GROWING AREA EU
St. Croix River; Eastport to Calais

Sanitary Survey Report

Report Date: 08/22/11

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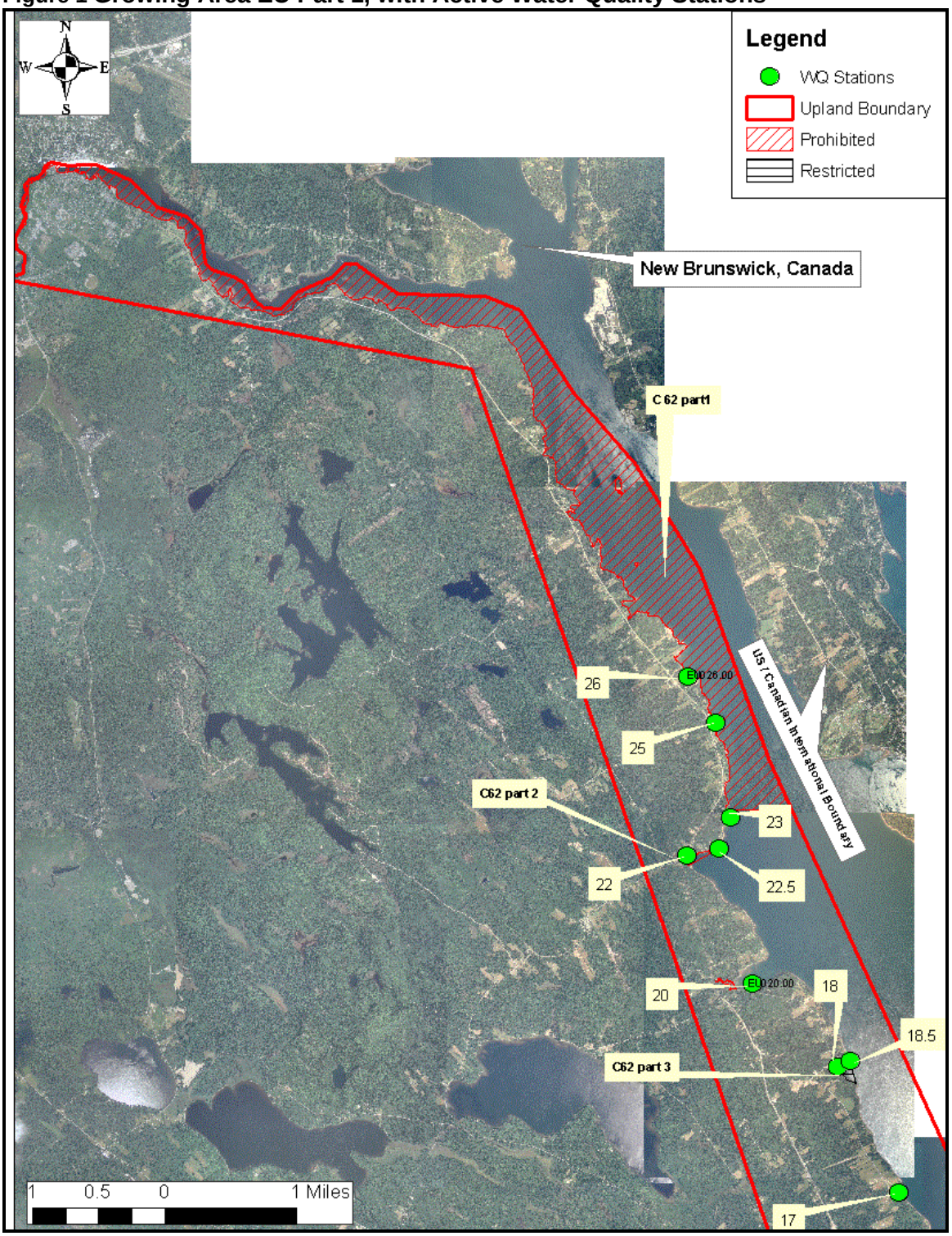
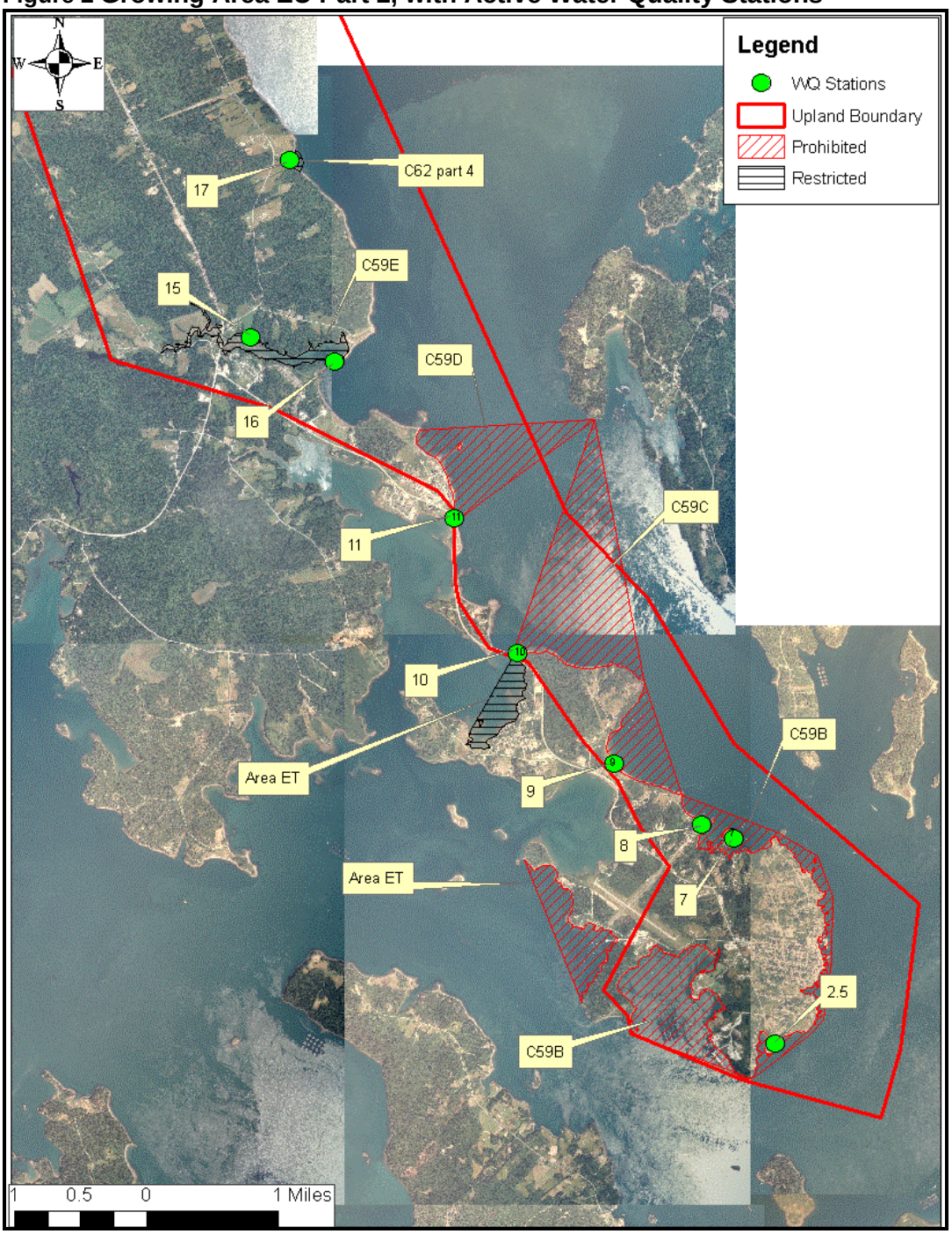


Figure 2 Growing Area EU Part 2, with Active Water Quality Stations



Executive Summary

This is a sanitary survey report for growing area EU written in compliance with the requirements of the2007 Model Ordinance and the National Shellfish Sanitation Program. This report includes a water quality review, based on water quality data collected through 2010, as well as an evaluation of all pollution sources identified during the 2010 shoreline survey of the shores of the growing area. Pollution sources reviewed in this report include domestic waste, including private in-ground systems and overboard discharges (OBDs), recreational areas, agricultural activities, domestic animal and wildlife areas, and non-point pollution transported by streams. Hydrographic and meteorological data are discussed in this report, including assessments of tides and currents, rainfall, and salinity. A discussion of current classifications and recommendations for future work are also presented in this report. As a result of this sanitary survey, Lewis Cove, Perry will be recommended for a seasonal CA. No new water quality stations were added or deactivated during the 2010 sampling season. The shoreline survey component revealed no new malfunctions requiring Prohibited areas.

Classification changes implemented since the last Sanitary Survey in 1998 include: the expansion of a restricted area in Gleason's Cove, Perry due to failing water quality in 2005, the repeal of 4000 acres of prohibited zone from Liberty Point, Robbinston to Gleason's Cove, Perry due to improved water quality and remediation of known pollution sources in 2006, a restricted area was put in place at the mouth of Loring Cove, Perry due to failing water quality in 2006, a prohibited zone in Mill Cove, Robbinston due to a failing septic in 2006, a new restricted zone in Frost Cove, Perry in 2007 and in 2009 Lewis Cove, Perry was downgraded to prohibited based on failing water quality. More detail of these classification changes can be found in the History of Growing Area Classification section of this report.

Station changes that have occurred since the last survey in 1998 include the deactivation of stations 1.5, 12, and 30 in 2004 because they were embedded in prohibited areas that will not be opened. The deactivation of stations 14, 24, 26, and 29 in 2005 because of being embedded in current WWTP dilution zones. Station 18.5 was a new station created in 2006 to help defend the boundary of a stream dilution zone and station 22.5 was created to help defend a closure line in Mill Cove, Robbinston. In 2008 station 31 was deactivated because of being embedded in a current WWTP dilution zone and station 26 was reactivated to help build data for a possible future upgrade in the Brooks Cove area of Robbinston. In 2009 stations 28, 27, and 1 were deactivated because of being embedded in current prohibited zones.

There were four licensed overboard discharges (OBDs) removed during the review period OBD 1522 was removed in 2001, 4889 was removed in 2004, 1895 was removed in 2007, and 7292 was removed in 2008. One new seasonal conditional area due to seasonal intermittent pollution is proposed for Lewis Cove in this report.

