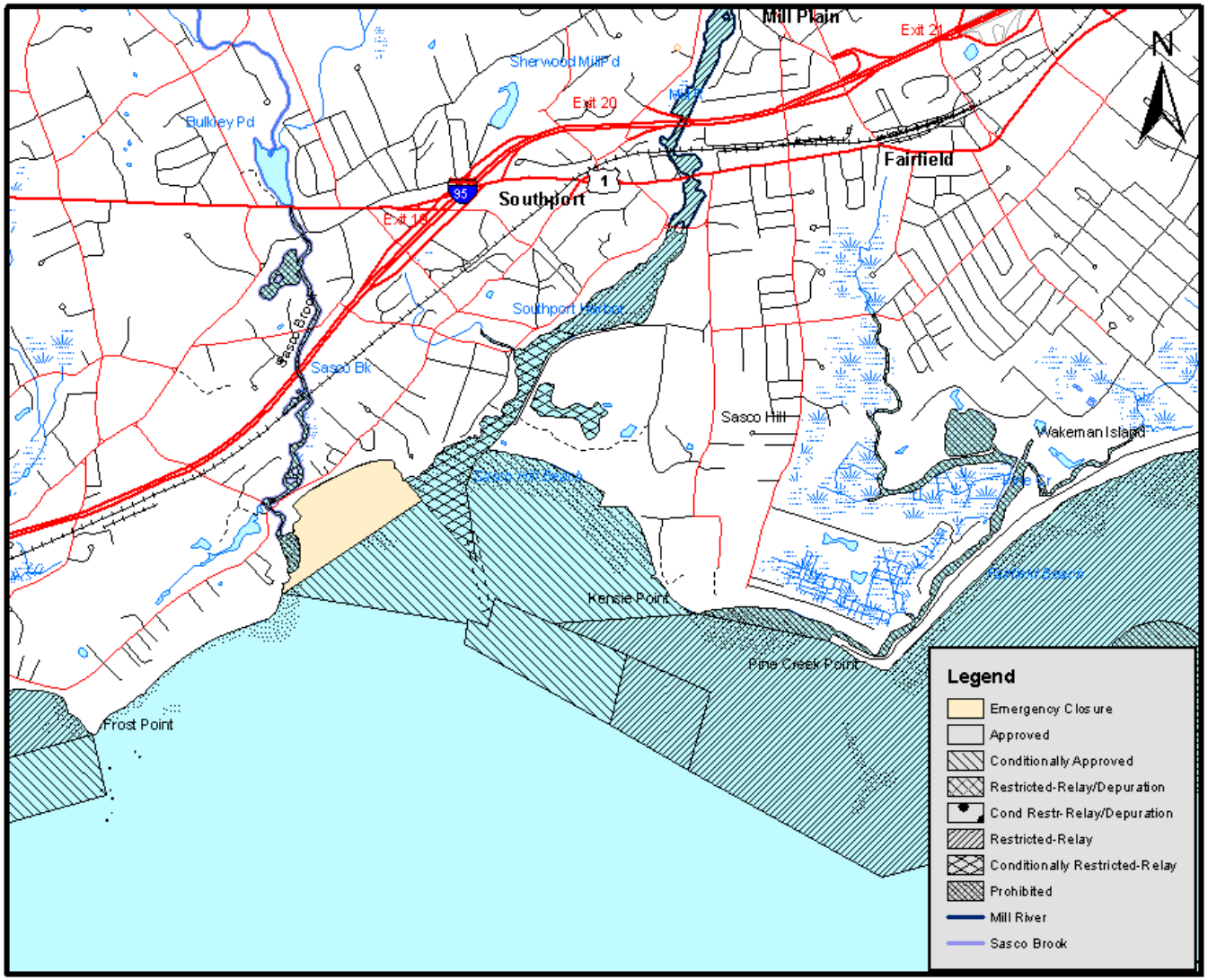

Figure 2 - Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River prior to May 16, 2006

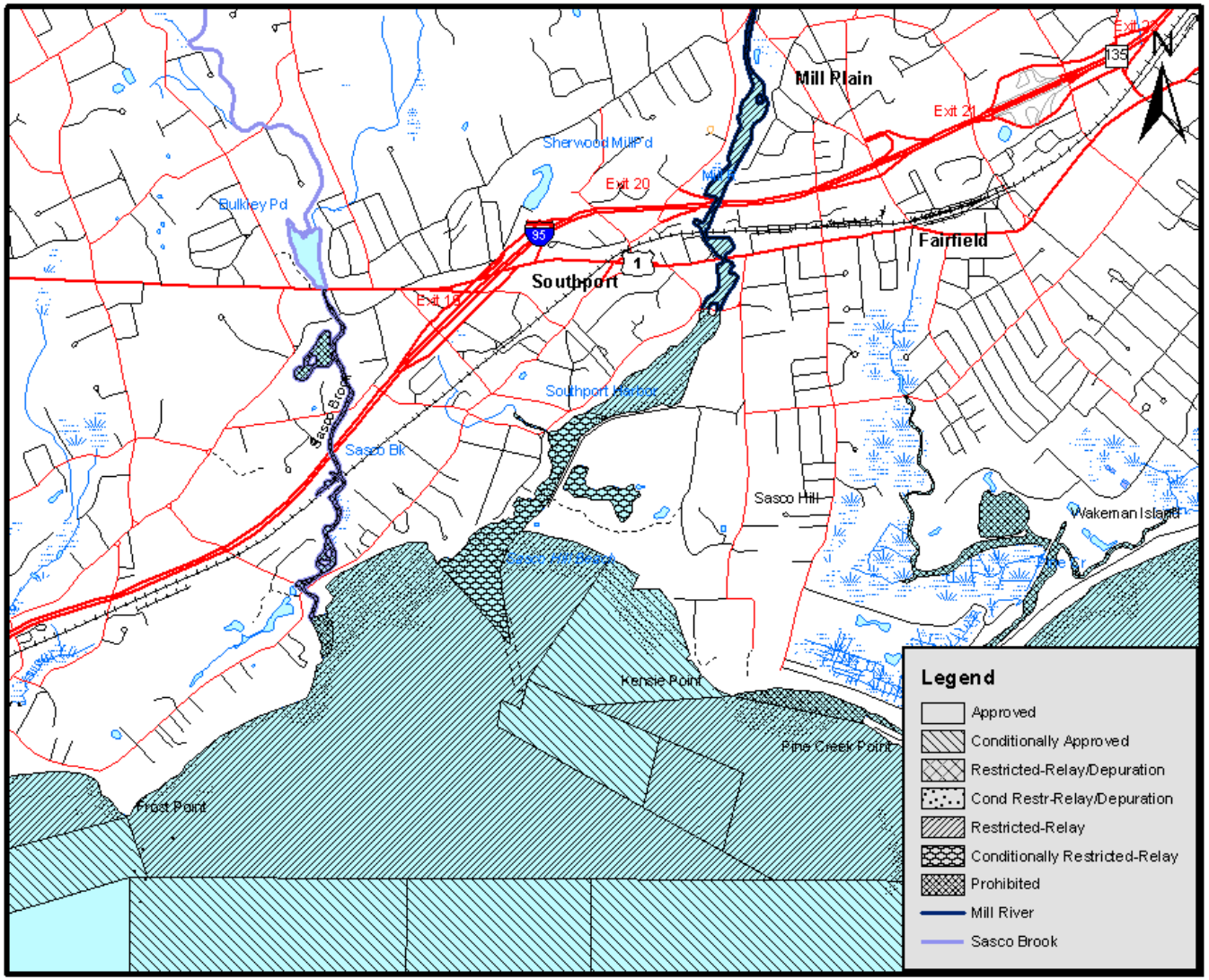

Figure 3 - Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River effective May 16, 2006

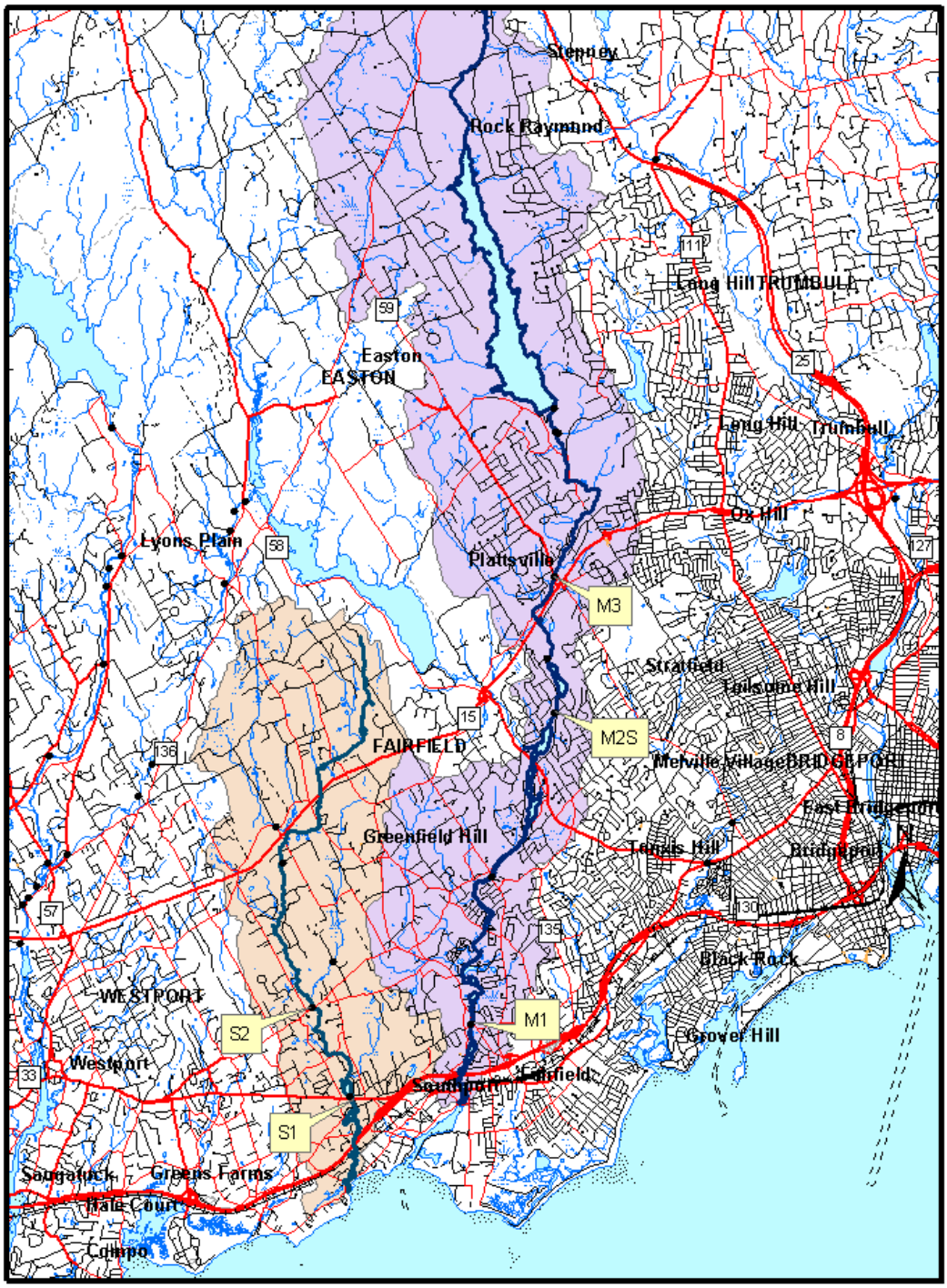

Figure 4 - Watershed Map showing the freshwater TMDL sites in the Mill River and Sasco Brook

PRIORITY RANKING

Southport Harbor is included on the 2006 *List* for impairment to shellfishing resources as a result of levels of indicator bacteria detected in excess of the water quality criteria to support shellfishing use in goal SA waters. According to the WQS[2], waters classified as SA or goal SA should support the harvest of shellfish for direct human consumption. Southport Harbor is ranked an "H" on the 2006 *List*, indicating that the waterbody was under study when the list was prepared and that a TMDL may be developed if warranted. Based on the Southport Harbor Hydrodynamic and Pollutant Transport Modeling Study[3] (SH Study), the CTDEP determined that a TMDL is an appropriate measure to address the shellfishing impairment to the outer harbor, and that enough relevant information has been collected to prepare TMDLs.

DESCRIPTION OF THE WATERBODY

Southport Harbor is located within the Town of Fairfield, Connecticut. The land use surrounding the harbor is primarily residential. Commercial and industrial uses exist along Route 1 and Interstate I-95. A land cover map is included as Figure 5 and waterbody specific information is provided in Appendix A.

The harbor can be geographically divided into inner and outer sections. As shown on Figure 6, the inner harbor lies north of Sasco Hill Beach and the outer harbor, south of Sasco Hill Beach. The Mill River is the main tributary to Southport Harbor. Sasco Brook contributes freshwater to a lesser degree. Another small tributary drains to the inner harbor just north of the Westway Road and Harbor Road intersection.

There is a private marina with mooring field (Pequot Yacht Club) and a town marina (Ye Old Yacht Yard) in the inner harbor. Pequot Yacht Club is served by public sewer and the town marina utilizes a septic system. There is a marine pump out facility located at Pequot Yacht Club, which is available for public use. Currently, the CTDEP is pursuing designation of the area from Guilford to Greenwich (which includes Southport Harbor) as a "No Discharge Zone". This designation will prohibit discharges of sanitary waste from boats equipped with marine sanitation devices to Long Island Sound and coastal waters, including Southport Harbor.

The Country Club of Fairfield, which offers a golf course and other leisure activities, is present on the east bank of the inner harbor. The country club maintains a number of subsurface sewage disposal systems to service the general manager's residence, maintenance building, beach pavilion, bathhouse and snack bar, main clubhouse, and tennis building. The onsite sewage disposal systems were inspected by the Town of Fairfield as part of shoreline survey for the harbor in July 2005. During the inspection, no overflow problems or other signs of septic problems were observed. A copy of the final report is attached as Appendix B. One tidal pond and one freshwater pond are located on the property. There are reports of large flocks of

waterfowl using these ponds. The country club uses firecrackers to discourage the waterfowl population from remaining on site.

Public sewer service is available on the west side of the inner harbor (Figure 7). The east side of the harbor is also sewered with the exception of the country club and a few properties on Sasco Hill Road. Public sewer service is not available to the areas surrounding Sasco Brook estuary, Southport Beach, and Sasco Hill Beach.

Two designated swimming beaches are located in Southport Harbor: Sasco Hill Beach and Southport Beach. Both beaches provide access to recreational shellfishing areas that are managed by the Town of Fairfield (Town). The Town issues permits and runs a voice message machine 24-hours per day to notify the public regarding the status of these shellfishing areas. The Town also restocks hard shell clams annually for harvesters. The initial closure of the shellfishing area at Southport Beach and subsequent downgrading of shellfishing areas has caused great concern among local officials and stakeholders. The downgrading included a large portion of Sasco Hill Beach, which has remained opened despite the closure at Southport Beach (Figure 8).

Shellfishing Area Classifications

Shellfishing area classifications are determined by the DA/BA in accordance with U.S. Food and Drug Administration (FDA)/Interstate Shellfish Sanitation Conference (ISSC) National Shellfish Sanitation Program Model Ordinance (NSSP-MO)[8]. Shellfishing area classifications for Southport Harbor are shown in Figure 8. Definitions are provided in Table 1. Shellfishing area classifications are established to minimize health risks, and may result in restrictions regarding the taking and use of shellfish from certain areas. DA/BA reevaluates shellfishing area classifications annually for conformance with the NSSP-MO. If nonconformance is determined, the area is downgraded. Shellfishing area classifications can be upgraded if improving conditions are determined to exist.

Routine work conducted by DA/BA for shellfishing areas results in a Comprehensive Evaluation Report, which includes a shoreline survey and water quality data every twelve years; an Annual Assessment Report, including shoreline changes and data analysis; and a Triennial Evaluation Report. These reports describe pollution sources and their potential impact, statistical analyses of water quality samples, corrective actions, and recommendations to reclassify an area in order to assure conformance with the NSSP-MO.

Table 1. Shellfishing Area Classifications and Definitions for Southport Harbor (effective May 16, 2006).

Classification	Waterbody	Area Description	Definition
Restricted-Relay	Inner Southport Harbor	From the northern most point of the wet basin at Pequot Yacht Club upstream to Sturges Rd. Bridge.	Aquaculture activities in this area are limited to the relay of shellfish to designated beds or approved areas for natural cleansing.
Conditionally Restricted-Relay	Inner and Outer Southport Harbor	From the southern shore of Sherwood Pt. southeast to N"8" channel buoy, then north along the breakwater to its landfall on the east shore, then west to northern most point of the wet basin at Pequot Yacht Club.	This area predictable does not conform to the restricted-relay criteria. This area is closed seasonally during the summer season from May 1 through October 15.
Restricted-Relay	Outer Southport Harbor	From a shellfish demarcation sign on Sasco Hill Beach southwesterly to N"2", then southeasterly to the northeastern corner of shellfish bed L-431, then westerly along the southern boundary line of the State Natural Bed to the intersection of the town boundary line, then due north to the mainland, thence northeasterly along the shoreline back to the point of beginning.	Aquaculture activities in these areas are limited to the relay of shellfish to designated beds or an Approved area for natural cleansing.
Seasonally Approved	Outer Southport Harbor - Sasco Hill beach	From a shellfish demarcation sign on Sasco Hill Beach southwesterly to N "2", then easterly to a shellfish demarcation sign at Kensie Point, including all of shellfish bed L-920, located in both state and town shellfish jurisdictional waters.	This area closes seasonally during the summer season from May 1 through September 30, as well as, in the event of 1.0" of rainfall, the area closes for 7 days and reopens on the eighth day.

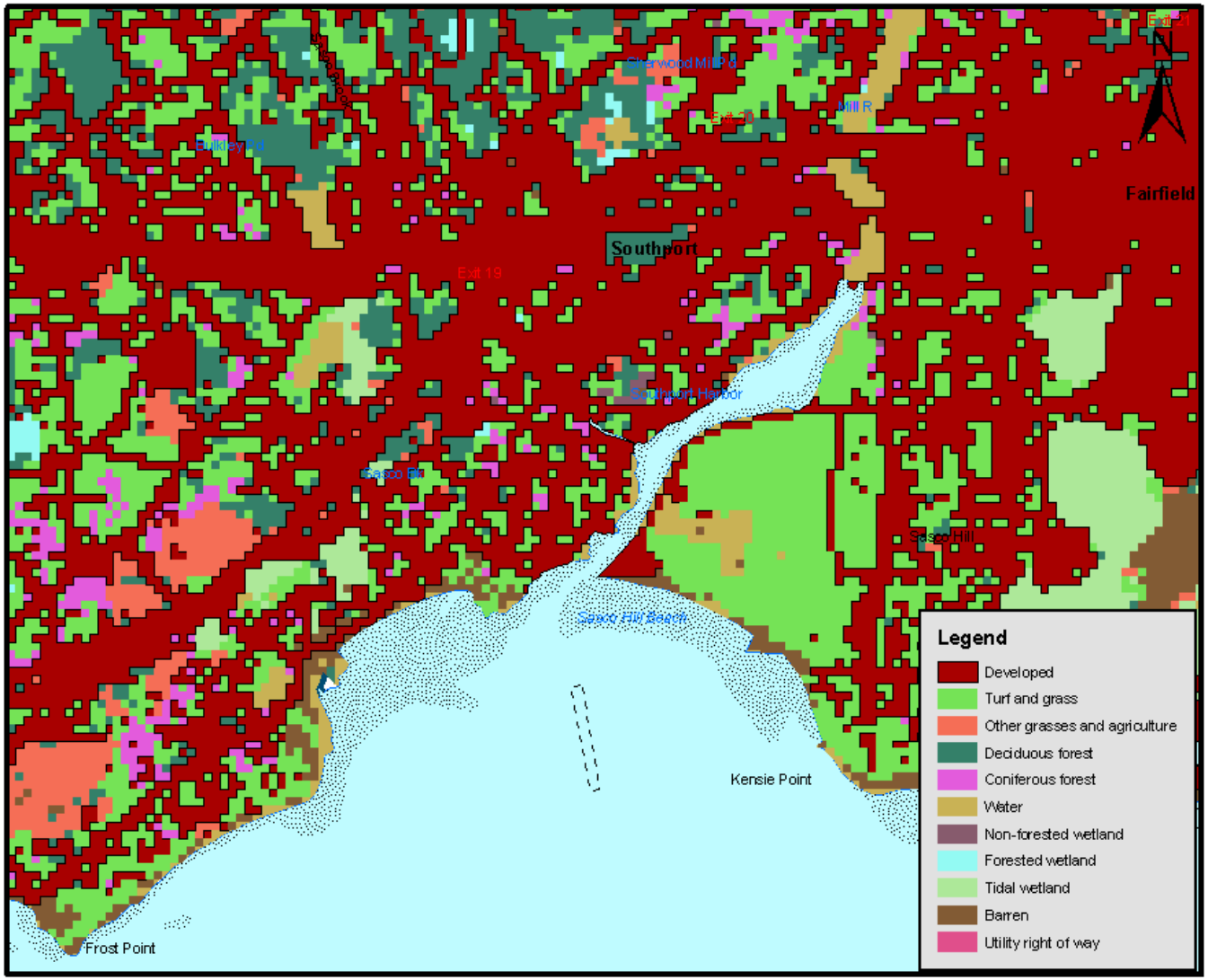

Figure 5 - Southport Harbor Land Cover Map

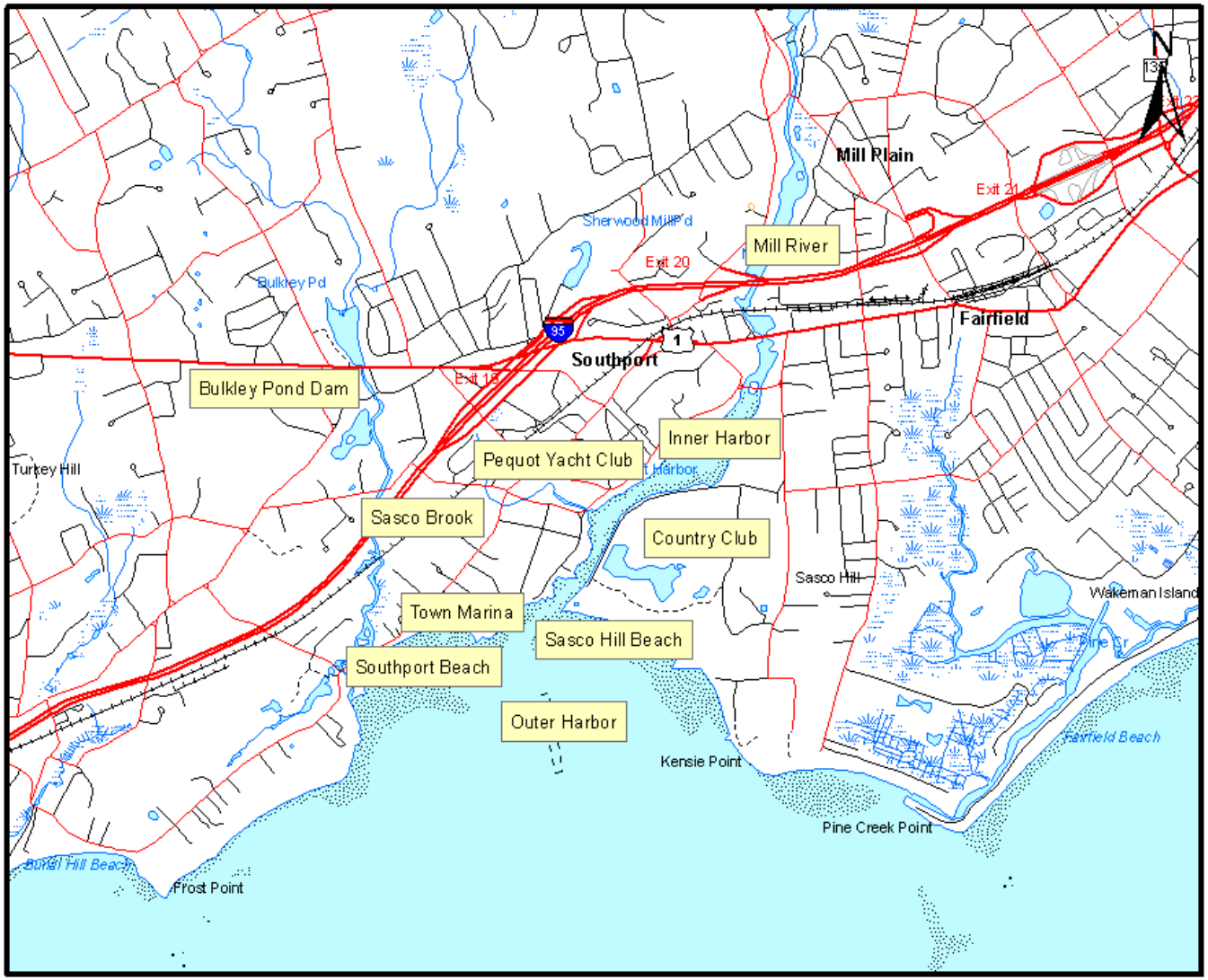

Figure 6 - Features Map of Southport Harbor

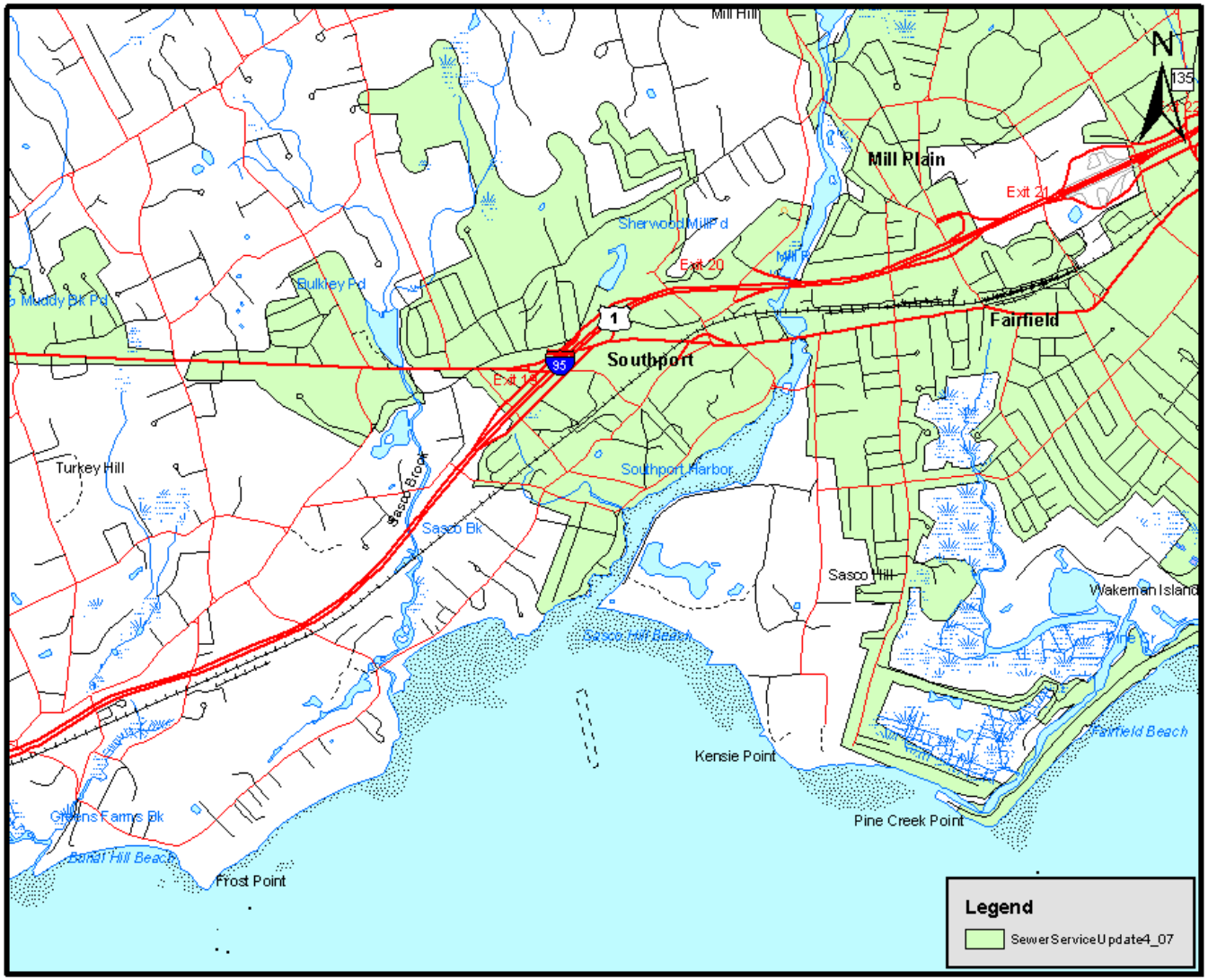

Figure 7 - Southport Harbor Sewer Service Area Map

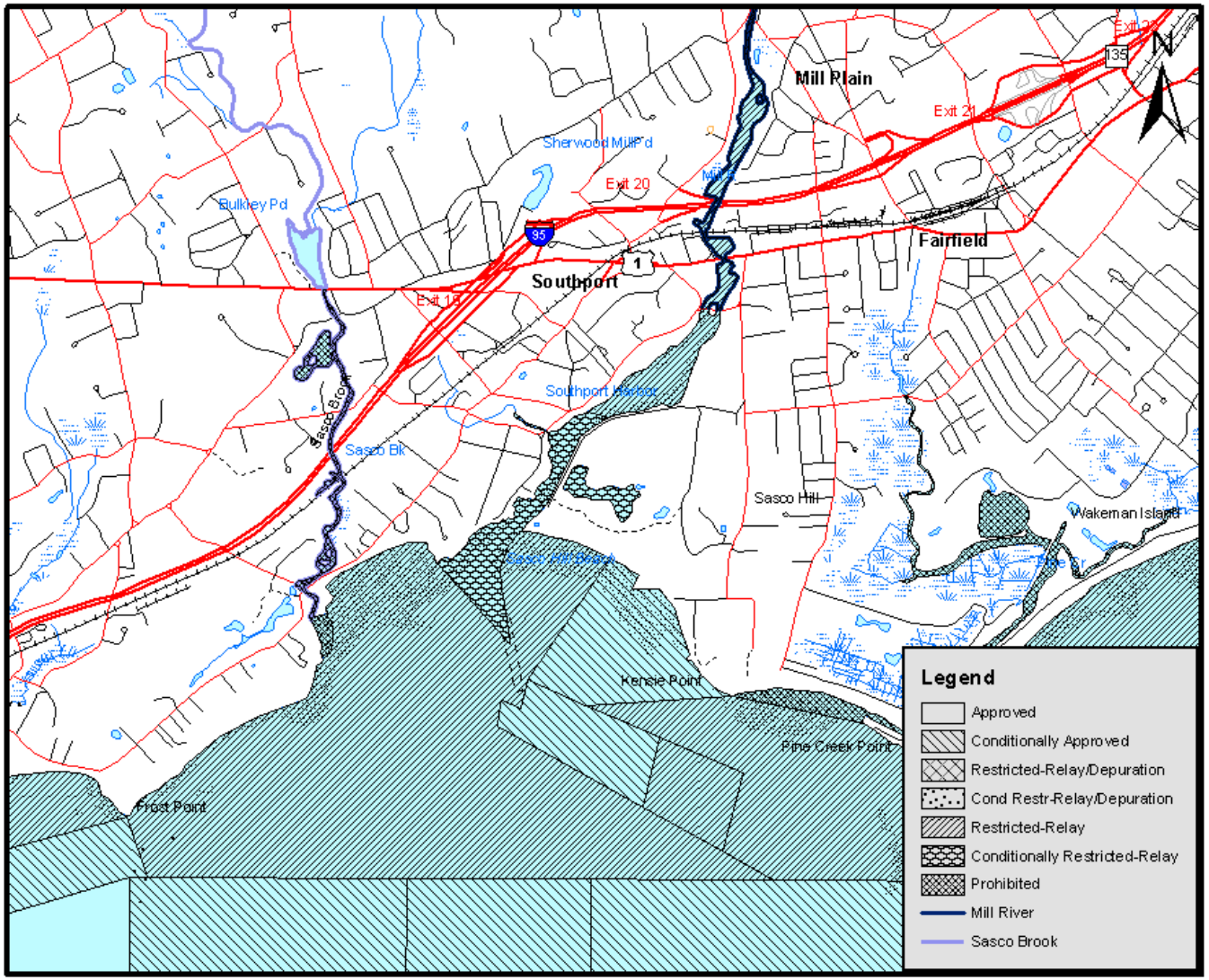

Figure 8 - Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River effective May 16, 2006

As previously mentioned, the CTDEP partnered with the DA/BA, EPA, and Town of Fairfield to conduct a hydrodynamic and pollutant transport modeling study[3] of Southport Harbor. The study was undertaken to evaluate the loading and transport of bacteria in the harbor. Physical information about Southport Harbor, as well as study findings from the SH Study are included in the following paragraphs.