Growing Area Description

The growing area is bounded on the east by the US/Canadian border, on the north by the Calais – St. Stephens Bridge, the west by US Route 1 and on the south by Shackford Head. The St. Croix River represents a significant fresh water source with a watershed of approximately 1631 square miles (USGS, Drainage areas Eastern Maine. 1982). In Washington County, growing area EU includes shores in the towns of Calais, Robbinston, Perry, and Eastport. The tides in downeast Maine average 20 feet and tidal currents can reach speeds of three knots and greater.

There are five (5) wastewater treatment facilities in this area, four (4) OBD's and six (6) other licensed process water discharges. The growing area consists of two prohibited areas and three restricted areas. All random stations were sampled 6 times per year during this review period.

There are four (4) finfish aquaculture sites in this growing area. They are all located in and around the Eastport area. All four are pen culture sites for finfish with salmon being the main species raised. There are no wet storage sites in this growing area.

History of Growing Area Classification

2005- C60 Little River, Perry reclassified from Approved to Restricted because of failing WQ from non- point runoff at station EU 15

2006- C62 St. Croix River, Calais, Robbinston, and Mill Cove large portion of this area was reclassified from prohibited to approved
-C 62-A, Mill Cove, Robbinston was made prohibited due to a suspect IG system and non point runoff
-C62-A, Mill Cove, Robbinston was repealed and promulgated as part of Closed Area No. 62; policy to combine closures
-C57 was also repealed and combined into a larger legal notice C59.

2007- C62 St. Croix River, Calais and Robbinston, Loring and Mill Coves, Robbinston and Perry; A new restricted area was promulgated in Frost Cove due to non- point runoff and failing WQ at station EU 17

2009- C62 St. Croix River, Calais and Robbinston, Loring and Mill Coves, Robbinston and Perry; Lewis Cove, Perry was downgraded to prohibited based on failing water quality.

Current Classification(s)

At the end of the 2010 review year, shellfish growing area EU had areas classified as:

Approved: 4 stations; EU 16, 18.5, 22.5, and 23

Restricted: Area No. 59 part E Little River, Perry; 1 station EU 15 Area No. 62 part 3 Loring Cove, Perry; 1 station EU 18; Area No. 62 part 4, Frost Cove, Perry; 1 station EU 17 all because of failing water quality

Prohibited: Area No. 59 (B, C, D), Outer Cobscook Bay (Eastport and Perry); 6 stations EU 2.5, 7, 8, 9, 10 and 11 all in WWTP dilution zones; and Area No. 62 parts 1 and 2, St. Croix River Calais, Robbinston and Mill Cove; 4 stations EU 20 failing water quality, 26 near OBD, 25 near OBD and 22 failing septic system.

Please visit the DMR website to view legal notices:

http://www.maine.gov/dmr/rm/public_health/closures/closedarea.htm#

Activity during Review Period

No classification changes took place during the 2010 review period. One area, Lewis Cove, Perry; is being recommended for a seasonal CA based on intermittent bacterial pollution. During the 2010 season 39 stream samples were collected as part of the shoreline survey. As part of the shoreline survey optical brightener pads were placed at 3 small intermittent streams that drain to the cove during a rain event that occurred in May. The pads were left for a week and then picked up and examined. All three pads were negative.

Conditionally Managed Area(s)

At the end of year 2010 there were no conditionally managed areas.

Pollution Sources Survey

As part of the 2010 sanitary survey the towns of Eastport along with Quoddy Village population 1582, were surveyed in April by DMR staff. The town of Perry, population 840 was surveyed in the month of May and Robbinston, population 543 through to St. Croix Island, Calais was surveyed in June.

The following sections include information on pollution sources which do or may impact water quality in growing area EU. Pollution sources that are reviewed in this section include domestic waste, including both private inground systems and over board discharges (OBDs), marinas and mooring fields, stormwater and pollution from non-point sources (streams), farms and other agricultural activities, domestic animals and wildlife areas, and recreational areas.

Domestic Waste *(IG Systems and OBDs)*

There are four (4) over board discharges (OBDs) that discharge their treated effluent into the waters of the St. Croix (Figure 3) and table 1. Four OBD's were removed over the 12 year period table 2.

Table 1 St. Croix OBD's and dilution zones

SLS_ID	TOWN	OBDNUM	FLOW	Mid Tide Depth	Dilution in Acres Needed
EU00426.00	Calais	2841	300	3.00	2.19
EU00429.00	Calais	2860	390	3.00	2.85
EU00460.00	Calais	1339	10500	3.00	76.72
EU00461.00	Calais	2375	13000	3.00	94.98

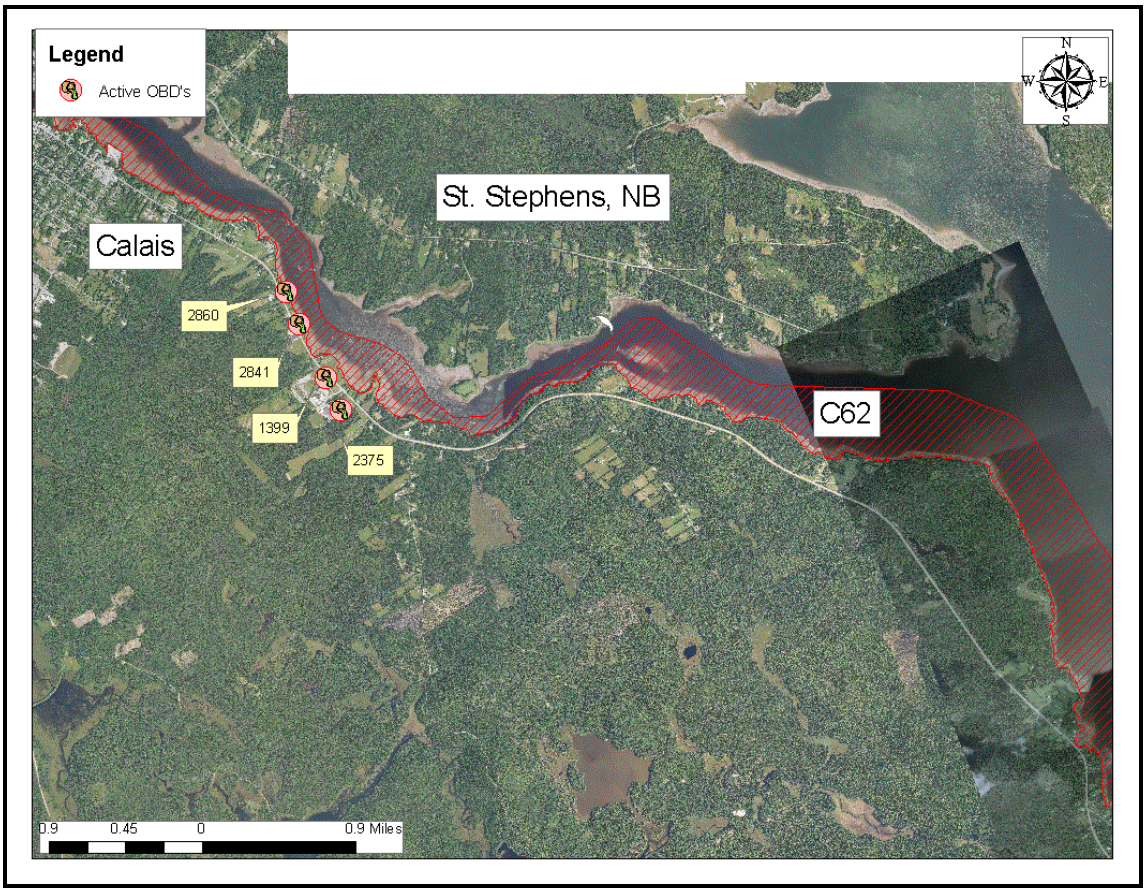


Table 2 Removed OBD's

OBD #	Year Removed	Town
1522	2001	Perry
4889	2004	Eastport
1895	2007	Calais
7292	2008	Calais

An overboard discharge is the discharge of wastewater from residential, commercial, and publicly owned facilities to Maine's streams, rivers lakes, and the ocean. Commercial and residential discharges of sanitary waste have been regulated since the mid-1970's when most direct discharges of untreated waste were banned. Between 1974 and 1987 most of the "straight pipes" were connected to publicly-owned treatment works or replaced with standard septic systems. Overboard discharge treatment systems were installed for those facilities that were unable to connect to publicly-owned treatment works or unable to install a septic system because of poor soil conditions or small lot sizes.

All overboard discharge systems include a process to clarify the wastewater and disinfect it prior to discharge. There are two general types of treatment systems; mechanical package plants and sand filters. Sand filter systems consist of a septic tank and a sand filter. In such systems, the wastewater is first directed to a holding tank where the wastewater solids are settled out and undergo partial microbial digestion. The partially treated wastewater then flows from the tank into a sand filter, consisting of distribution pipes, layers of stone and filter sand, and collection pipes within a plastic liner. The wastewater is biologically treated as it filters down through the sand, and is then collected and discharged to a disinfection unit. Mechanical package plants consist of a tank, where waste is mechanically broken up, mixed and aerated; mechanical systems require electric power, and must have an operating alarm on a separate electrical circuit that will activate if the treatment unit malfunctions due to a power failure. The aerated treated wastewater is held in a calm condition for a time, allowing for solids to settle and for the waste to be partially digested by naturally occurring bacteria. The clarified water from the tank is then pumped off the top into a disinfection unit. There are two types of disinfection units, UV and chlorinators (most common). In a chlorinator, the treated water contacts chlorine tablets and remains in a tank for at least 20 minutes where bacteria and other pathogens are killed. The treated and disinfected water is discharged from the disinfection unit to below the low water mark of the receiving waterbody (the ocean, a river, or a stream) via an outfall pipe.

OBDs are licensed and inspected by the Maine Department of Environmental Protection. At each inspection, DEP looks for tags on each treatment unit identifying the service contractor and the last date of service. If an OBD is not properly maintained, or if the OBD malfunctions, it has the potential to directly discharge untreated wastewater to the shore; therefore, preventative closures are implemented surrounding every OBD located in growing area EU (Table 1). The size of each closure is determined based on a dilution, using on the permitted flow rate of the OBD (in gallons per day, GPD), and the depth of the receiving water that each OBD discharges to; the fecal concentration used for this dilution calculation is $1.4X10^5$ FC /100 ml. All current closures are of adequate size to protect public health.

The property survey involved the on-site inspection of 800 shoreline properties, as well as non-shoreline properties determined to have a potential impact on the shore. These are categorized as permitted point sources, other domestic waste, storm sewer discharges, tidal creeks/stream/wetland discharges, agricultural sources, wildlife areas, industrial waste, dredging, and marinas Many of these properties are residential with on-site in-ground (IG) septic systems; exception include structures with licensed overboard discharges, vacant/forested lots and public shore access points. During the 2010 sanitary survey no individual IG systems located in current approved or restricted areas were found to be malfunctioning.