Tidal Cycle
Data collected from a current meter installed in the harbor during the SH Study indicated the semi-diurnal component of the tides (i.e., approximately two complete tidal cycles per day or one cycle every 12.42 hours). Variations in tidal amplitude related to the spring-neap cycle were also evident. The tidal range varied from as much as ~3 m around the spring tide (31 July – 1 August, 2004) to as little as ~1.5 m around the neap tide (11 August, 2004). Based on a mean tidal range of 2.0 m, tidal flow in and out of Southport Harbor averages 5,544 cubic feet second (cfs).

Currents and Flow
Currents are essentially uniform with depth, with minimal vertical structure in the flow. Current velocities are relatively low, with peak flood and ebb magnitudes typically less than 25 cm/s. Flow is somewhat stronger in the east-west direction than in the north-south direction, consistent with the dominant east-west tidal flow in Long Island Sound. In particular, there is a strong flow to the east at and after high tide and a corresponding flow to the west at and after low tide.

Salinity and Temperature
Some stratification in both salinity and temperature was observed in Southport Harbor. However, the overall degree of stratification is relatively small, and stratification of salinity is limited to stations within the inner harbor, where the fresher surface layer is thin. Most of the outer harbor is well mixed, and waters at depths > 1.5 m are particularly uniform.

Freshwater Flow
Sasco Brook and the Mill River introduce freshwater to the harbor. Above the Bukley Pond dam, Sasco Brook is freshwater and above Sturges Road, Mill River is freshwater. Based on the yearly average of gauging data maintained by the United States Geological Survey (USGS), Sasco Brook (1965-2003) discharges at a mean annual rate of 18.7cfs (watershed size, 26.4km^2) and the Mill River (1973-2003) mean annual discharge rate is 42.2cfs (watershed size, 83.0km^2) to Southport Harbor. The extent of saltwater in both these tributaries is shown in Figure 9.

Sasco Brook estuary
Sasco Brook forms the boundary between Westport and Fairfield. The shoreline of Sasco Brook estuary consists of marsh grasses and eroded mud stream banks. Water depths are generally shallow, less than one foot to no more than six feet at high tide, with an average depth of approximately three feet. Residential homes are present along the shoreline. These homes rely on subsurface sewage disposal systems for their wastewater treatment and discharge. Industrial discharges to the brook are not present. A number of

stormwater pipes discharge to the brook, including pipes at the Route 1 bridge in Westport which have been documented to flow during periods of dry conditions (HarborWatch/RiverWatch[9]).

Harbor Hydrodynamics

Sasco Brook estuary Dye Studies

To observe the movement of water to Southport Beach during ebb tide, the DA/BA conducted a dye dispersion and float study from the mouth of Sasco Brook estuary in July, 2000. Elevated levels of fecal coliform bacteria had been detected in Sasco Brook estuary and DA/BA was interested in learning if water from the brook travels to Southport Beach. The study showed that Southport Beach receives water from Sasco Brook for the first two and a half hours after high tide during ebb tide. However, the first few hours of ebb tide consist primarily of water from Long Island Sound that entered Sasco Brook during the previous flood tide. Based on monitoring data collected by DA/BA as well as data collected specifically for the SH Study, Long Island Sound water does not contain elevated levels of indicator bacteria under normal conditions and therefore, is not considered an impairing source to shellfishing use at Southport Harbor. In fact, at the onset of ebb tide, it is likely that water from Sasco Brook estuary is diluted by Long Island Sound water in the outer harbor, including the Southport Beach area. During the dye release conducted in 2004 for the SH Study, water from Sasco Brook estuary traveled to the west exiting Southport Harbor. Both studies suggest that indicator bacteria from Sasco Brook estuary have a slight impact on only a small portion (southwestern side) of the outer harbor at Southport Beach (Figure 10). For the SH Study, dye dilution data was used to calibrate a pollutant transport model. Figure 11 demonstrates the area and probability of influence for water from Sasco Brook estuary on outer Southport Harbor.

Inner Southport Harbor Dye Study

Dye was released at Ye Old Yacht Yard in 2004 for the SH Study to observe the movement of water from the inner harbor to the outer harbor during ebb tide. The results indicate that water moves west from the inner harbor to the outer harbor and into Long Island Sound. Based on these results, it is expected that indicator bacteria from the inner harbor have a significantly greater impact on the outer harbor shellfishing areas than does water from Sasco Brook estuary (Figure 12). These effects are most noted at low tide, when the inner harbor water dominates the outer harbor, specifically Southport Beach and little water is available for dilution from Long Island Sound. Figure 13 demonstrates the area and probability of influence for water from the inner harbor on the outer harbor as modeled for the SH Study.

Outer Harbor Modeled Hydrodynamics

As part of the SH Study, the hydrodynamics of Southport Harbor were modeled using BFHYDRO, a component of WQMAP produced by Applied Science Associates, Inc. (ASA). ASA used current data and dye dilution information collected during the project field program in 2004 to calibrate and validate the model. The results of the model indicate that as water begins to ebb from the inner harbor, it combines with outer harbor water and travels east towards Bridgeport (Figure 14). Water exiting Sasco Brook

estuary travels east-northeast (Figure 14). Approximately three to four hours later, water from the inner harbor and Sasco Brook estuary changes direction to the south-southwest and travels out of the harbor towards Westport (Figure 15). Upon flood tide, water enters the harbor and Sasco Brook estuary from the east (Figure 16). Three to four hours later, water entering the harbor is from the south-southwest (Figure 17).

SH Study Conclusions

The Southport Harbor Hydrodynamic and Pollutant Transport Modeling Study (SH Study) found that circulation in the harbor is primarily driven by the tides and secondarily by winds. The highest concentrations of bacteria were found in the inner harbor and the mouth of Sasco Brook estuary. Dye studies conducted at these two sites suggested that water from the inner harbor and Mill River are a more likely source of contamination to Southport Beach due to advection of the dye along the western shore of the Harbor than Sasco Brook. The hydrodynamic model showed the complex nature of tidal flows in Southport Harbor, varying from the primarily east-west flow in the outer harbor to the primarily north-south flow in the inner harbor. In the pollutant transport model, scenarios were run in both forward and backward modes at Southport Beach. The forward mode model results showed that plumes from the inner harbor were more likely to impact the beach area than those from Sasco Brook. The backward mode results showed that the inner harbor was the likely source based on six representative receptor sites located in the beach area. The model results also suggested that sources from offshore locations can impact the beach but this was discounted since there are no known offshore sources. In addition, data from offshore sampling sites demonstrates that water from Long Island Sound does not contain elevated levels of fecal coliform bacteria under normal conditions.

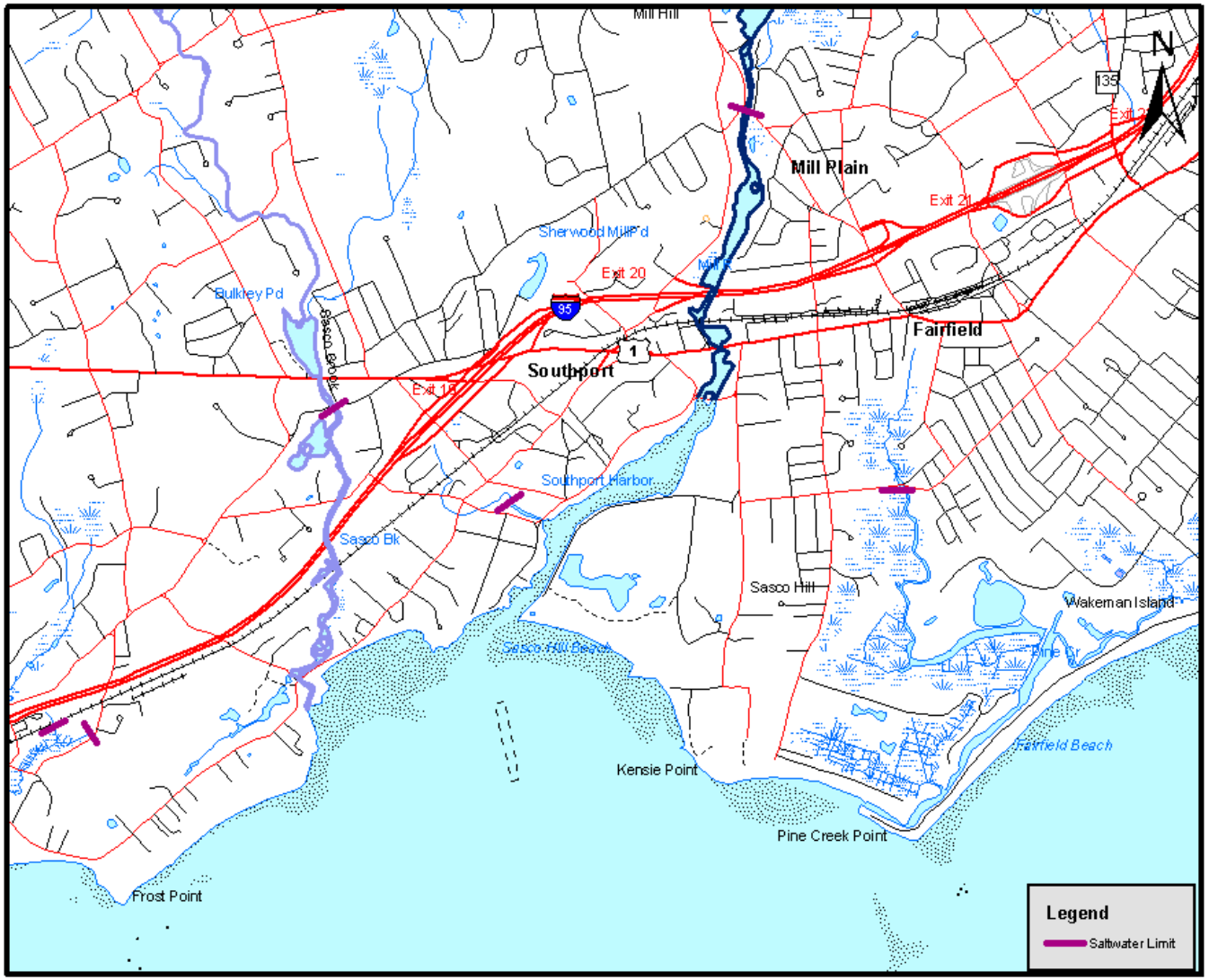

Figure 9 - The extent of Saltwater in the Mill River and Sasco Brook

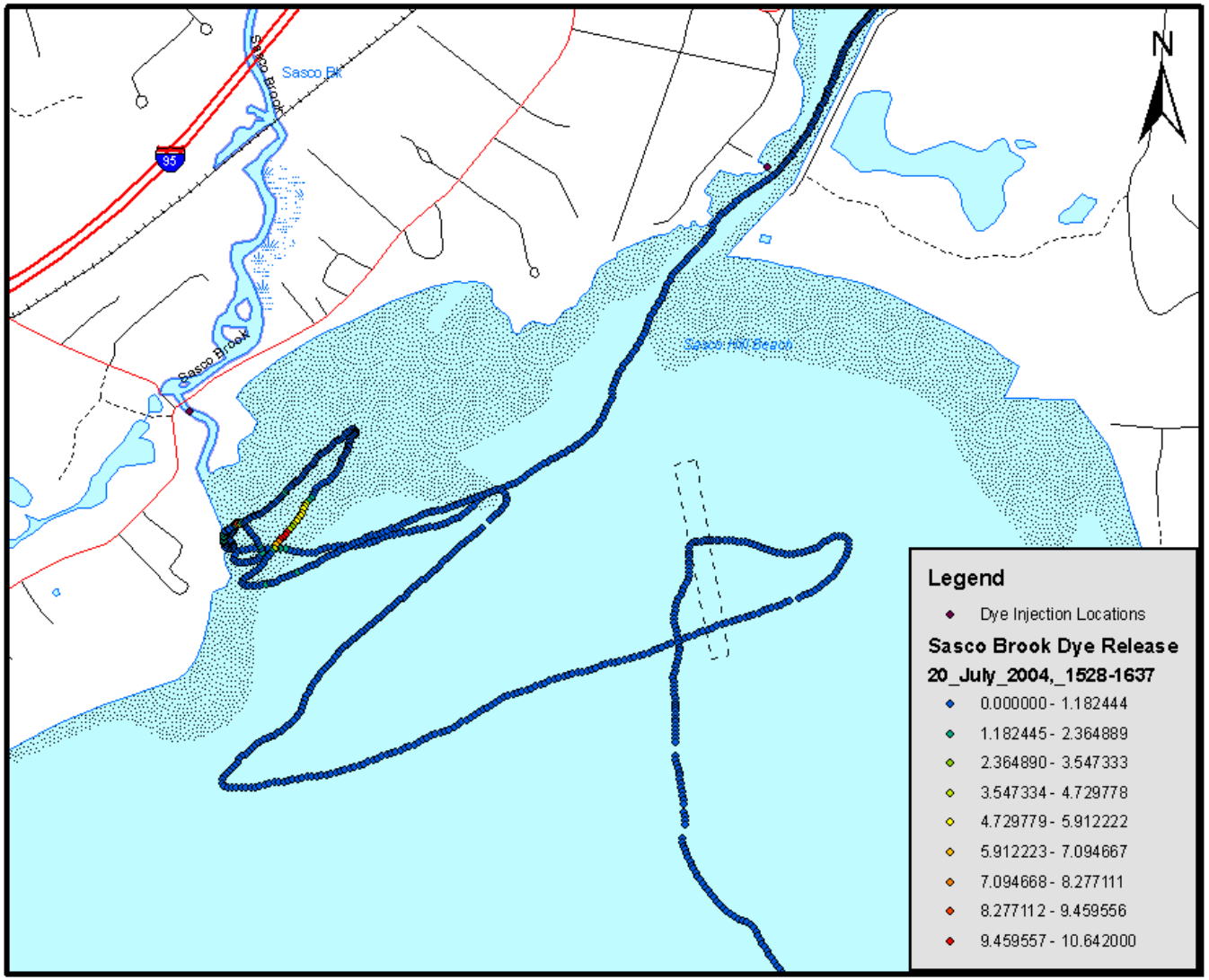

Figure 10 - Sasco Brook Estuary Dye Release - highest dye concentrations (warm colors) observed in the southwest corner of Southport Beach shellfishing area (concentrations in ug/L)