Municipal Wastewater Treatment Plant (WWTP)

On January 12, 2001, Maine received authorization to administer the National Pollutant Discharge Elimination System permitting program for discharges to surface waters (MEPDES Review Process). Through the end of 2008, the list of licensees includes primary and secondary treatment plants; sub- surface disposal systems owned and maintained by a municipal sewer department or district; surface disposal systems (lagoon-spray) owned by a sewer department, district or school district; mechanical-sand filter system owned by a department or district; combined sewer overflows (CSOs); treated leachate from landfills; non-contact cooling water; EPA major facilities; storm water systems; food processing facilities; fish hatcheries; paper mills; finfish aquaculture operations; and town snow dumping operations. Some of the licensed discharges in this growing area empty into Prohibited areas or are far from the shore or are flow through watering systems at research-aquaculture operations.

The city of Calais has one municipal WWTP. It is a year-round mechanical system with seasonal chlorination from May 15 – September 30. (Lic. # 0100129), average design of 0.71 MGD and peak flows through secondary is 1.5 MGD. Peak flow through the entire plant including chlorinated storm water bypass flows was 5. 9 MGD recorded in 2007. Flows greater than this also reach the plant and are pumped with the plant's CSO stations. This results in approx. 5-6 discharges per year at this location. See table 2 for the CSO discharges for the year 2007-2009. The licensed discharge volume is 1.5MGD. The discharge is into a Prohibited area (C62). We have no CA associated with this plant and have calculated our prohibited zone based on peak flow through the entire plant including chlorinated storm water bypass flows of 5.87 MGD plus the max flow recorded in 2008 on 12/12/08 of the CSO bypass which was an additional 6.7 MGD. This resulted in a flow of 12.5 MGD for the Calais WWTP. This closure also figures in the combined flow from the OBD's flowing into the St Croix in Calais and Robbinston which is an addition 28,460 GPD along with the max wet weather flow of 1.5 MGD from the St. Stephens WWTP on the Canadian side. The Canadian side of the river has 27 CSO located in St. Stephens with 11 of these located right along the waterfront. This brings the total flow used in the dilution calculation to 14 MGD.

Based on this 14 MGD flow (max flow through the plant plus the max flow during 2008 CSO bypass event, plus all OBD's and design flow of 1.5 MGD for the St. Stephens plant), 140,000 FC/100ml in effluent and an average depth of 60 feet for the receiving water results in the following dilution calculation;

(1) The bacterial dilution zone = 7,160 acres

(2) The current Prohibited zone = 7,376 acres

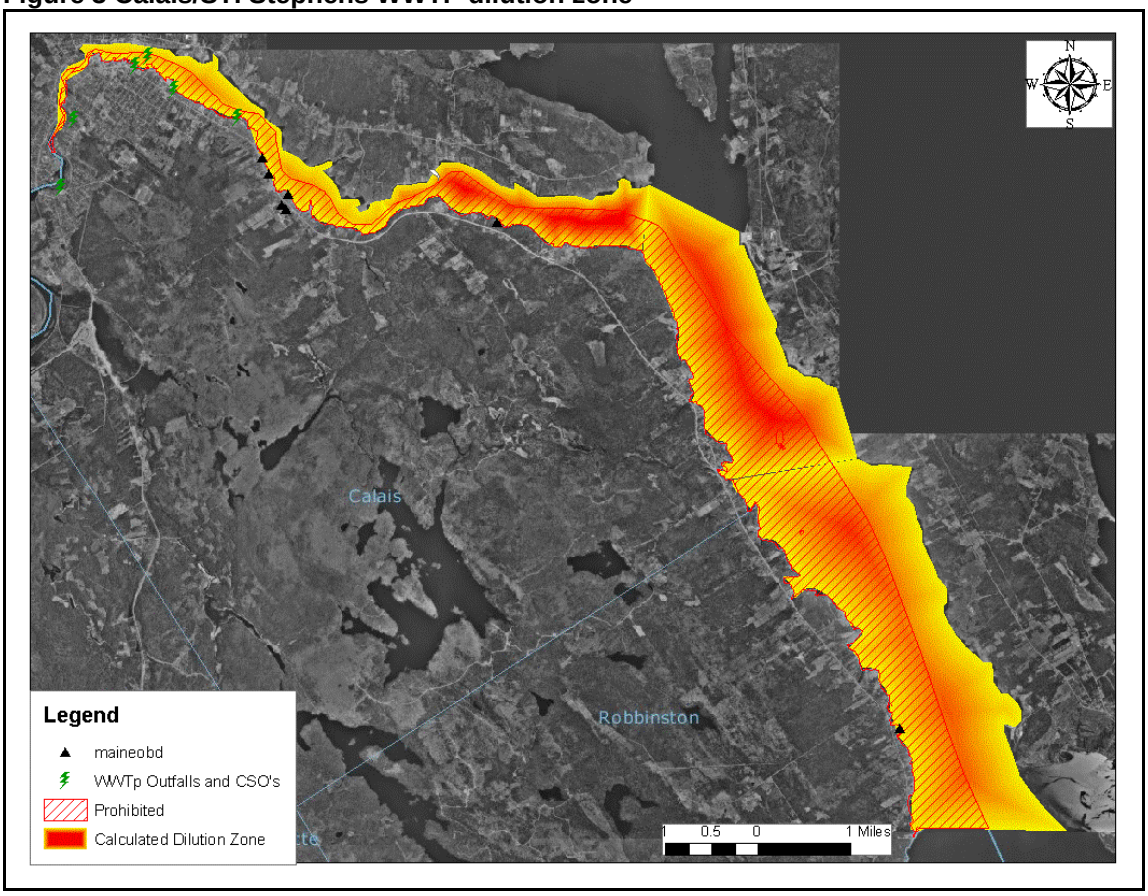
The City has spent the following to reduce the CSO's over the past 2 years; 2006 - $1.522 million; 2007 - $1.584 million; 2008 planned and secured - $4.133 million.

Table 3 Calais CSO Events

Date	Total Rain	Max Hr.	#003	#004	#005	#006	#007	Gallons	Duration Hr.
3/17/2007	2.51	0.55	3,337,500		153,278		163,000	3,653,778	10
4/16/2007	2.12	0.24	6,060,000				124,000	6,184,000	18
4/17/2007	1.36	0.15	5,767,500				48,000	5,815,500	18
7/20/2007	2.01	0.74	2,936,250					2,936,250	9
10/12/2007	2.12	0.24	2,142,292					2,142,292	7
11/3/2007	2.13	0.31	902,700					902,700	10
11/16/2007	1.5	0.16	376,500					376,500	12
12/23/2007	0.75	0.1	49,500					49,500	8
3/3/2008	2.20	0.50	2,046,000	285,080	976,774	36,430		3,344,284	13
9/6/2008	3.50	0.59							8.5
9/7/2008	0.20	0.05	1,152,000		189,915			1,341,915	4
11/15/2008	1.60	0.48							6.5
11/16/2008	1.20	0.50	2,418,000		52,656			2,470,656	24
11/25/2008	2.90	0.32							9
11/26/2008	0.60	0.23	2,520,000		2,554,639			5,074,639	24
12/9/2008	1.00	0.12							7
12/10/2008	1.50	0.04							24
12/12/2008	1.30	0.47	5,460,000	36,431	976,774	285,080		6,758,285	8
3/29/2009	0.50	0.03	2,400,000		852,047			3,252,047	20
4/3/2009	1.40	0.15	1,824,000		1,237,497	95,766		3,157,263	12
4/5/2009	0.11	0.11	136,800					136,800	1
4/6/2009	1.30	0.06	1,687,200					1,687,200	24
4/7/2009	0.30	0.11	387,600					387,600	24
4/8/2009	0.40	0.11	519,840					519,840	13
4/21/2009	1.40	0.17	543,000				`	543,000	24
6/12/2009	0.70	0.16	120,000					120,000	8
6/20/2009	1.80	0.28	1,020,000					1,020,000	9
6/28/2009	0.90	0.18	180,000					180,000	6
8/29/2009	2.60	0.08	1,740,000					1,740,000	18
10/4/2009	1.40	0.36	3,660,000					3,660,000	10
10/24/2009	1.60	0.23	2,160,000					2,160,000	18
11/15/2009	2.30	0.33	2,700,000					2,700,000	12

A neighboring Canadian community called St. Stephen recently reported having 28 CSO's in its sewer system with 11 located along the river. St. Stephen is working on a two phase sewage system upgrade project involving: the construction of a new sewage treatment plant (completed), and elimination of CSO's one by one, at an estimated cost of $7.5 million. Until the project is complete, the community will undoubtedly continue to have wastewater and storm water overflows, and the question remains on what to do about this in the interim. What is IJC? IJC (International Joint Commission that oversees boundary waters) Meeting Summary on CSO's (May 2011)

Figure 3 Calais/ST. Stephens WWTP dilution zone



Figures 4 and 5 below show the Canadian shellfish classification on the Canadian side of the river. As shown their closures mirrors our shellfish closures.

Figure 4 Upper St. Croix Canadian shellfish classification

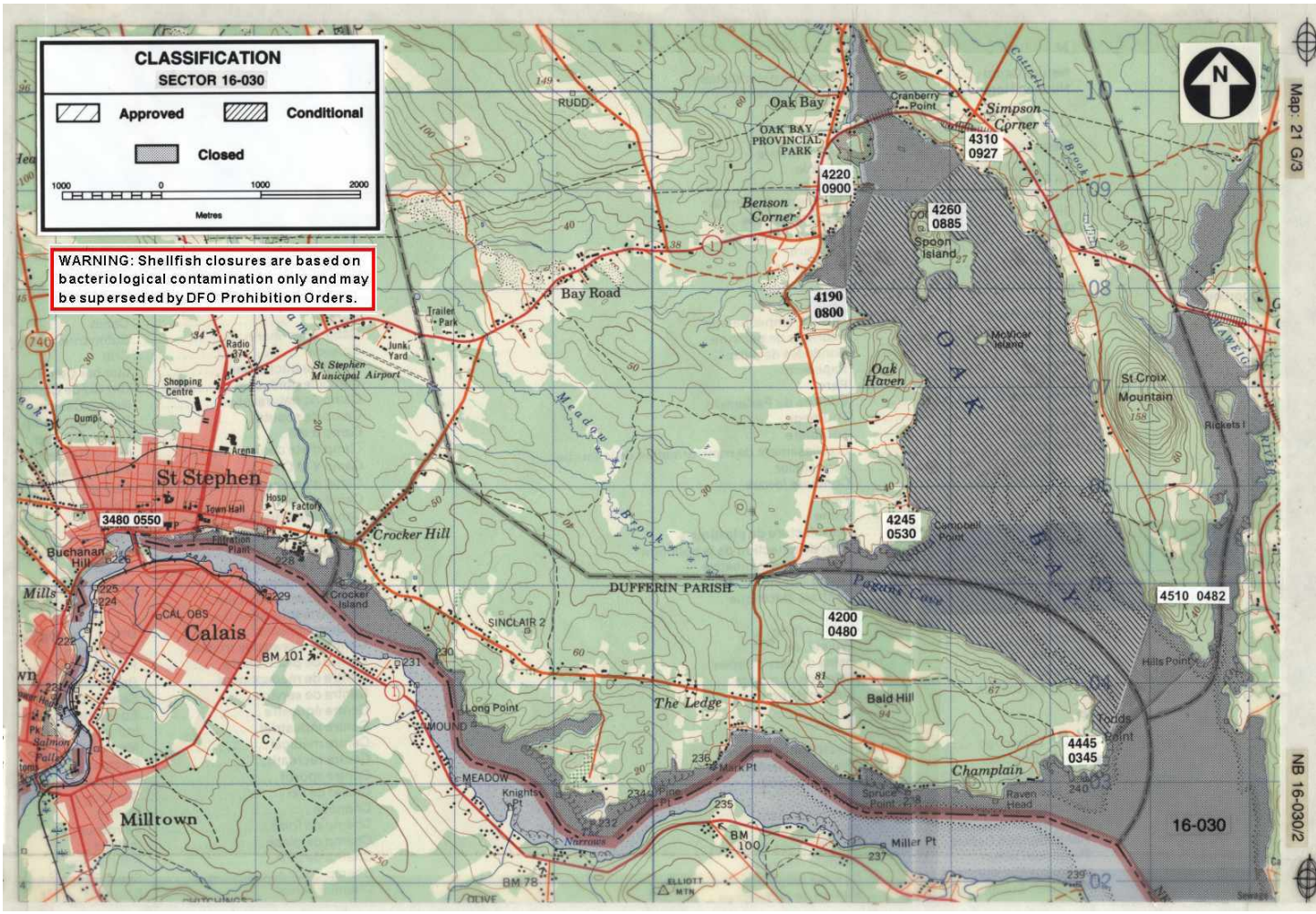
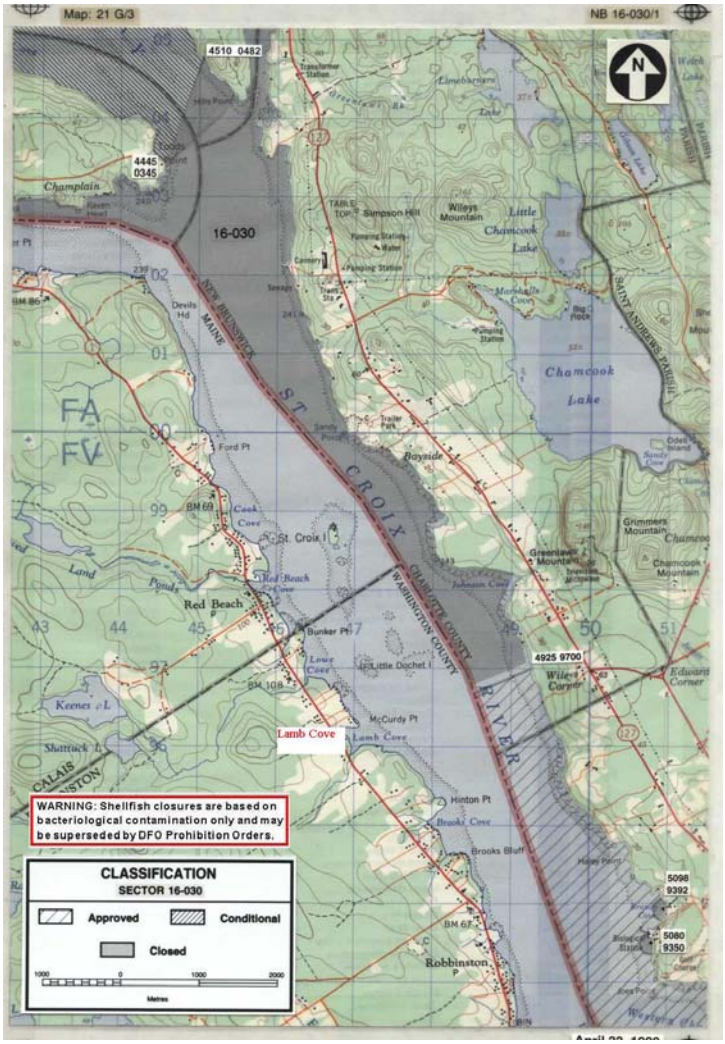


Figure 5 Middle St. Croix Canadian shellfish classification



The next plant in line down from Calais is the Pleasant Point WWTP located on the Passamaquoddy reservation in Pleasant Point (Figure 6). The Pleasant Point WWTP in Eastport consists of an extended aeration oxidation ditch facility, a sewer collection system, and thirteen pump stations. (License # W-002561) The licensed discharge volume is 0.15 MGD but the plants average daily flow is 0.08 MGD. There are currently plans to improve the collection system by eliminating inflow and infiltration (I&I). The discharge is into a Prohibited area (C59). The Passamaquoddy Tribal Wastewater Treatment Facility consists of primary and secondary treatment with a collection system that serves about 730 private, commercial and governmental connected users. The raw wastewater entering the facility receives biological stabilization and pollutant removal prior to its discharge into Passamaquoddy Bay as treated effluent. (http://www.wabanaki.com/facility_history.htm, accessed March 2011) The plant was upgraded based on three studies over the years. The studies were designed to address the problems at

the facility and plan for the improvements and up-grade to the existing facility, which consisted of the following and was completed in 2005:

1. An aerated grit chamber was added at the headworks of the plant and two primary manual grit chambers.

2. A new diffused aeration system was added to the biological treatment reactor to replace the present inadequate rotor system.

3. Variable Frequency Drives were installed on all motors which controls the in-put to all motor controllers.

4. A selector basin was installed in cell # 1 this is for to promote growth of floc-former bacteria over poorly settling filaments.

5. An 40,000 /gal aerobic sludge digester was installed to store and biodegrade excess waste sludge. The reactor will allow up to half of the organic portion of the plant's sludge to be biodegraded and will reduce future sludge disposal volumes from 20,000 gallons per week down to only 5,200 gallons per week. This will allow sludge to be removed from the plant on a less frequent monthly basis as compared to the present twice weekly removal schedule.

6. Telementary was installed although out the facility and pump stations.

7. The aeration basin was divided into four cells and two stages.

8. 30,000 gallon surge tank installed just before the final pump station before it is pumped into the head-works. (http://www.wabanaki.com/facility_history.htm, 2011)

Based on current observed flows posted on the facilities website as seen below;

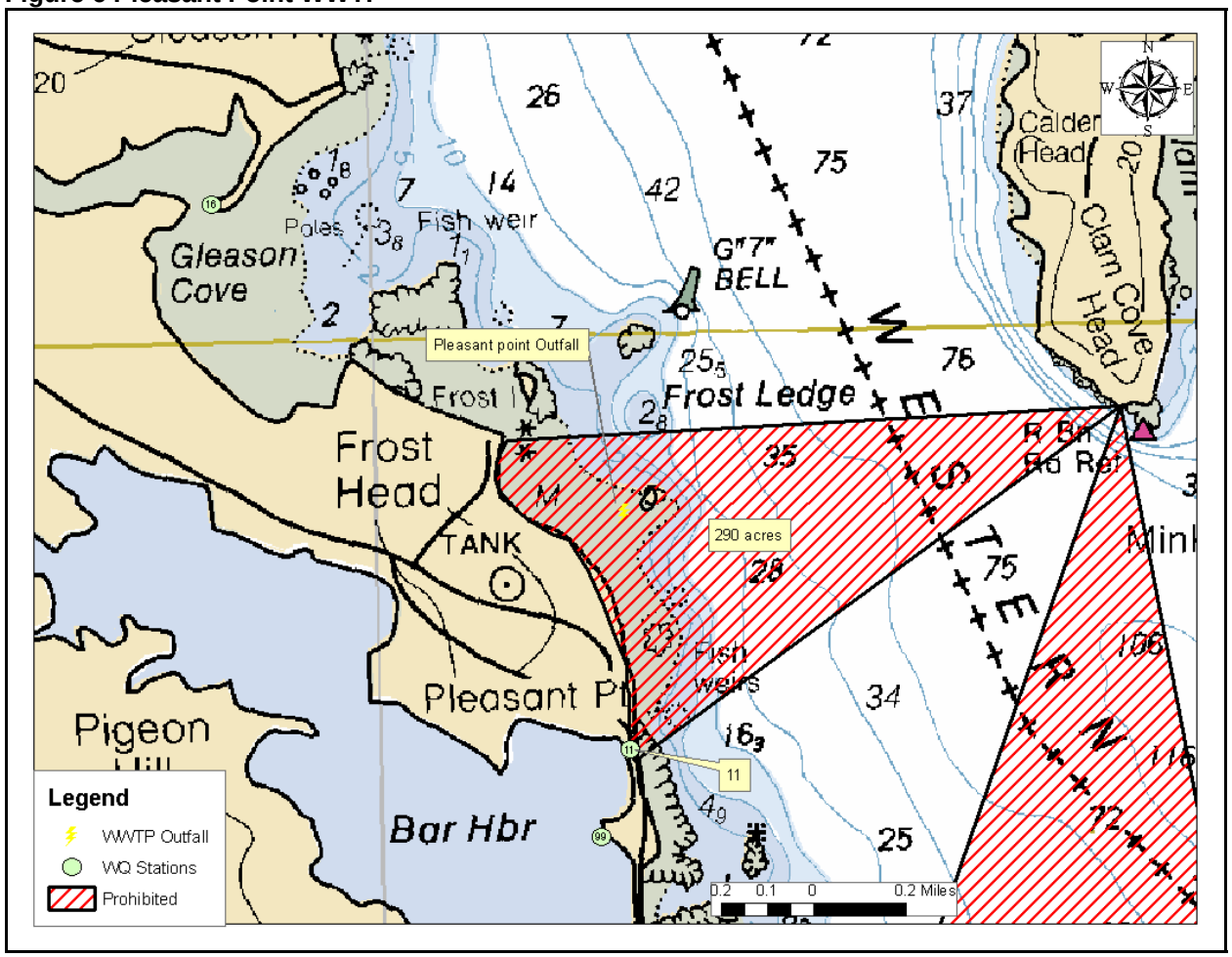
Average daily flow (GPD)	90,000
Maximum monthly flow (GPD)	145,000
Maximum daily flow (GPD)	230,000
Peak hourly flow (GPD)	400,000

Based on a max monthly flow of 145,000 GPD a loading of 140,000 FC/100ml in effluent before chlorination and an average depth of 20 feet for the receiving water results in the following dilution calculation;

(1) The bacterial dilution zone = 222 acres

(2) The current Prohibited zone = 290 acres

Figure 6 Pleasant Point WWTP



After the Pleasant Point Facility the next WWTP is the Quoddy village facility located in Eastport (Figure 7). The Quoddy WWTP located in Eastport license # W008131-5L-C-R, is a primary treatment facility that serves approximately 200 people.