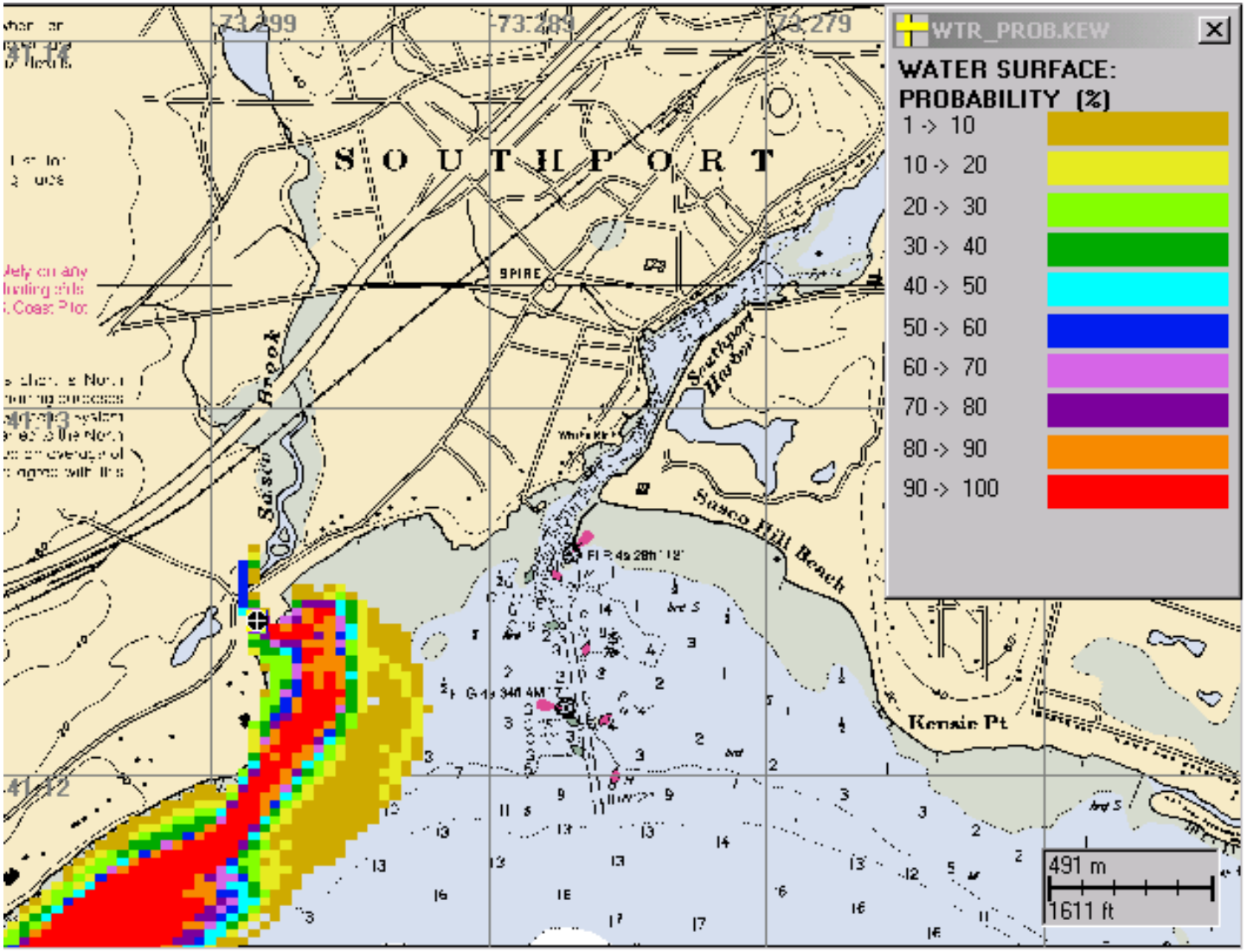

Figure 11. Sasco Brook Estuary Dye Release- Pollutant Transport Model. Demonstrates area and probability of impact from Sasco Brook Estuary

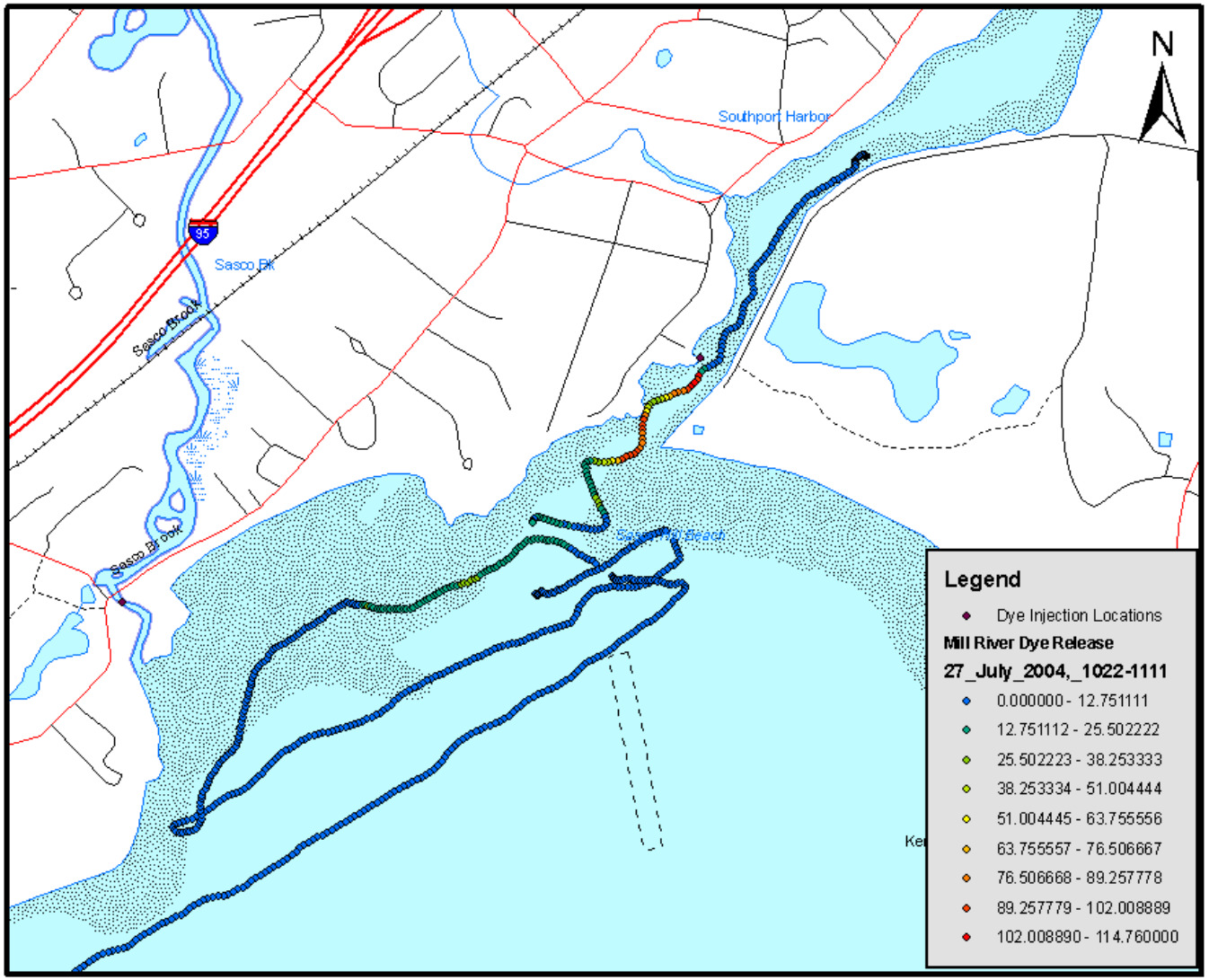

Figure 12 - Inner Harbor Dye Release - highest dye concentrations (warm colors) observed over the Southport Beach shellfishing area (concentrations in ug/L)

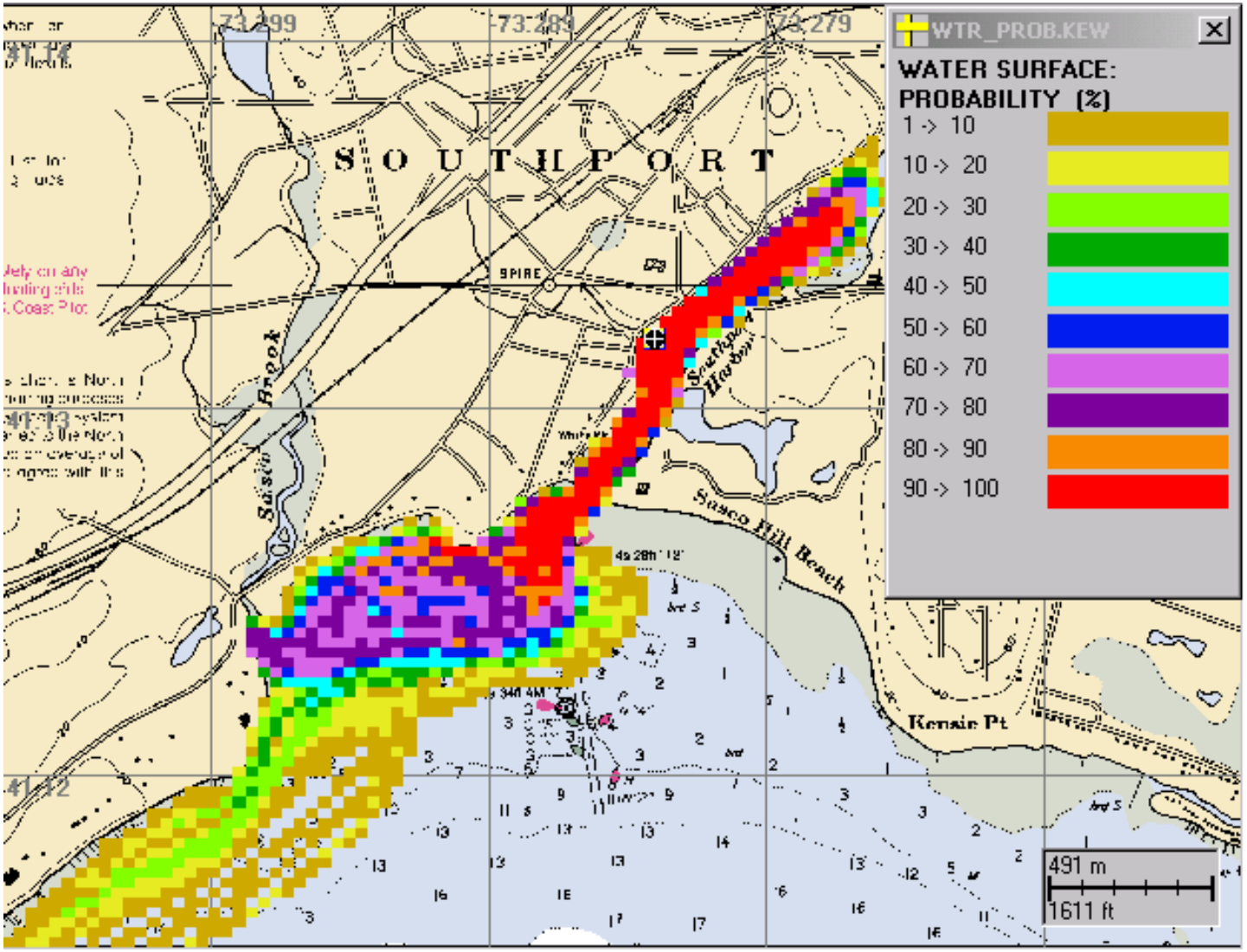

Figure 13. Inner Harbor Dye Release- Pollutant Transport Model. Demonstrates area and probability of impact from Inner Harbor water.

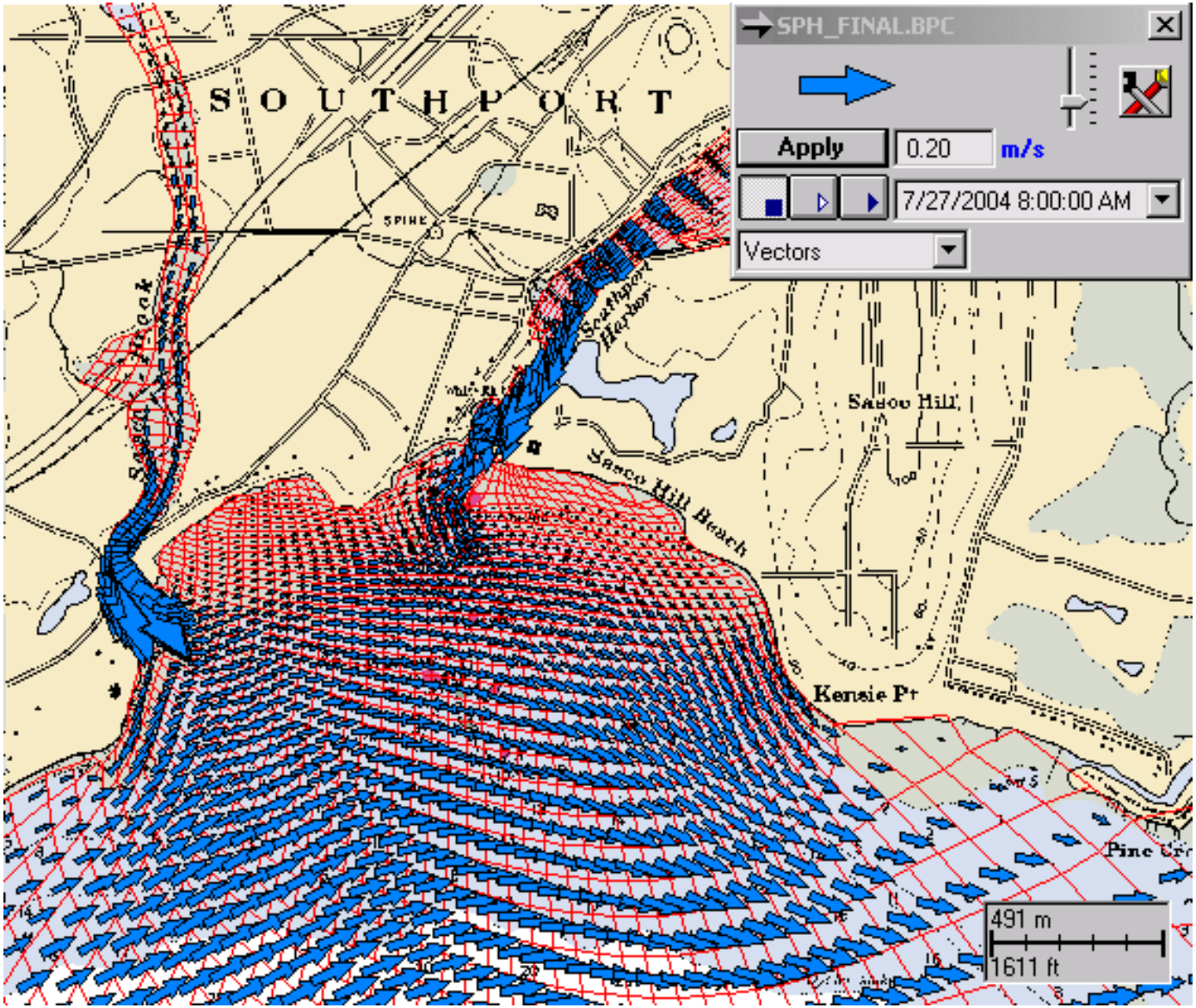

Figure 14. Southport Harbor Hydrodynamic Model - At Initial Ebb Tide, water from Sasco Brook Estuary and the Inner Harbor travels to the East