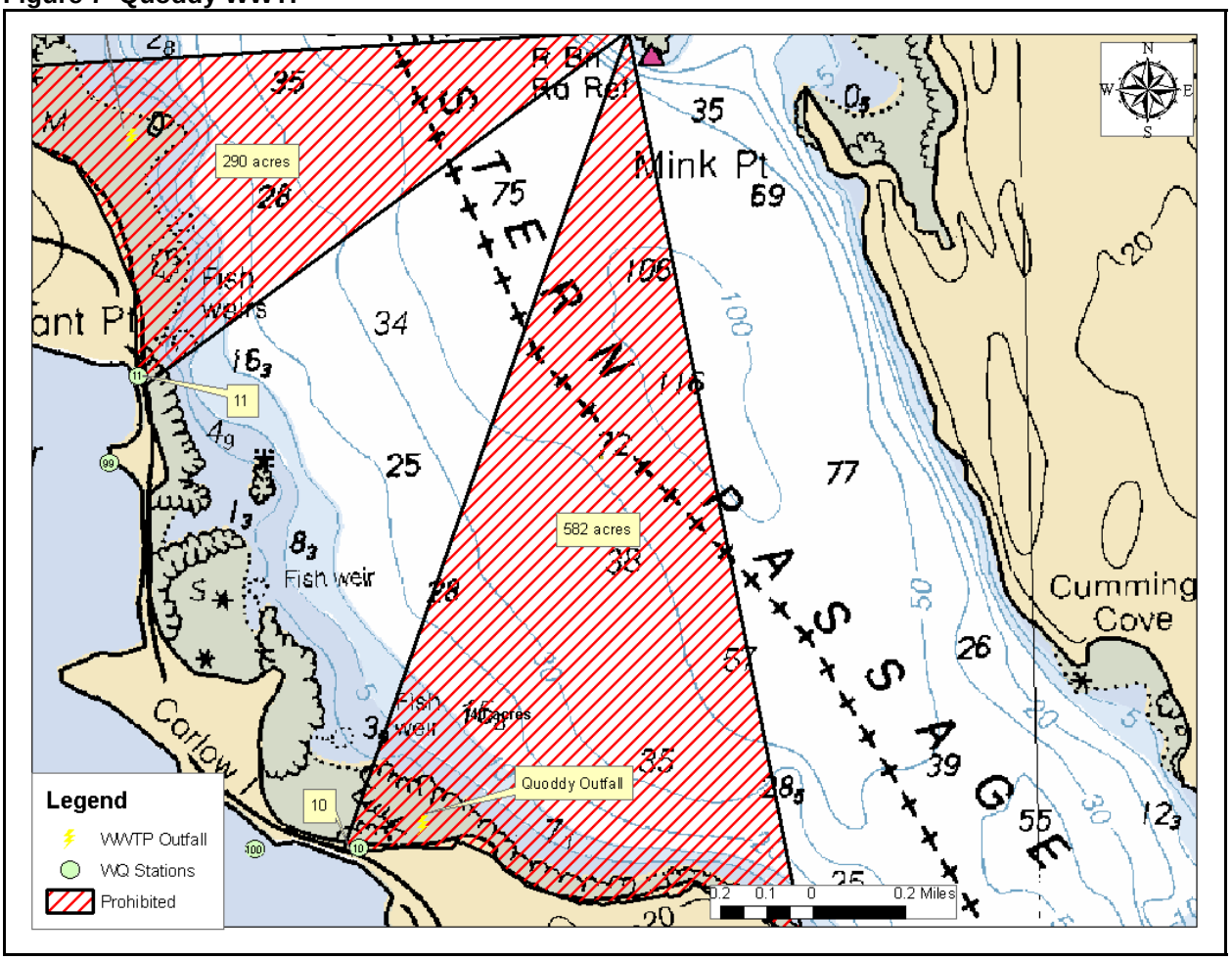
"*Sanitary waste waters received at the treatment facility are generated by residences and commercial entities in the Quoddy Village area of the City of Eastport. The waste water collection system in Quoddy consists of 14,400 linear feet of force main and gravity sewers with no combined sewer overflow(CSO) points in the system. Each household's waste water flows to the sewer system via City owned and maintained septic tanks. Two households require septic tank effluent pump stations, which collect effluent from City owned and maintained septic tanks at individual homes. The collection system includes only new sewers that have passed leakage*

tests. There are approximately 105 residential connections to the treatment facilities. The facility does not receive any flows from industrial sources. The facility provides a primary level of treatment by individual on-lot septic tanks. The collection system network conveys the effluent from each residence to a treatment plant which consists of an influent pump station, two chemical addition manholes, a storage tank, and effluent pump station, effluent flow metering, and a sampling manhole. The treated effluent is discharged to Passamaquoddy Bay during high tide periods. Septic tank effluent flows, by gravity to the influent pump station. The waste water is then pumped through the first chemical addition manhole where chlorine, in the form of sodium hypochlorite, is added and is then discharged to a 38,000 gallon storage tank. The waste water is pumped from the storage tank during high tide periods, through the access port for the second chemical addition manhole where sodium bi-sulfite is added to de-chlorinate the waste water, and discharged by means of a gravity sewer outfall. The effluent pumps are controlled by a float switch in the outfall manhole." (Maine DEP, Quoddy NPDES Permit, 2008)

This plant discharges into closure 59 C only at high tide, into waters with an average depth of 5' and a 0.050 MGD flow (licensed daily flow), 140,000 FC/100ml in effluent before chlorination and an average depth of 5 feet for the receiving water results in the following dilution calculation;

(1) The bacterial dilution zone = 307 acres
2) The current Prohibited zone = 582 acres

Figure 7 Quoddy WWTP



The last WWTP facility in the tidal stretch of this growing area is the Eastport WWTP facility located in Eastport (Figure 8). The Eastport WWTP (license # W-002598-46) is a primary treatment facility that serves approximately 2000 people.

"Sanitary wastewaters received at the treatment facility are generated by residential and commercial entities in the City of Eastport. The facility receives no flow from industrial sources. All CSOs have been eliminated from the collection system. The wastewater collection system consists of 10 miles of interceptor and collector sewers and six (6) submersible pump stations. The collection system has been upgraded over time and the newer sewer lines have reduced the quantity of infiltration and inflow (I&I). The collection system consists of a triplex submersible pump station at Middle Street, 2,400 linear feet of 10-inch diameter force main to the treatment plant and 3,200 feet of gravity outfall sewer to Passamaquoddy Bay. The Middle Street pump station includes a bar rack, gas detection system, wet well, pumps and piping, valve pit, control panel and stand-by emergency generator (housed in a building). The City treatment facility provides a primary level of treatment and consists of (1) screening and grit removal, (2) two primary treatment Imhoff tanks (3) pre-chlorination (if needed), (4) chlorination and dechlorination, (5) effluent flow metering, (6) sampling of effluent quality, (7) sludge

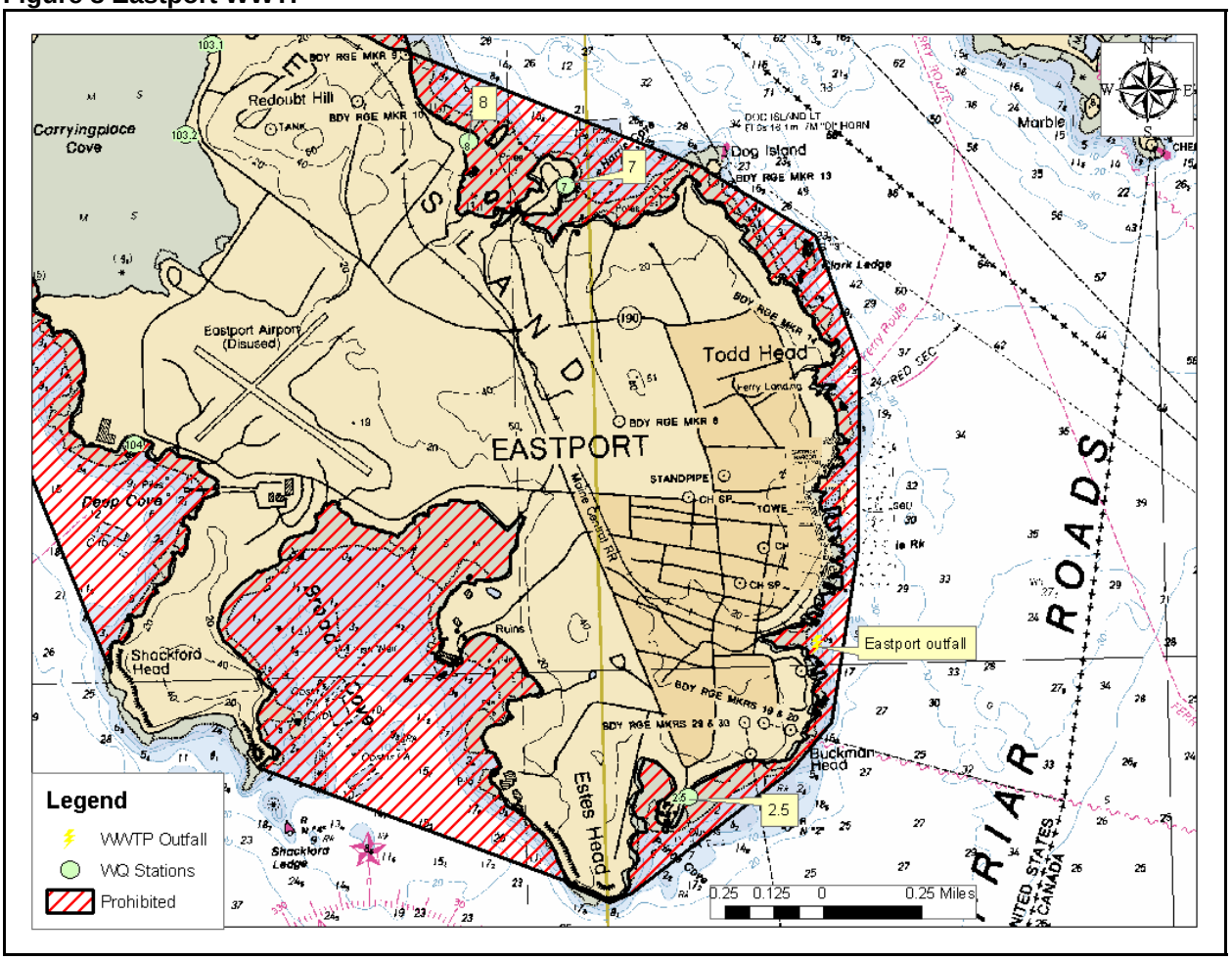
removal, mixing, drying and stabilization (8) lime, polymer and potassium permanganate chemical addition facilities, and a Control Building. The treated effluent is discharged to Passamaquoddy Bay by way of a twenty four (24) inch diameter pipe that is submerged at mean low water.