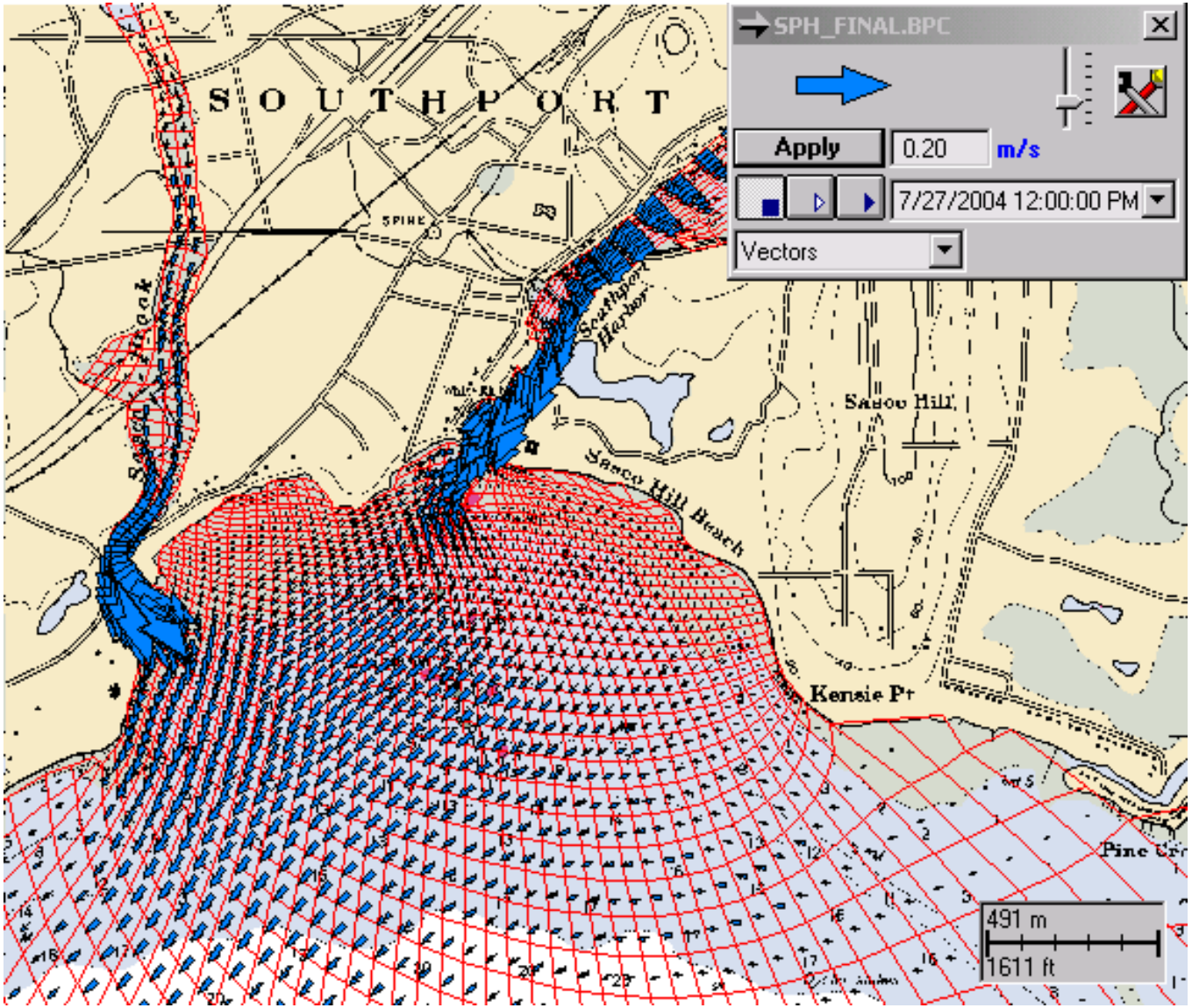

Figure 15. Southport Harbor Hydrodynamic Model - Approximately four hours into Ebb Tide, water from Sasco Brook Estuary and the Inner Harbor travels to the South-Southwest

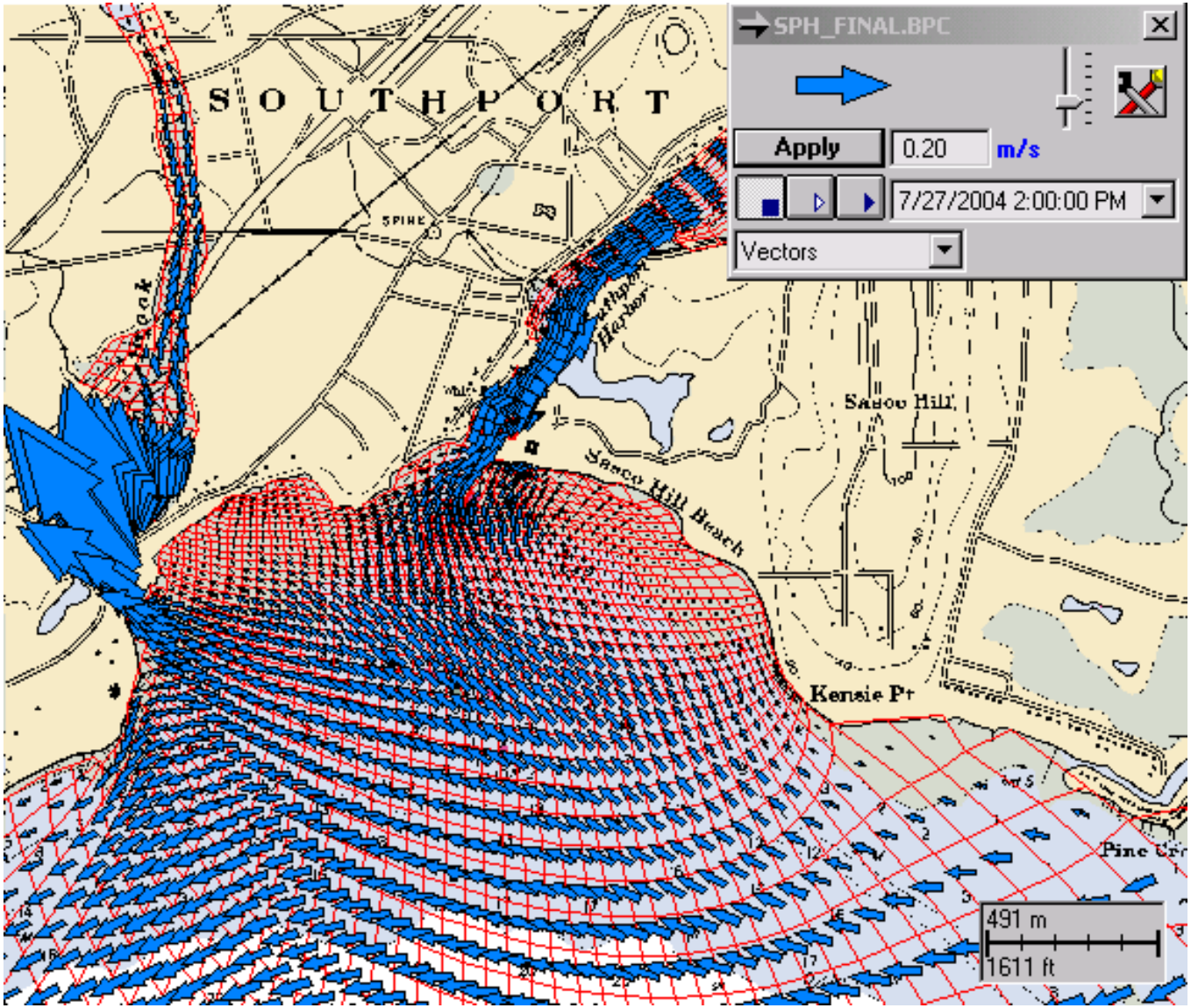

Figure 16. Southport Harbor Hydrodynamic Model - At Flood Tide, water enters the harbor and Sasco Brook Estuary from the East

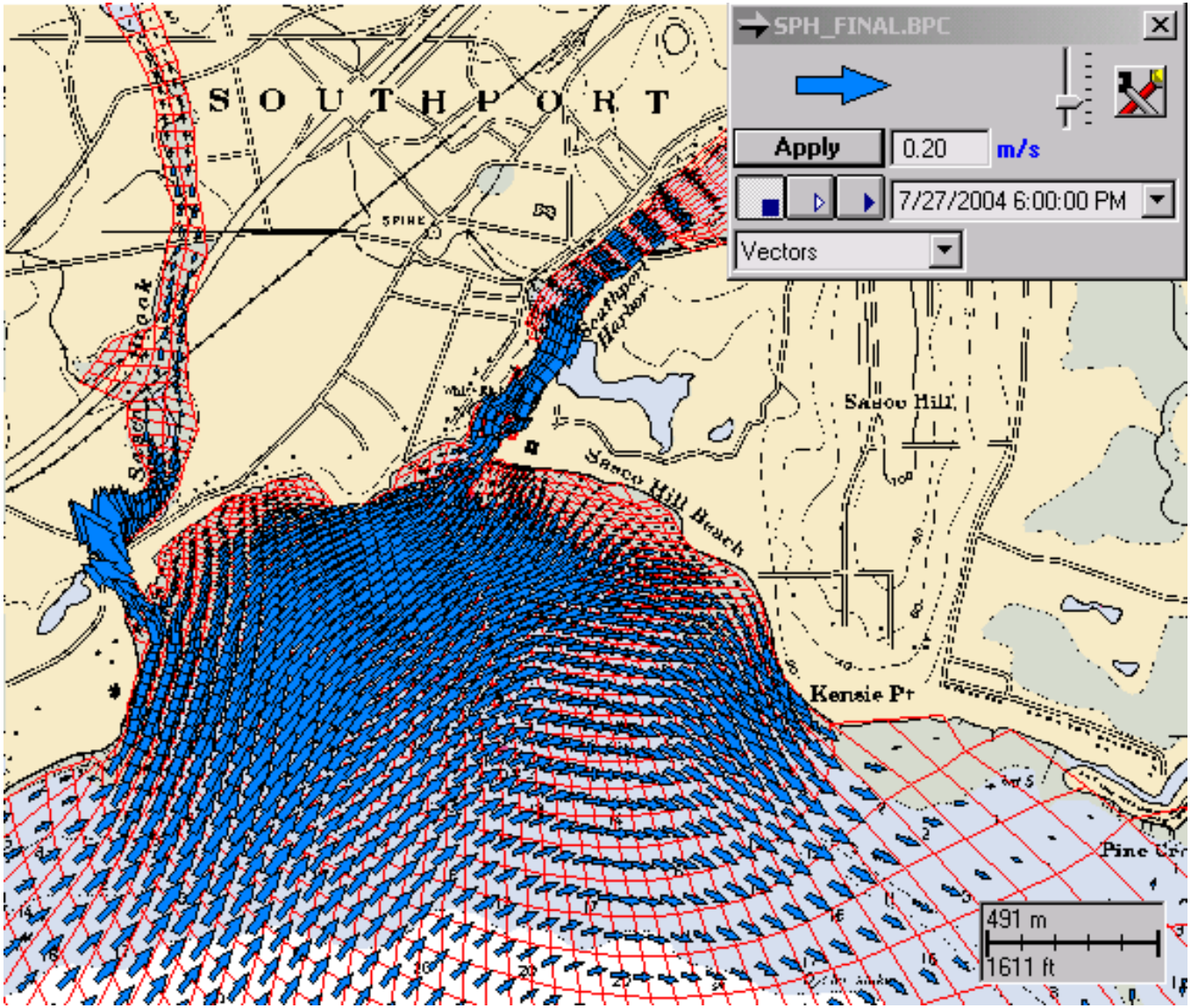

Figure 17. Southport Harbor Hydrodynamic Model - Approximately four hours into Flood Tide, water enters Sasco Brook Estuary and the Inner Harbor from the South-Southwest

POLLUTANT OF CONCERN

DA/BA conducts routine monitoring and analysis of all shellfish resources located within Connecticut waters. Analyses include fecal coliform bacteria in seawater samples and shellfish; phytoplankton in seawater samples; and biotoxins in shellfish tissue. All facets of shellfishing from harvest to market are managed by the DA/BA in accordance with the National Shellfish Sanitation Program-Model Ordinance (NSSP-MO). The NSSP-MO is updated as needed by the ISSC and FDA. In August 2002, DA/BA found densities of fecal coliform bacteria in excess of the shellfishing use criteria in the Southport Beach area. In response to the high bacteria densities, DA/BA surveyed the area and made recommendations to the town to have dye testing completed. A subsurface disposal system that services the beach was pumped out. However, no direct sources of bacteria were located. In May 2006, DA/BA reclassified the harbor based on the 2005 Annual Assessment. This resulted in a restriction to the size of the conditionally approved shellfishing area and the subsequent loss of recreational shellfishing use. The previous shellfishing area classifications are shown in Figure 18, which can be compared to Figure 19 (shellfishing area classifications as of 5/16/2006).

Sampling locations established by DA/BA and also sampled by the Fairfield Shellfish Commission are shown in Figure 20. An analysis of the data collected by the DA/BA and the Town of Fairfield for select locations before and after closure of the Southport Beach shellfishing area (August_2002) is presented in Table 2. The data demonstrate that bacteria levels have increased at site 1.1 (mouth of Sasco Brook estuary), site 1.2 (located at Southport Beach), and site 2.1 (just below the mouth of the inner harbor).

Table 2. Fecal Coliform (col/100ml) geometric mean results for select harbor locations.

	Before Shellfishing Area Closure				After Shellfishing Area Closure			
Sample Loc	Date Range	Geo Mean	90th %tile	N	Date Range	Geo Mean	90th %tile	N
M1	99-01	71	NA	71	no data			
N4	no data				8/2004	27	135	18
2.1	99-8/02	14	68	46	8/02-12/04	22	135	87
1.3	no data				2004	15	83	51
1.2	00- 8/02	9	49	46	8/02-12/04	16	85	119
1.1	99-8/02	51	141	42	8/02-12/04	126	501	104

N = number of samples
NA = not applicable
Data provided by DA/BA and the Town of Fairfield.

It is important to note that Southport Beach is fully supporting for contact recreational uses, specifically swimming, based on information provided by the Fairfield Health Department. Designated swimming areas in estuarine waters are assessed using Enterococci as the bacteria indicator. Southport Beach is monitored by the local health department in accordance with state guidelines and the federal BEACH Act[10].

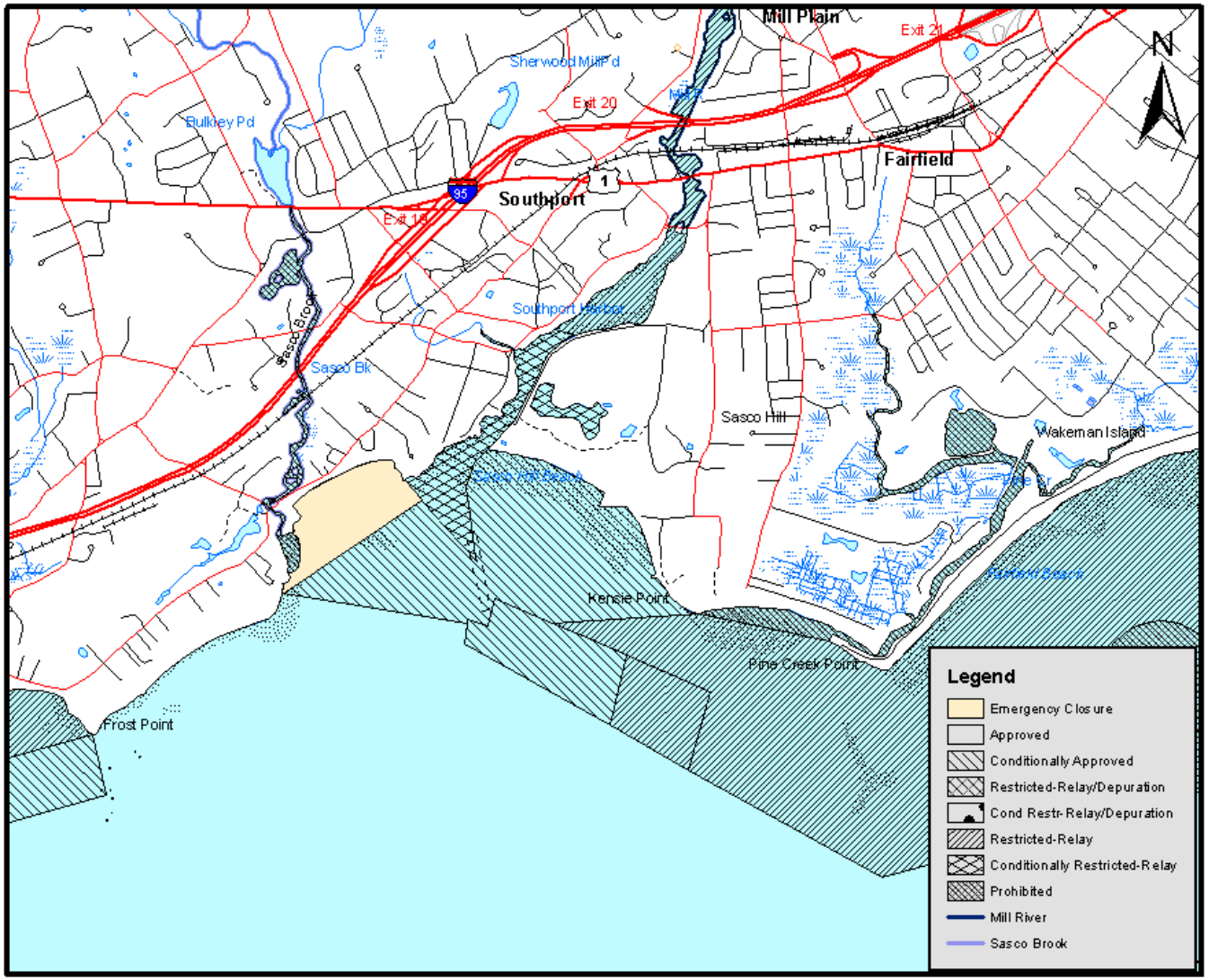

Figure 18 - Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River prior to May 16, 2006