Wastewater enters the treatment plant through a 10 inch diameter force main to an influent channel to the screening and grit removal facilities. Following screening and grit removal the wastewater is conveyed by gravity to a weir controlled flow splitting structure which controls flow into the two Imhoff treatment tanks. The sludge and scum are stored in the lower compartment of the tank for anaerobic digestion and then seasonally disposed of by liquid sludge land application or dewatered in the on-site drying beds and either land filled or sent to another appropriate facility for further treatment and disposal. The wastewater flows from the Imhoff tanks to the chlorine contact tank for disinfection. The wastewater is disinfected by the addition of chlorine in a mixing chamber at the head end of the contact tank. The wastewater is dechlorinated at the tail end of the chlorine contact tank in another mixing chamber. Effluent flow is monitored and sampled prior to discharge to Passamaquoddy Bay via the ocean outfall." (Maine DEP, NPDES permit 2008)

This plant discharges into closure 59 B. Based on a 0.82 MGD flow (design flow), 140,000 FC/100ml in effluent before chlorination and an average depth of 75 feet for the receiving water results in the following dilution calculation;

(1) The bacterial dilution zone = 335 acres
(2) The current Prohibited zone = 360 acres

Figure 8 Eastport WWTP



Industrial Pollution

There is no heavy industrial activity in the growing area such as chemical plants, steel mills, large ship yards or refineries. Small industry includes small boat builders or boat storage yards, a boat building school in Eastport, an international barge ferry wharf in Eastport, nature tour businesses and an ocean shipping wharf at Shackford Head, Eastport. Storage tanks with >500 gallons for gasoline or diesel were noted at Shackford Head, Eastport, The Maine Department of Environment Protection and the US Coast Guard coordinates spill reporting to the Public Health Division of the DMR and the department responds with an appropriate closure action.

Upriver above the head of tide there are paper mills that discharge to the St. Croix. During the 1960s, pulp and paper effluent was discharged directly into the St. Croix, causing fisheries in the lower part of the waterway to almost disappear. Improvements have been made since, but the area still has instances of industrial pollution contributing to high levels of bacteria, nutrients, and toxic pollutants. "Dioxins" are highly toxic and persistent chemicals produced by industrial processes that use or burn products containing chlorine, particularly in pulp and paper mills.

Dioxins are released into the atmosphere through the incineration of plastics and wood, as well as the release of wastewater effluent into rivers. Evidence suggests dioxin contamination has a strong correlation with cancer and has been shown to disrupt hormonal, reproductive and immune systems in humans, fish and wildlife (www.nrcm.org/dioxin_facts.asp). The issue is complicated by the fact that fish metabolize dioxins very slowly, which means they bio-accumulate up the food chain. In Maine, dioxin legislation was put in place in 1997, requiring that, by 2003, fish downstream would have no more dioxin then fish upstream of mills. Companies agreed to work toward eliminating dioxin discharges. On July 1, 2004, a North American industrial pulp and paper company called Domtar spilled 3.5 million gallons of untreated wastewater from its mill located in Woodland, Maine into the St. Croix River. The spill occurred over a period of approximately 4 hours from 4-8 AM. *"The mill increased the River flow, by opening the dam gates, from approximately 875 cfs to 2500 cfs. The River was monitored down river at the USGS station for DO, specific conductance, and temperature and no significant changes were noted. The licensed discharge to the river was less than half of their allowable levels at this time which probably lessened the potential for any environmental impacts. No fish kills or visual impacts were noted. Public notices were issued per the existing local agreements."* www.**ijc.org**/rel/boards/saint/saint2004ar.pdf accessed March 2011

There is one site in this area that the DEP has listed on their toxic site cleanup list, the Marine Trades center located in Eastport. This sight is located in Deep Cove which is on the boundary of the ET and EU growing areas. The Marine Trades Center had an issue with one 2-dichloroethane leaking from a tank and contaminating drinking water and soil. The contaminated soil was removed in 2001, shipped to Quebec and an activated charcoal filter put in place for the effected wells. The Maine DEP feels the site was remediated. The adjacent growing area ET maintains a current closure in Deep Cove the cove closest to the marine Trades Center.

Other NPDES(National Pollution Discharge Elimination System) permitted facilities in the growing area are aquaculture sites. The aquaculture sites have recently been bought by the Cook Aquaculture Company, but current licenses remain under the old ownership names. Permits for the aquaculture operations are for fish foods, antibiotics or fish waste. Each pen area is required to have non-discharging septic collection systems for crew waste. The waste is barged ashore and disposed by a licensed septic disposal company. Fish pens are not considered a pollution source requiring a closure at each site.

Airports

Eastport Municipal Airport is located near Shackford Head, Eastport. The airport provides services for commercial connector airlines, general air and air shipping companies. Aircraft maintenance and servicing is available. The airport is a Class III facility and must comply under the FAA Part 139, Class III airport operational and safety requirements. These include a recordkeeping system and new personnel training (per §139.303), safety areas (per §139.309), snow and ice control plan (per §139.313), aircraft rescue and fire fighting response, HAZMAT handling/storage (per §139.321), airport emergency plan, self-inspections (per §139.327), wildlife hazard management (per §139.337) and airport condition reporting (per §139.339). Lubec Municipal Airport, a small grass landing strip, runs parallel to Route 189 west of the village. Less then five planes regularly use the landing field.

Marinas and Mooring Fields

Under the NSSP, any shellfish growing area within the confines of a marina proper or mooring field is presumed to be contaminated for some period of time. Therefore, no growing area within the marina proper can be classified approved. The classifications available for marina areas are conditionally approved, conditionally restricted and prohibited. The microbiological and chemical contamination associated with marinas and marina facilities may result in the contamination of shellfish and sediments in the adjacent areas. The NSSP has developed a set of evaluation criteria to be used in determining if the shellfish growing areas adjacent to marinas and mooring fields are affected by contamination associated with sewage.

The NSSP defines 'marinas' as an area that has 10 or more boats with heads. Each mooring field and marina in the growing area must be evaluated. Marina performance standards must be assessed annually utilizing the DMR developed evaluation form and a review of existing performance standards for those marinas that are in conditionally approved and conditionally restricted areas. The sanitary survey and triennial reviews require a marina inspection. A marina or mooring field that is in a conditional area must be inspected (and documented) prior to the area closing and opening to assure that the conditions of the management plan are met. Marina closure zone calculations are completed using the information from the inspection to input into a DMR model which was developed using the NSSP volumetric calculations.

The marina community in Maine only operates for a portion of the year due to adverse winter weather conditions. The management of marinas in Maine allows for shellfish growing areas to be available to harvesters for at least a portion of the year for direct market harvest by utilizing conditional area management plans.

Small mooring fields are scattered throughout the growing area with the largest number (groups of 10 or more moorings) of boats in Eastport in Deep Cove, Shackford Head and the waterfront along town. These boats are almost exclusively work boats (lobster boats, trawling vessels). The other mooring areas are in Gleasons Cove, Perry with three to four work boats and off the town ramp in Robbinston. Individual boats are on moorings scattered randomly within the growing area. Cobscook Bay is not a common stopping area for recreational boaters because of its remote location. There are small boat launching facilities in Calais, Robbinston, Perry and Eastport. These facilities are primarily used as launching sites for shellfish harvesters, duck hunters, skiffs for larger boats and recreation fishermen. No areas in EU are closed exclusively because of boats or marinas**.** Recreational boating is at a bare minimum in this apart of Maine and no large marinas exist where there are 10 or more live-aboard boats with heads.

Stormwater

Stormwater runoff is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated (US EPA 2009). Thus, stormwater pollution is

caused by the daily activities of people within the watershed. Currently, polluted stormwater is the largest source of water quality problems in the United States.

The primary method to control stormwater discharges is the use of best management practices (BMPs). In addition, most major stormwater discharges are considered point sources and require coverage under an NPDES permit. In 1990, under authority of the Clean Water Act, the U.S. EPA promulgated Phase I of its stormwater management program, requiring permitting through the National Pollution Discharge Elimination System (NPDES). The Phase I program covered three categories of discharges: (1) “medium” and “large” Municipal Separate Storm Sewer Systems (MS4s) generally serving populations over 100,000, (2) construction activity disturbing 5 acres of land or greater, and (3) ten categories of industrial activity. In 1999, US EPA issued Phase II of the stormwater management program, expanding the Phase I program to include all urbanized areas and smaller construction sites.

Although it is a federal program, in the state of Maine, the Phase II Stormwater permit is issued and regulated by the Maine DEP (Chapter 500 and 502). Under the MS4 regulations, each municipality must implement the following six Minimum Control Measures: (1) Public education and outreach, (2) Public participation, (3) Illicit discharge detection and elimination, (4) Construction site storm water runoff control, (5) Post-construction stormwater management, and (6) Pollution prevention/good housekeeping. The permit required each city or town to develop a draft Stormwater Management Plan by September 3, 2003 that will establish measurable goals for each of the Minimum Control Measures. The Town must document the implementation of the Plan, and provide annual reports to the Maine DEP. Currently the discharge of stormwater from 28 Maine municipalities is regulated under the Phase II permit requirements, however, no municipalities located within the boundaries of growing area EU fall under these regulations. Additionally, the Maine Stormwater Management Law provides stormwater standards for projects located in organized areas that include one acre or more of disturbed area (Maine DEP 2009).