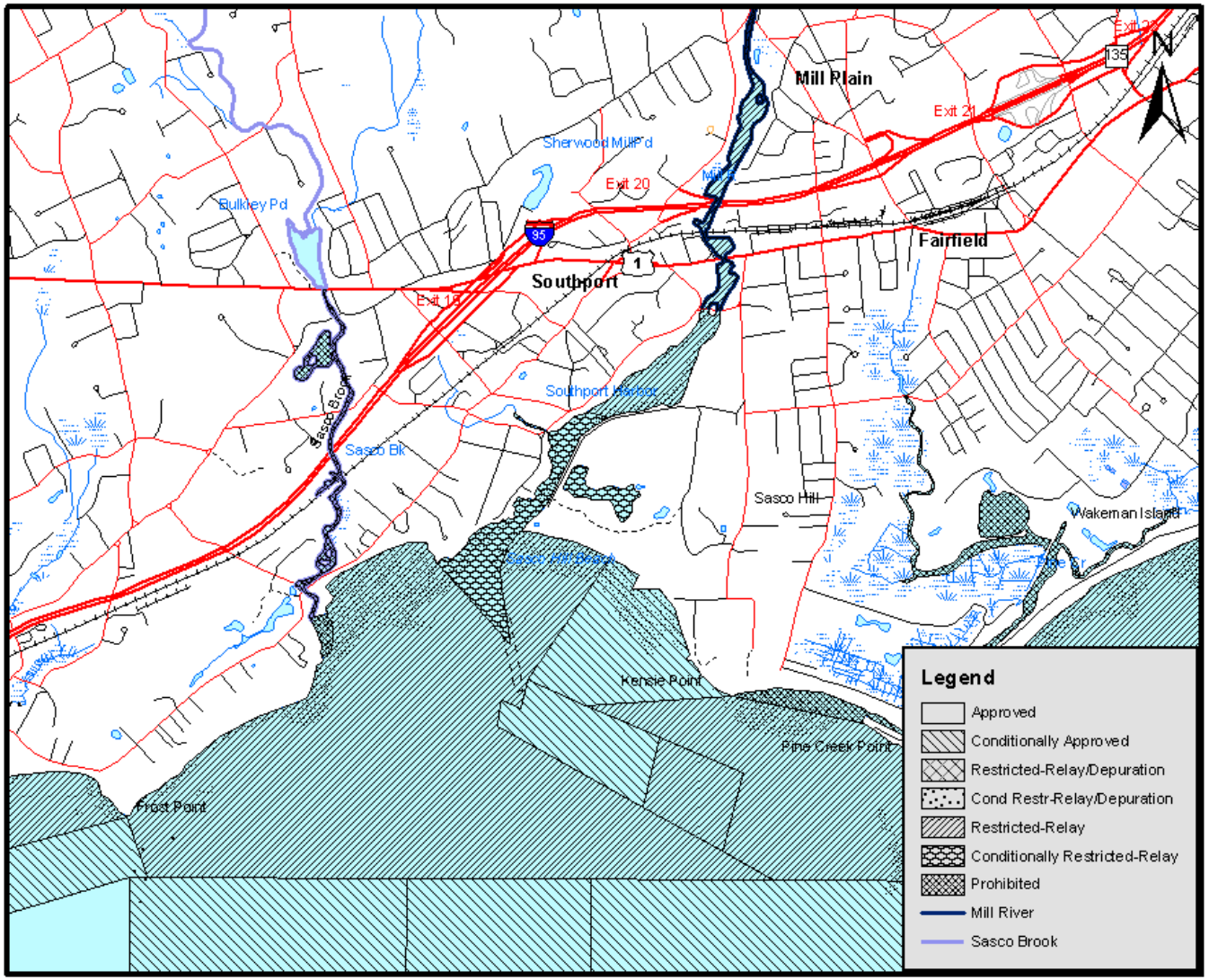

Figure 19 - Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River effective May 16, 2006

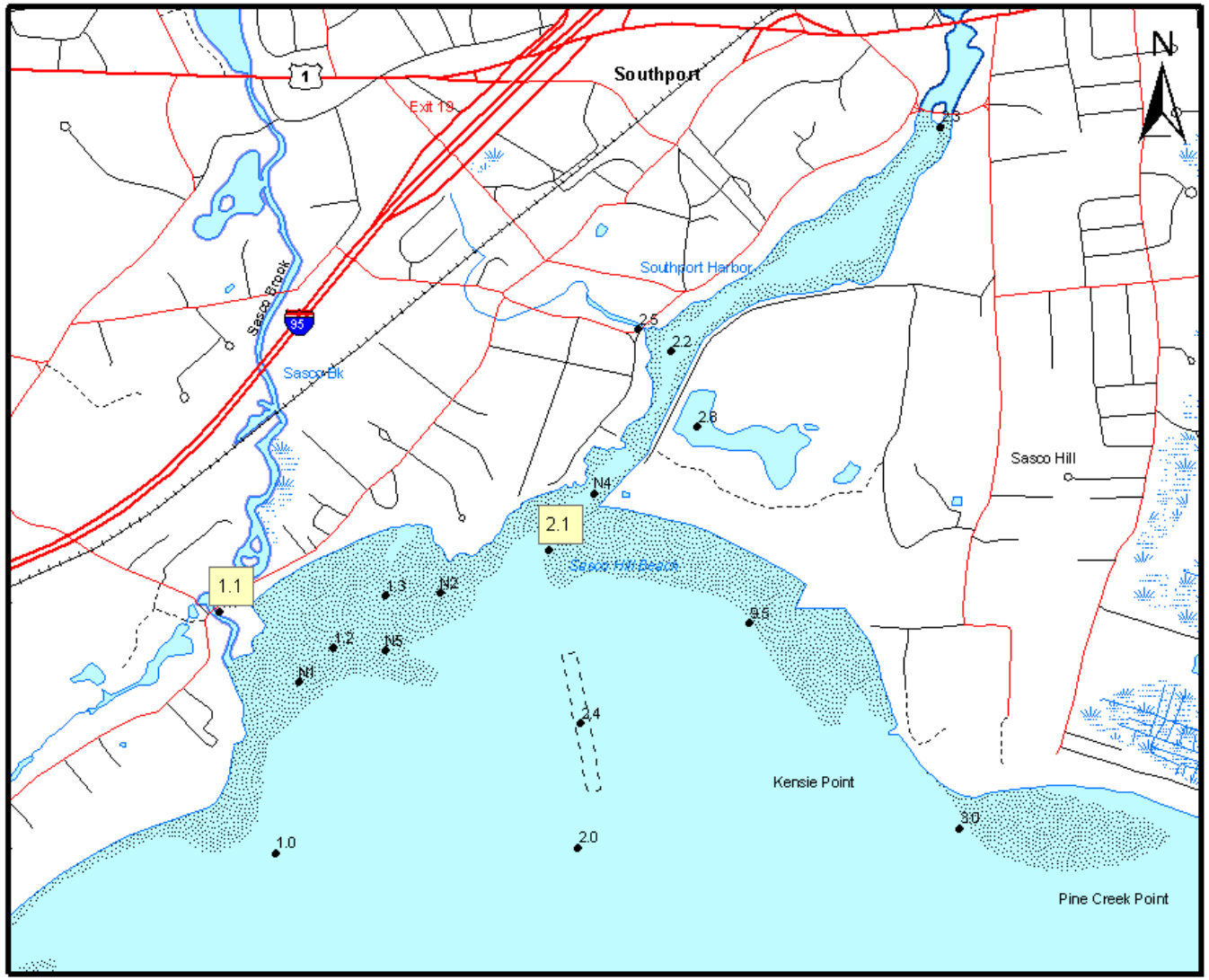

Figure 20 - Sampling locations for shellfish water quality as well as the Transport and Hydrodynamic Modeling Study

APPLICABLE SURFACE WATER QUALITY STANDARDS

The DA/BA is the lead agency responsible for shellfish and aquaculture in the State of Connecticut. Under the Shellfish Sanitation Program, DA/BA works to assure the quality of shellfish for commercial and recreational harvest and complies with the NSSP-MO. The DA/BA evaluates shellfish resources using the standards set forth in the NSSP-MO, and the CTDEP includes the fecal coliform criteria used by DA/BA in its WQS. The criteria vary based on shellfishing area classifications. For Southport Harbor, the applicable fecal coliform criteria are:

1. Fecal coliform geometric mean < 14 col/100ml
2. Not more than 10% of all Fecal coliform results may be greater than the 90^{th} percentile value of 43 col/100ml

Sample collection requirements vary by shellfishing area classification. For approved and conditionally approved areas, which is the goal of this TMDL, the collection requirements are:

> "A minimum of five (5) seawater samples must be collected annually during adverse pollution conditions. A minimum of 15 seawater samples, collected over a three-year period, during adverse pollution conditions, must be used for a geometric mean. Adverse pollution conditions have been defined by the NSSP-MO as a state or situation caused by meteorological, hydrological, or seasonal events and point or non-point source discharges that have historically resulted in elevated fecal coliform levels in a particular growing area".
> (Connecticut Department of Agriculture, Bureau of Aquaculture and Laboratory Services, Shellfishing Area Classifications - http://www.ct.gov/doag/cwp/view.asp?a=1369&Q=259170)

The CTDEP conducts assessments of the state's surface waters every other year in accordance with the *Connecticut Consolidated Assessment and Listing Methodology*[11]. To assess shellfishing use support, the CTDEP applies shellfish area classifications (determined by DA/BA) to the water quality classifications. For example, a shellfishing use for SA classified waters is considered fully supporting when harvest for direct human consumption can occur. Therefore, if the shellfish classification for an SA waterbody is anything other than "Approved", the waterbody is considered impaired for shellfishing and included on the State's Impaired Waters List. The water quality classification for Southport Harbor is SB/SA (i.e. goal SA). The current shellfishing area classifications do not allow for direct harvest of shellfish for any area of the harbor and are therefore inconsistent with the standards (Figure 21).

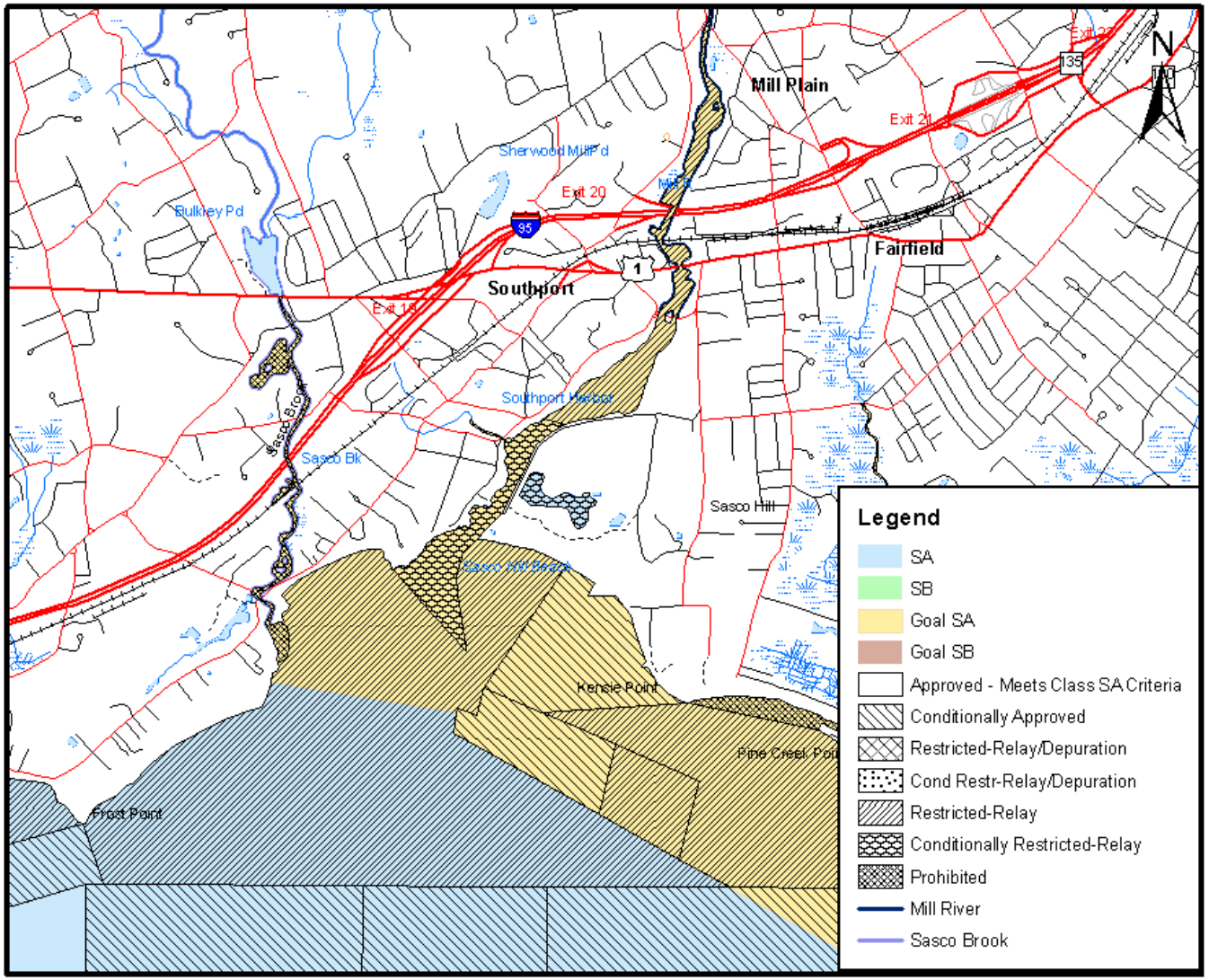

Figure 21 - Water Quality Classifications relative to the current Shellfishing Area Classifications for Southport Harbor and estuarine portions of Sasco Brook and Mill River

NUMERIC WATER QUALITY TARGET

As required, the TMDL accounts for waste load allocations (WLA) for all point sources, including stormwater discharges regulated under the NPDES program; load allocations (LA) for all nonpoint sources, including background loading; and a margin of safety (MOS). The MOS accounts for any uncertainty regarding the relationship between waste load and load allocations and water quality. The equation for the TMDL analysis is as follows:

$$TMDL = LA + WLA + MOS$$

TMDL calculations were performed using data provided by DA/BA and Town of Fairfield. Table 3 provides the TMDLs for Southport Harbor. The TMDLs were established at two locations, at the inlet to the outer harbor (2.1) and the mouth of Sasco Brook estuary (1.1). See Figure 20 for site locations.

Table 3. Summary of TMDL analysis. Percent reductions from current conditions.

Site	TMDL		WLA		LA		MOS
	Geometric mean	90th %tile	Geometric mean	90th %tile	Geometric mean	90th %tile	
2.1	36%	77%	50%	79%	26%	74%	Implicit
1.1	59%	72%	61%	66%	59%	74%	Implicit

TMDL at site 2.1

As indicated in the *Southport Harbor Hydrodynamic and Pollutant Transport Modeling Study* (SH Study)[3], bacteria loading from the inner harbor has a greater influence over the western side of the outer harbor than does Sasco Brook estuary (see Description of the Waterbody - Harbor Hydrodynamics, pg. 14). The SH Study also demonstrated that flow and subsequently bacteria loading from inner Southport Harbor travels directly into the outer harbor and over Southport Beach during ebb and low tide when little Long Island Sound water is available for dilution. For these reasons, the target TMDLs at site 2.1 were based on the criteria for shellfishing in approved and conditionally approved waters (geometric mean < 14 col/100ml and not more than 10% of all Fecal coliform results > 43 col/100ml).

TMDL at site 1.1

The goal of the Sasco Brook estuary TMDL at site 1.1 is to establish a target fecal coliform level that would allow for achievement of the SA shellfishing criteria in outer Southport Harbor. The TMDL was based on data collected prior to August, 2002 before elevated levels of fecal coliform resulted in closure of the Southport Beach shellfishing area. As demonstrated in Table 2, the total geometric mean more than doubled and the 90th percentile increased by five times when compared to pre-2002 levels. As such, the TMDL percent reductions were determined by evaluating the geometric mean and 90th percentile before and after August 2002 when bacteria loading from Sasco Brook estuary did not result in impairment to the shellfishing use at Southport Beach. It is expected that

reducing levels of fecal coliform bacteria in Sasco Brook estuary to pre-2002 levels will provide for sufficient bacteria reductions at the southwest side of Southport Beach to attain the water quality criteria for shellfishing use in outer Southport Harbor.

LA and WLA

For Southport Harbor, the load allocations (non-point sources) and waste load allocations (point sources) were determined using precipitation data in order to estimate the contribution of bacteria from stormwater. EPA policy guidance[12] suggests that TMDL analyses provide separate allocations for "regulated" and "non-regulated" stormwater. Regulated stormwater is defined by EPA as stormwater that is discharged through a point source (discrete outfall) and requires a permit under federal NPDES regulations. This includes stormwater discharged from industrial facilities and construction sites covered under the "Phase I Rule"[13], and municipal small separate storm sewer (MS4) discharges covered under the "Phase II Rule"[14]. MS4 communities have been identified by the Census Bureau based on the 2000 population information. The local watershed Towns of Fairfield and Westport are considered MS4 communities. There is one industrial permittee (Jelliff Corporation) that discharges stormwater to the municipal stormdrain system.

Regulated stormwater was determined in accordance with the procedure specified in *Guidelines for Development of TMDLs for Indicator Bacteria Using the Cumulative Distribution Function Method* [15]. Precipitation data for each sampling date is designated as a "dry" or "wet" sampling event in an Excel spreadsheet model. Wet conditions are typically defined as greater than 0.1 inches precipitation in 24 hours, or 0.25 inches precipitation in 48 hours, or 2.0 inches precipitation in 96 hours. Wet sampling events constitute the waste load allocation and dry sampling events the load allocation. It is expected that watershed towns (Westport and Fairfield) that contribute stormwater loading to these tributaries will participate in TMDL implementation through compliance with the MS4 permit. Only local watershed towns are noted in this TMDL since TMDLs for indicator bacteria have been established for both freshwater tributaries to Southport Harbor (Sasco Brook and Mill River).

The Waste Load Allocation (WLA) and Load Allocation (LA) percent reductions at site 1.1 (located at the mouth of Sasco Brook estuary) are 61 and 59, respectively. This indicates that both point stormwater and nonpoint sources are equally contributing to the bacteria load. At site 2.1 (located at the mouth of the inner harbor), the WLA percent reduction is almost double the LA percent reduction indicating that point source stormwater has a greater impact at that location.

Potential sources of fecal coliform bacteria that contribute to the WLA for Southport Harbor include regulated stormwater (stormwater discharged through a pipe). Under the MS4 permit, municipalities are required to monitor stormwater and submit the results to CTDEP. In 2004, one sample was collected by the Town of Fairfield, at Pequot Avenue within the watershed of Southport Harbor. Fecal coliform in this sample was analyzed to be 104 col/100ml. Jelliff discharges stormwater under the General Permit for the Discharge of Stormwater associated with Industrial Activities to the municipal storm

drain system. As a provision of its 1998 permit, Jelliff sampled stormwater yearly for a number of parameters, including fecal coliform bacteria. Between 1998 and 2002, fecal coliform ranged from 0 to 2,500 fecal colonies/100ml.

Potential sources of fecal coliform bacteria that contribute to the LA for Southport Harbor include stormwater as sheetflow, waste from wildlife species (such as resident Canada geese), illicit discharges, improperly functioning septic systems, and improper handling of domestic animal waste. All tributaries that enter Southport Harbor have potential to contain such sources. However, as demonstrated in the SH Study, bacteria from the inner harbor and Mill River have a greater impact on the outer harbor shellfishing areas than does water from Sasco Brook estuary.

MARGIN OF SAFETY

TMDL analyses are required to include a margin of safety (MOS) to account for uncertainties regarding the relationship between load and wasteload allocations, and water quality. The MOS may be either explicit or implicit in the analysis. For Southport Harbor, the margin of safety is implicit. In the TMDL analysis, worst-case conditions are assumed since decay and die-off of bacteria, which is known to occur, was not considered. For example, in the Barrington River (Rhode Island) TMDL study[16], a decay coefficient was determined to be 0.2-day^{-1} during dry conditions in July. Decay of bacteria was not considered in the Southport Harbor TMDL analysis to allow for an increase in the implicit MOS. Also, the TMDLs do not account for mixing with water from Long Island Sound. Bacteria concentrations in water from Sasco Brook estuary and the inner harbor will be diluted with water from Long Island Sound. As shown in the SH Study, as well as data collected by DA/BA, Long Island Sound water does not contain significant concentrations of bacteria, and does provide for dilution especially during flood and high tide conditions.

SEASONAL ANALYSIS

The TMDLs presented in this document encompass seasonal as well as annual variability. Data used to determine the TMDLs were derived from year round sample collection. As a result, the TMDLs are effective for all seasons. With the exception of recreational shellfishing, activities may occur at any time throughout the year and the TMDLs presented in this document provide for achievement of the standards when shellfishing activities occur.

TMDL IMPLEMENTATION GUIDANCE

The percent reductions established in this TMDL can be achieved by implementing control actions, where technically and economically feasible, that are designed to reduce fecal coliform loading from nonpoint sources (Load Allocation) and point sources (Waste Load Allocation). These actions may be taken by State and Local government, academia, volunteer citizens groups, and individuals to promote effective watershed management.

Point sources to Southport Harbor include regulated stormwater discharged by the Towns of Fairfield and Westport, as well as stormwater discharged by Jellif Corporation to the town system. Control actions for regulated stormwater include the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 Permit). Under the MS4 permit, municipalities are required to implement minimum control measures in their Stormwater Management Plans to reduce the discharge of pollutants, protect water quality, and satisfy the appropriate water quality requirements of the Clean Water Act. The six minimum control measures are:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-construction Runoff Control
- Pollution Prevention/Good Housekeeping

The minimum control measures include a number of Best Management Practices (BMP) for which an implementation schedule must be developed and submitted to the DEP as Part B Registration. Both the Towns of Fairfield and Westport submitted their Part B Registration in 2004. Under the MS4 permit, all minimum control measures must be implemented by January 8, 2009. Information regarding Connecticut's MS4 permit can be found on the DEP's website at http://www.dep.state.ct.us/pao/download.htm#MS4GP. In addition, the EPA has developed fact sheets, which provide an overview of the Phase II final rule and MS4 permit, and provide detail regarding the minimum control measures, as well as optional BMPs not required in Connecticut's MS4 permit. The fact sheets can be found on the EPA's website at: http://cfpub.epa.gov/npdes/stormwater/swphases.cfm. Some of the information includes guidance for the development and implementation of Stormwater Management Plans, as well as guidance for establishing measurable goals for BMP implementation.

Section 6(K) of the MS4 Permit requires the municipality to modify their Stormwater Management Plan to implement the TMDL (achieve reductions) within four months of TMDL approval by EPA. It is recommended that municipalities focus their revised Stormwater Management Plans on the TMDL waterbodies for Section 6(a)(1)(A)(i) - implement public education program, Section 6(a)(3)(A)(i, ii, iii) and 6(a)(3)(A)(i, ii, iii, iv) - illicit discharge detection, Section 6(a)(6)(A)(iv) - stormwater structures cleaning, and Section 6(a)(6)(A)(v) - prioritize stormwater structures for repair or upgrade, of the MS4 permit.

The TMDLs establish a benchmark to measure the effectiveness of BMP implementation. Achievement of the TMDLs is directly linked to incorporation of the provisions of the MS4 permit by municipalities, as well as the implementation of other BMPs to address nonpoint sources. Nonpoint sources include wildlife, improperly functioning septic systems, and improper handling of pet waste. BMPs for the management of nonpoint sources include septic system testing and maintenance, nuisance wildlife control plans, and pet waste ordinances. It is expected that as progress is made implementing BMPs,

fecal coliform bacteria levels will decrease and shellfishing use at Southport Beach will be achieved and maintained.

Guidance to local municipalities for the management of septic systems can be found on the EPA's website at http://cfpub.epa.gov/owm/septic/guidelines.cfm#7478. Additional general information regarding septic systems can be found at http://cfpub.epa.gov/owm/septic/home.cfm. Nuisance wildlife information can be found on the DEP's website at http://www.dep.state.ct.us/burnatr/wildlife/problem.htm.

In response to the issuance of the MS4 Permit, the Town of Fairfield developed a stormwater committee to address issues associated with MS4 permit compliance, as well as implementation of the previously approved TMDLs for the freshwater portions of the Mill River and Sasco Brook. In addition, a pollution abatement committee (PAC) for Sasco Brook formed in the early 1990's to address concerns regarding pollution of both the freshwater and estuarine portions of Sasco Brook. The committee consists of participants from the Towns of Westport and Fairfield, Natural Resources Conservation Service, Southwest Conservation District, HarborWatch/RiverWatch, The Nature Conservancy, CTDEP, local residents, and other stakeholders. In 2006, the committee summarized their accomplishments and generated a to-do list. Copies are included as Appendix C. Also in 2006, the Town of Westport completed a draft watershed based plan for Sasco Brook. It is anticipated that once finalized this plan will be used to further guide the PAC in their efforts to restore Sasco Brook.

The Town of Fairfield Shellfish Commission contracts with an independent professional to monitor Southport Harbor for bacteria levels and pollution sources in an effort to better understand trends in bacteria levels and identify sources. The DA/BA and Town of Fairfield work cooperative to assess water quality, shellfishing use, and potential sources of pollution to Southport Harbor. In 2005, the shellfish commission had a shoreline survey and inspection of the Country Club of Fairfield, as well as an inspection of the stormwater drainage system on Sasco Hill Road (east side of the harbor) completed. A copy of the final report for this study, which includes recommendations, is attached as Appendix B.

Routine work conducted by the DA/BA results in a Comprehensive Evaluation Report, which includes a shoreline survey and water quality data every twelve years; an Annual Assessment Report, including shoreline changes and data analysis; and a Triennial Evaluation Report. These reports describe pollution sources and their potential impact, statistical analyses of water quality samples, corrective actions, and recommendations to reclassify an area in order to assure conformance with the NSSP-MO.

Based on information collected by HarborWatch/RiverWatch, the Town of Fairfield, and the DA/BA, the estuarine portion of Sasco Brook does receive dry weather discharges from a number of stormwater pipes that contribute to bacteria exceedences of the water quality standards in the brook. The applicable mechanism for addressing discharges to Sasco Brook estuary is the illicit detection requirement included in the MS4 permit. A number of promising illicit discharge detection methods, including the use of optical

brightener pads, are available to assist municipalities with implementation of such a program[17,18,19,20].

The DEP encourages all local stakeholders to continue their efforts by working together to implement the TMDLs. One process is through the development of a watershed based plan. A watershed based plan for TMDL implementation formulated at the local level will most efficiently make use of local resources by assigning tasks to responsible parties and serving as an agreed roadmap to reducing bacteria loading to Southport Harbor.

In addition, the DEP's watershed coordinator will continue to provide technical and educational assistance to the local municipalities and other stakeholders, as well as identify potential funding sources, when available, for implementation of the TMDL and monitoring plan.

WATER QUALITY MONITORING PLAN

Water quality monitoring conducted by DA/BA and the Fairfield Shellfish Commission is sufficient for assessing improvements in bacteria reductions. Previously established sampling stations include the TMDL sites 1.1 (Sasco Brook estuary) and 2.1 (mouth of the inner harbor), which are routinely monitored.

It is further recommended that the watershed towns of Westport and Fairfield conduct stormwater sampling, which is required under the MS4 permit, at storm drains that discharge to the inner harbor as well as Sasco Brook estuary. Information collected at these outfall locations may help determine where the implementation of corrective actions may be necessary in order to achieve the greatest bacteria reductions. The following pollutant parameters are monitored under the MS4 Permit using methods prescribed in Title 40, CFR, Part 136 (1990).

pH (SU)
Hardness (mg/l)
Conductivity (umos)
Oil and grease (mg/l)
Chemical Oxygen Demand (mg/l)
Turbidity (NTU)
Total Suspended Solids (mg/l)
Total Phosphorous (mg/l)
Ammonia (mg/l)
Total Kjeldahl Nitrogen (mg/l)
Nitrate plus Nitrite Nitrogen (mg/l)
E. coli (col/100ml)
Precipitation (in)

Under the MS4 permit, the required indicator bacteria parameter is *E. coli*. However, the Southport Harbor TMDLs are specific to fecal coliform, which is the appropriate indicator bacteria for shellfishing use. For this reason, it is recommended that fecal

coliform also be analyzed when stormwater sampling is conducted in Southport Harbor and Sasco Brook estuary.

REASONABLE ASSURANCE

The MS4 Permit is a legally enforceable document that provides reasonable assurance that the municipalities will take steps towards achieving the target TMDLs and reducing point sources of stormwater containing bacteria.

In 2006, the Town of Fairfield established a stormwater committee to focus its MS4 efforts in TMDL waterbodies and the town shellfish commission continues to monitor and assess potential bacteria sources to the shellfishing areas. These steps provide assurance that efforts are being made to reduce bacteria loading to Southport Harbor and subsequently achieve the TMDLs. In addition, the responsiveness exhibited by the Town indicates that progress will continue to be made toward identifying sources of bacteria and implementing corrective actions. Activities conducted by the Sasco Brook Pollution Abatement Committee have made progress towards the freshwater TMDL and will likely continue to focus on bacteria reductions to achieve these TMDLs.

The DEP further supports the development of a watershed based plan specific to bacteria reductions and source mitigation in order to implement the TMDLs. Such a plan may also make projects aimed at reducing nonpoint sources of bacteria to Southport Harbor eligible for funding, as along as such projects are not used for MS4 permit compliance.

PROVISIONS FOR REVISING THE TMDL

The DEP reserves the authority to modify the TMDLs as needed to account for new information made available during the implementation of the TMDLs. Modification of the TMDLs will only be made following an opportunity for public participation and be subject to the review and approval of the EPA. New information, which will be generated during TMDL implementation includes monitoring data, new or revised State or Federal regulations adopted pursuant to Section 303(d) of the Clean Water Act, and the publication by EPA of national or regional guidance relevant to the implementation of the TMDL program. The DEP will propose modifications to the TMDL analyses only in the event that a review of the new information indicates that such a modification is warranted and is consistent with the anti-degradation provisions in Connecticut Water Quality Standards. The subject waterbody of this TMDL analysis will continue to be included on the *List of Connecticut Waterbodies Not Meeting Water Quality Standards* until monitoring data confirms that shellfishing use is fully supported.

PUBLIC PARTICIPATION

This TMDL document was noticed for public review and comment in the Connecticut Post on May 14, 2007. In addition stakeholders and other interested parties were notified of the proposed TMDLs by mail. At the close of the public comment period on June 22, 2007, the DEP received one comment letter from the Town of Westport. The comments

were reviewed and the TMDL document was revised where appropriate. A separate response to comments document was prepared and is available by request.

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4 - Connecticut Department of Agriculture, 2005. Annual Assessment of the Shellfish Growing Waters in Fairfield, Connecticut. Bureau of Aquaculture, Rogers Avenue, Milford, CT 06460.

5 - Code of Federal Regulations, 40CFR section 130.2(i).

6 - USEPA. November 15, 2006 memorandum. *Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No.05-5015, (April 25, 2006) and Implications for NPDES Permits*.