Non-Point Pollution Sources *(streams, etc)*

Many of the bays have freshwater streams draining into them. Larger streams that flowing into the estuary or near potential pollution sources are sampled during routine random sampling or stream sampling. Table 4 lists all the streams in the area that have been sampled over the last 12 years. Streams with a minimum of 5 samples along with their average flows, average fecal scores and required dilution zones based on mid tide depth in the area are shown in Table 5 below. Those streams with less than 5 samples do not have enough data to make any analysis. Streams with required dilution zones of greater than one acre are shaded gray in Table 5. Figures 9 and 10 below show the location of these streams in the growing area. Additional sampling and surveying of these streams is necessary. Streams are considered to be actual or potential, direct pollution sources impacting the growing area.

Table 4 Area EU Stream List

Stream ID	Description	Nearby water quality station
EU00001.89	Intermittent Stream draining to broad cove from airport	2.5
EU00001.90	Intermittent Stream draining from airport	2.5
EU00001.91	stream crossing deep cove road drains to broad cove	2.5
EU00040.50	Stream closest to Harris Point, Eastport	7,8
EU00047.10	Stream at Seaview Campground	7,8
EU00122.50	Boyden Stream, where it first crosses under S. Meadow Rd, some beaver activity	15
EU00125.80	Little River, just NW of the New Friendly Restaurant	15
EU00146.50	Frost Cove stream	17
EU00172.80	Second stream draining to Loring Cove, stream south of other stream EU0173.50	18,18.5
EU00173.50	Loring Cove Stream, just S of sampling station # 18,	18,18.5
EU00219.30	Pottle Brook, sample can be taken from E side of Rt. 1 just opp. Todd Lerke's (219) house, go down over banking to stream.	20
EU00229.00	Steady stream S, Western Brook, feeds into head of Mill Cove, water sampling station EU22	22
EU00229.10	Steady stream, Eastern Brook, feeds into Western Brook, then both flows into had of Mill Cove, water sampling station EU22	22
EU00231.00	"13" ss yellow house, brown shutters, IG replaced 1999 by SCGP; IG on water side of lawn, 1500 gal tank; seasonally occupied NPF found during 2010 survey	22
EU00231.35	culvert S and downhill from Stanhopes (231.40), water flows across Rt. 1, past Stanhopes, downhill to Geagan's lawn	22
EU00237.50	Intermittent Stream flowing between properties 237.3 and 238, Mill Pt, A-1 MPN 23 as examined on 10/20/98, 50 GPM on 10/19/98	22
EU00240.50	Intermittent stream S flows to the S of Mollholand (241), pull off Rt 1 just S of 241, runs under road to the E, take sample here,50 GPM	22
EU00244.10	Steady stream flows to the N of Dwelly's (244) red log home close to Rt 1, to get sample, park at 244 walk N to SS,	23
EU00248.50	Steady stream flows through wetland behind Chambers (248) and onto beach S of abandoned Sardine Factory (249), take right turn down drive just S of Robbinston General Store all the way to the beach, 100 GPM	23
EU00256.50	turn right down drive just N of Clark (256) residence and take sample to left, just before state picnic area, Clark have new IG, 100 GPM	25
EU00257.20	Steady stream flows N of Robbinston Picnic Area/Town Boat Ramp, pull to the right just after picnic area, stream flows through culvert under road, take sample here, 200 GPM	25
EU00268.50	Steady stream flowing N of, take drive to camp, walk N of camp to stream for sample, not sure of 268 system, 200 GPM	25
EU00270.30	steady stream runs from the N onto (270) fills a small pond and drains into Brooks Cove, have to walk down over fields to get to sample	26
EU00275.50	steady stream flows to the S of (275) home, through his Animal Farm, under Rt. 1 E towards Lamb Cove, take sample E side of road opposite 275 and S of (276) yellow ranch, near EU/27, 500 GPM	26

Stream ID	Description	Nearby water quality station
EU00285.20	stream flows E into cove N of McCurdy Pt, turn down drive to Curriers (285) white seasonal camp, walk N of 285 to Intermittent stream	na
EU00288.50	steady stream runs just S of (289) than flows into Lowe Cove, to take sample walk S. down banking from 289,	na
EU00302.50	steady stream flows to the S of (294) past leach field continuing E into cove at Bunker Point, drive past 294 to cove, take sample, 150 GPM	na
EU00318.50	steady stream flowing into Red Beach Cove at the historical site, drains Flowed Land Ponds, drive into St. Croix historical site walk S to stream, 1000	na

Table 5 Stream Impact Zone Area EU

Stream ID	Sample Count	Average Flow Rate GPM	Flow GPD	Avg. fecal Score	Dilution in Acres Needed	Current Closure # And size acres
EU00122.50	12	1,515.50	2,182,320.00	71	6.75	59 part E
EU00146.50	16	147.07	211,790.76	260	2.455	62 A5
EU00172.80	8	85.50	123,120.00	4.65	0.0255	
EU00173.50	18	198.92	286,457.14	232	2.915	62 A4
EU00219.30	23	595.09	856,930.90	277	10.5	62 part B
EU00229.00	25	324.80	467,712.00	9.86	0.20	
EU00229.10	16	141.00	203,040.00	28	0.25	
EU00231.50	5	112.50	162,000.00	76	0.54	
EU00257.20	8	129.50	186,480.00	40	0.33	
EU00275.50	10	1,475.00	2,124,000.00	47	4.42	62 A1
EU00288.50	8	1,553.33	2,236,800.00	29	2.81	62 A1
EU00318.50	10	1,148.75	1,654,200.00	12	0.84	

Figure 9 Area EU streams map

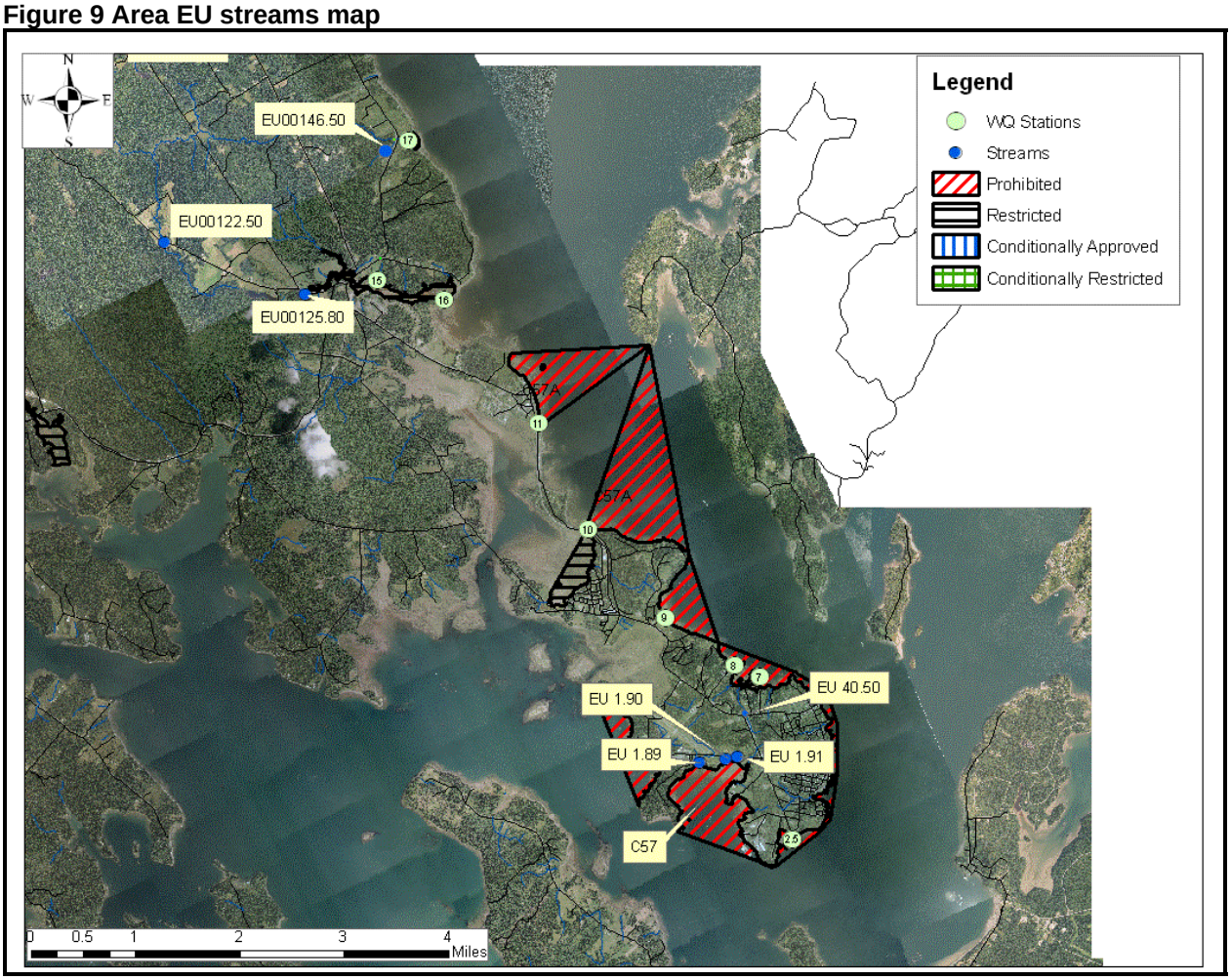
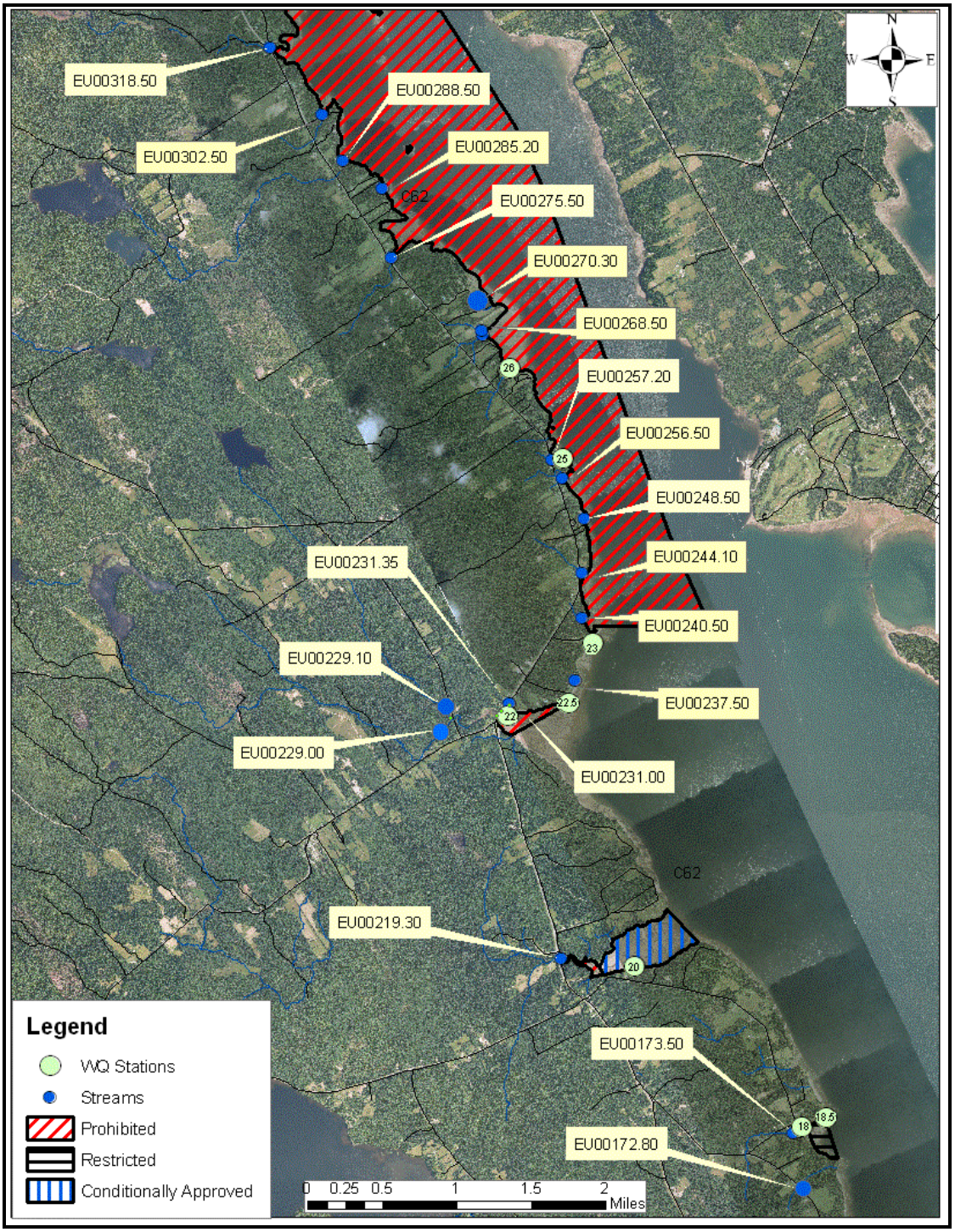