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15 - Connecticut Department of Environmental Protection, 2005. *Development of Total Maximum Daily Loads (TMDLs) for Indicator Bacteria in Contact Recreation Areas Using the Cumulative Distribution Function Method.* Bureau of Water Management, 79 Elm Street, Hartford, CT 06106-5127.

16 - Feeney, C., 1998. Transport of Fecal Coliform in Barrington River Estuary, Rhode Island. Presented at NEWEA Annual Conference, NEWEA Journal, vol. 32 no. 2, 1998.

17 - Jewell, C., 2002. *A Systematic Methodology for the Identification and Remediation of Illegal Connections*. Presented at NEWEA winter meeting, January 2002. Boston Water and Sewer Commission, Boston MA.

18 - Center for Watershed Protection, 2004. *Illicit Discharge Detection and Elimination Manual*. Center for Watershed Protection (http://www.cwp.org/index.html).

19 - Massachusetts Department of Environmental Protection, Division of Watershed Management, 2004. Summary Report: Bacteria Source Tracking Pilot Study (http://www.mass.gov/dep/water/priorities/bact2004.pdf).

20 - Sargent, D., Castonguay, W., 1998. Water Quality Sampling: An Optical Brightener Handbook (http://www.naturecompass.org/8tb/sampling/).

Appendix A
Southport Harbor
Waterbody Specific Information

Impaired Waterbody
Waterbody Name: Southport Harbor
Waterbody Segment IDs: CT7108-E_04
Waterbody Description: From west just below mouth of Sasco Brook estuary, Westport, east to Pine Creek Point, Fairfield (includes Southport Harbor up to tide gates)
Waterbody Segment Size: 1.08 square miles

Impairment Description:
Designated Use Impairment: Shellfish Harvest
Surface Water Classification: Class B/A

Watershed Description:
Total Drainage Basin Area: 23,054 acres
Subregional Basin Name & Code: Southwest Shoreline - 7000, Mill River - 7108, Sasco Brook - 7109,
Regional Basin: Southwest Shore and Southwest Eastern
Major Basin: Southwest Coast
Watershed Towns: Fairfield, Westport, Easton, Trumbull, Monroe
MS4 applicable? Yes
Applicable Season: Recreation Season (May 1 to September 30)
Regional Basin Landuse:

Land Use Category	Percent Composition
Barren	0.6
Coniferous Forest	2.8
Deciduous Forest	40.1
Developed	27.6
Forested Wetland	2.6
Non-forested Wetland	0.1
Other Grasses and Agriculture	9.2
Tidal Wetland	0.1
Turf and Grass	13.9
Utility Right of Way	0.1
Water	3.1

Data Source: 2002 Land Cover, CLEAR - Center for Land Use Education and Research.

Appendix B

Summary Report: Shoreline Survey and Inspection of the Country Club of Fairfield, and Inspection of the Storm Water Drainage System on Sasco Hill Road, Fairfield, Connecticut

SHORELINE SURVEY AND INSPECTION OF THE COUNTRY CLUB OF FAIRFIELD, AND INSPECTION OF THE STORM WATER DRAINAGE SYSTEM ON SASCO HILL ROAD, FAIRFIELD, CONNECTICUT.

CONDUCTED BY DONALD BELL, ENVIRONMENTAL ANALYST CONSULTANT

DATED: DECEMBER 6, 2005

At the request of the Fairfield Shellfish Commission an inspection was conducted at the Country Club of Fairfield, 936 Sasco Hill Road for possible storm water drainage pollution sources and of the Town of Fairfield storm water drainage system on Sasco Hill Road.

Portions of the storm water drainage system for Sacco Hill Road and portions of the storm water runoff from the golf course at the Country Club of Fairfield discharge to Long Island Sound at Sasco Beach. The discharge point is located next to the town lifeguard station and concession stand and flows from a 24inch concrete pipe. There is also a 12 inch corrugated pipe next to the concrete pipe. This 12inch pipe is connected to an individual catch basin located in the parking lot next to the lifeguard station. This pipe is not connected to the Sasco Hill storm drainage system and would have minimal impact to the Long Island Sound. The storm water from both of these pipes discharge to the Fairfield recreational shellfishing area, which is classified as Conditionally Approved by the State of Connecticut, Department of Agriculture, Bureau of Aquaculture (DA/BA).

The description of the Conditionally Approved Area is, “This area includes all tidal flats, shores and coastal waters northerly of a line originating at the demarcation sign at Dennie’s Point a.k.a Richardson’s Point extending easterly to the outer channel marker N “2” proceeding to the demarcation sign at Kensie Point exclusive of all waters classified as Prohibited or Restricted Relay and shellfish bed known as 919. The shellfish bed known as 920 shall be considered to be wholly within the Conditionally Approved area. (See attached map of the State of Connecticut Shellfish Area Classifications and Map of Sampling Stations).

The events requiring closure of this conditionally approved 1.0” rainfall trigger area are: Rainfall Events: Rainfall will be measured daily by a rain gauge located at the Wastewater Pollution control Facility in Fairfield. Closure action is required with rainfall amounts equaling or exceeding 1.0” within a 24-hour period (or longer if continuous event). The Conditionally Approved area will remain closed for a minimum of seven (7) days commencing from the time the rainfall event has ended and may automatically “reopen” on the eighth day. Rainfalls of 1.0” or greater occurring when the area is already “closed” to shellfishing will be cause to initiate a new seven (7) day closure period.

Sampling of the storm water discharge from the 24-inch pipe began on 12/12/2004 and is designated as sampling station 051-100. The discharge pipe and the Conditionally

Approved area was sampled during periods when the Conditionally Approved area is opened for the harvesting of shellfish.

All seawater sample results were tested for fecal coliform bacteria using the membrane filtration method using M-TEC agar at the DA/BA Laboratory in Milford, Ct.. The DA/BA Laboratory switched over to the M-TEC method on 1/1/05. Samples collected prior to 1/1/05 were tested for fecal coliform using the modified A-1 method.

From 12/12/04 to 5/31/05 a total of 29 water samples were collected. The period from 6/5/05 to 10/7/05 was a dry period and little or no rainfall occurred. The discharge pipe was dry therefore no samples were collected. The only significant rainfalls during this time period was a 1.21" rainfall on 6/28/05 and a 2.15" rainfall on 8/15/05.
Nine of the samples collected had elevated fecal coliform counts for no apparent reason. Normally station 051-100 was sampled using a high dilution range which would give fecal coliform reading between < 2 or >160 colony forming units (CFU). One sample collected had results >80 (CFU). Eight other sample results had results >160 (CFU). When results are >80 or >160 it is unknown how high the actual fecal coliform counts would be (See attached Sampling Results, 12/12/04-05/31/05).

On June 7, 2005 a survey of the golf course drainage system at the Country Club of Fairfield, 936 Sasco Hill Road was conducted with Mr. David Koziol, Golf Course Superintendent. At that time, all of the subsurface sewage disposal systems (SSDS) serving the buildings located on the grounds of the Country Club were visually inspected for possible sewage overflow problems. The private home, owned by the Country Club, and being used by the clubs general manager, had a new SSDS installed approximately three years age according the Mr. Koziol. The maintenance building has a 1250-gallon septic tank and leaching fields across the roadway. The beach pavilion, bathhouse and snack bar are serviced by two separate SSDS. Some repair work was done on the systems on 10/1/03 according to the Fairfield Health Dept. The main clubhouse at 936 Sasco Hill Road has a dual SSDS that can be manually switched from one system to the other during times of high water use at the clubhouse. The tennis building is serviced by a SSDS located in the back of the building to the west.

During the time of inspection, no septic overflow problems or signs of problems were observed. All of the inspected SSDS appeared to be operating properly.

There are two ponds on the property. The larger pond is approximately 1300 feet long by 600 feet wide. This is a tidal pond and is controlled by a tidal gate and flows in and out to the Mill River. The smaller pond is approximately 200 feet by 200 feet. This pond is fed by ground water and rainfall. These ponds do not have direct discharge or direct impact to Sasco Beach. Although no large flocks of Canada Goose or ducks were observed during the inspection, at times large flocks of these birds do use the ponds and graze on the golf course.

There are seven open storm water drainage trenches on the golf course. They range in length from approximately 200 feet to 1400 feet long. Six of the drainage trenches either

drain to the large pond or to open plunge pools and would not have a negative impact to Sasco Beach. There is one open drainage trench located just north of and adjacent to the paved parking lot at Sasco Beach. This drainage trench is approximately 1000 feet long and drains to a concrete pipe that runs under the parking lot and connects to the town drainage pipe at a manhole located in the roadway/parking lot. Standing water from the golf course sprinkler system was observed in the trench but there was no water flowing to the beach. Small wind blown pieces of paper and plastic bags were noted in the trench. It appears that this material blows through or over the chain link fence at the Sasco beach parking lot. The golf routinely picks up this material from the trench.
See enclosed Designated Inland Wetlands and Water Courses maps dated Sept. 1, 1994 for the drainage systems at the Country Club of Fairfield.

The Town of Fairfield storm water drainage system on Sasco Hill Road was visually inspected on 7/27/05 and 8/8/05.The catch basins were visually inspected for signs of pet waste, septic waste, oil, odors, other drainage pipes discharging to the catch basins, animal life, such as raccoons, leaf and grass clippings and other signs of possible pollution.

These dates were picked because no significant rainfalls had occurred prior to these dates. This might make it easier to find any water or wastewater being discharged to the catch basins. Unfortunately upon inspection it was noted that many of the homes on Sasco Hill Road are serviced with in ground water sprinkler systems. Many of the sprinkler systems spray nozzles are located at the road curbside and water would either be sprayed by wind or excess surface ground water from the proprieties would drain into the road and fill up the catch basins.

On 7/27/05 and again on 8/8/05 the storm water drainage system from the intersection of Oldfield Road to Sasco Beach was inspected. The storm drain system starts in front of property #794. The storm water flows from this section of roadway, downhill to the discharge pipe location (station 051-100) at Sasco Beach. This is an approximate distance of .6 miles of storm drain system. Twenty-one catch basins were checked. During the investigation 19 catch basins had water in them to some extent and two were dry.

The catch basin located in front of #1067 Sasco Hill Road has a 12” corrugated pipe which discharges to the catch basin. It appears to be coming from their property and at this time no water was flowing from the 12” pipe. The town should verify what this pipe is used for. A six inch green PVC pipe discharges to the double catch basin in front of house #945. No water was flowing from this pipe at this time. The town should verify what this pipe is used for.

During the time of inspection no visible signs of possible pollution sources in the storm water drainage system was observed.

A re-inspection of the storm water drainage system was conducted on 11/20/05. At this time two catch basins were dry and 19 were filled with water. A lot of decaying leaves was noted in the catch basins. The catch basin at the intersection of Sasco Hill Road and

Oldfield Road was filled to the top with sand. This catch basin does not flow to Sasco Beach. See enclosed Town of Fairfield Storm Drainage Maps (Sasco Hill Road).

During the re-inspection all homes along the storm drainage system that are serviced by SSDS's were checked for possible septic problems. This was a visual inspection that was conducted from the road curb. A list of homes not connected town sanitary sewers was provided by Leo C. Mackewich, Supervisor for the Fairfield Sewer Dept. (see attached letter from Leo C. Mackewich). A total of 26 homes were checked and no signs of septic problems were found at this time. Most of the home SSDSs appear to be located over 150' from the Sasco Hill Road storm drain system.

Conclusions and Recommendations:

During the times of the inspection of the drainage system and SSDSs at the Country Club of Fairfield and the inspection of the storm water drainage system on Sasco Hill Road, no visual signs of possible pollution sources were found.

It is recommended the town of Fairfield clean out the catch basins and flush out the storm drainage pipes on Sasco Hill Road on a more often maintenance schedule. Flushing of the drainage system should be done when the Conditionally Approved area is closed to shellfishing to minimize the impact to the receiving waters of Long island Sound. Storm water discharging from the Sasco Hill Road drainage system has an impact to the shellfishing and bathing waters of Sasco beach

The town should verify what the pipes are used for that discharge to the catch basins in front of properties # 1067and #945. Dye testing of the SSDS on these properties should be conducted if there is a question of the closeness location of these pipes to the SSDS on the properties.

The bathhouse and concession stand at Sasco Beach are serviced by SSDS. The location and size of these systems is not known. No records for these systems could be found in the files of the Fairfield Health Dept. It appears that the SSDS are under the parking lot or roadway leading into the entrance of Sasco Beach. These SSDS could be very close to the storm drainpipe. It is recommended that the SSDS for the bathhouse and concession stand be dye tested next year when they are open and in use.

Appendix C

Sasco Brook Pollution Abatement Committee: Accomplishments and To-do List

Sasco Brook Pollution Abatement Committee Accomplishments
1991-2005

1. Established water quality monitoring program of the watershed that has been in place for 15 years.

2. Have secured grants to help fund the monitoring program.

3. Aquatic life parameter of TMDL criteria improved

4. Accomplishments of the Fairfield County Hunt Club have included:
   a. New or replaced septic systems
   b. Completion and implementation of Event Management Plan
   c. Improved manure management- include installation of covers over containment areas
   d. Installation of wash stalls
   e. General drainage maintenance improvements
   f. Further improvements to come –P&Z approval recorded

5. Connecting Woodhill Road to sewer (6d)

6. Hidden Brook-sewer connection; separated sewer from storm water.

7. Landsdowne pipe sealed from former landfill

8. Disconnection of janitor closet drain from Stop & Shop
9. Stenciling of catch basins

10. Mass mailing to everyone in watershed about non-point sources of pollution

11. Prepared dam repair and fish ladder plans and compiled DEP permit application.

12. Development of stormwater management web-site (in progress-will be up and running early 2006)

13. Sasco Brook watershed in Westport-catch basins and outfalls mapped

14. In FAIRFIELD-Horse farm in vicinity of Congress St and Merwin Lane-horses moved back from water's edge

15. Also in FAIRFIELD, horse farm on Beechwood Lane relocated

Westport accomplishments

DRAFT TO DO LIST FOR SASCO BROOK COMMITTEE
September 29, 2005, updated October 7, 2005

TMDL Update

DEP would like an update of our TMDL Plan. We need to identify what we have accomplished so far and what our goals and objectives are for the future. All that is listed below can be part of the TMDL update. Any other ideas would be greatly appreciated. This should be our focus for the meetings ahead.

Manure Management

1. compile a list of horse owners in Fairfield and Westport – Hunt Club to assist in compiling mailing list
2. design a questionnaire about their horsekeeping habits – Carol to draft
3. distribute information about good horsekeeping habits
4. amend zoning regulations

Streamside Buffers

1. compile list of streamside property owners (done by Conservation Dept staff already)
2. conduct mailing about benefits of vegetative buffers
3. write letter to Conservation Commission and Planning and Zoning Commission encouraging requiring vegetative buffers as conditions of permit approval – Dick to write letter.
4. amend regulations to vary setbacks depending on site characteristics

Discharge of Camper Waste

1. compile list of registered campers in Westport
2. ask DEP to provide a list of approved waste deposit sites and distribute to camper owners – None in our area
3. ask Westport Sewage Treatment Plant to accept waste
4. write to State about establishing waste disposal sites for campers.

Press

1. Prepare press releases or have press cover one of our meetings to alert people to our mission.
2. better website outreach, include water quality results

Storm Drain Stenciling

1. Stencil storm drains throughout the watershed in Westport alerting people that the catchbasins drain to Long Island Sound and no dumping is permitted, including keeping them clear of debris. – underway

Septic System Testing

1. Identify what properties have consistently high bacteria counts and have the Health Department test these sites to confirm if septic systems are failing.

Bulkley Pond Dam

1. Identify property owners around the pond, including owners in Fairfield (already compiled by Conservation Department staff.)
2. Ask President of Nash's Pond Association to come and speak to our group and interested Bulkley Pond owners about how a separate taxing district was formed to generate funds and guide stewardship and maintenance of that pond.

Mapping

1. Develop more detailed map of watershed

Outreach

1. establish bulletin board for Sasco Brook in Town Hall
2. establish kiosk at Southport Beach

Sasco brook to do list