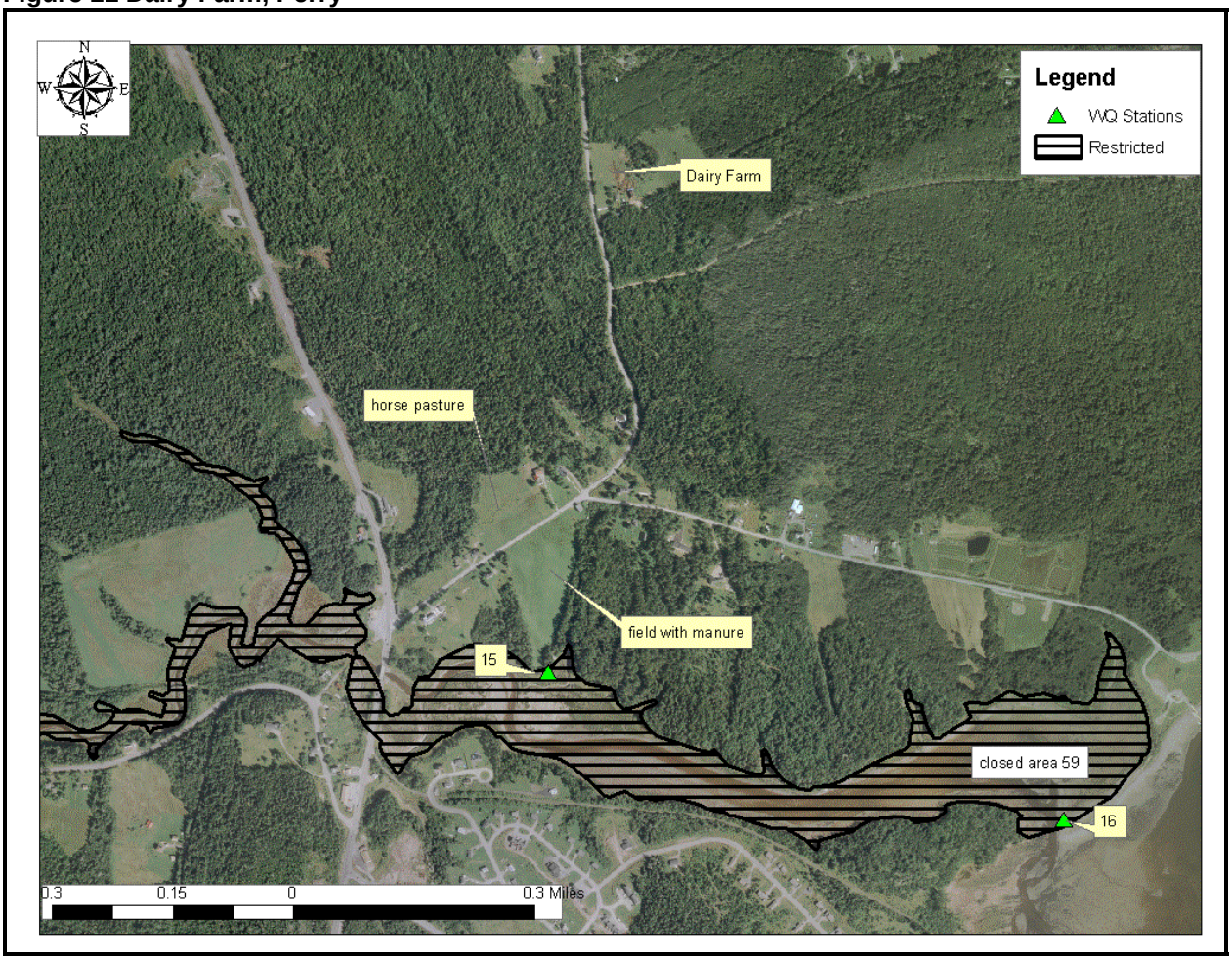
Figure 10 Area EU Stream Map



Agricultural Activities

There are no identified slaughter houses, large scale manure spreading operations or garden centers in the area. Only one small agricultural farm that raises dairy cows located in the town of Perry is located in this growing area. This operation is more than 0.5 miles from the shore with no direct access for runoff or animals to reach the shore. The farm does spread manure on a field that borders the Little River near station EU 15 and may be impacting this station during periods of heavy rain and runoff. See figure 9 below. The manure is spread in the fall and this portion of the Little River is currently in closed Area 59. A new horse pasture on the Shore Rd across from the field used to access EU 15 was seen to have two horses. This pasture is located > 1000' from the shores of the Little River and has no direct discharge to the shore.

Figure 11 Dairy Farm, Perry



Domestic Animals and Wildlife Activity

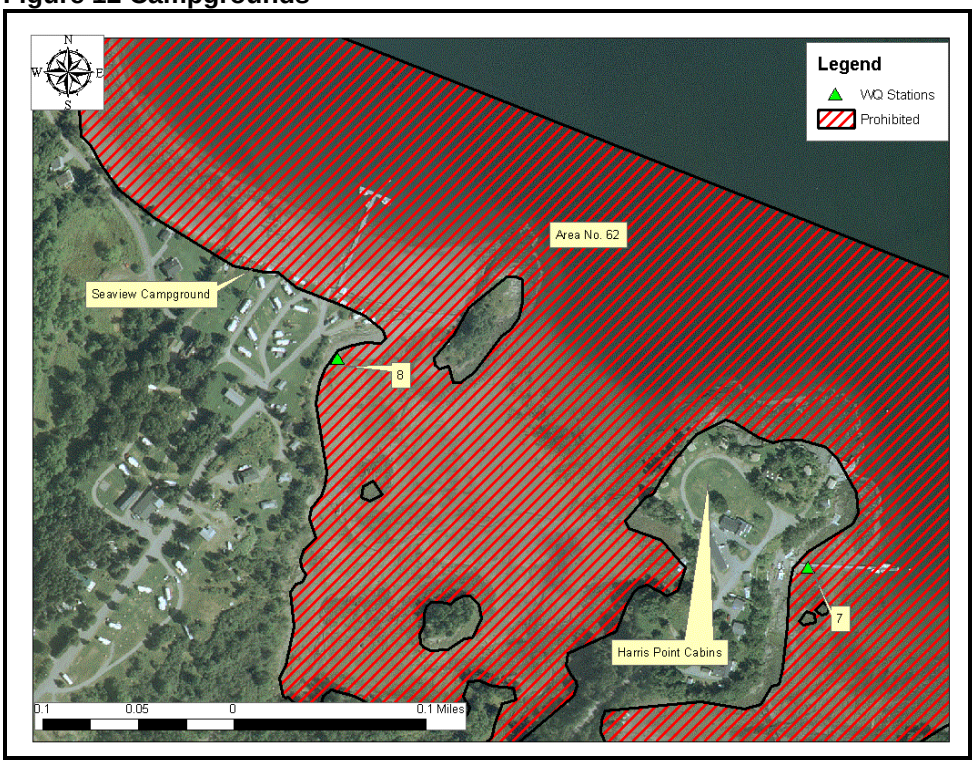
The salt marshes and mudflats of the growing area do provide valuable habitat to a variety of wildlife. Mammals living within the growing area include dogs, cats, whitetail deer, muskrat, squirrels, chipmunks, rabbits, moles, mice, bats, shrews, weasels, skunks and raccoons. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, egrets, swans, and others. Maine Inland Fish and Wildlife surveys indicate that migratory waterfowl numbers begin to increase in the early summer months, and typically peak in late fall or early winter. Staging shorebirds need feeding areas with high concentrations of inter-tidal invertebrates. Although large numbers of birds can, pose a threat the growing area water quality, such occurrences are very difficult to document. No such significant water quality impacts have been documented from wildlife to date in growing area EU.

Conservation/Recreation Areas (beaches, trails, etc.)

The concern for actual or potential pollution from recreational areas is they aren't a pollution source by themselves but activities at the recreational areas may contribute to water quality problems by placing added pressure on the watershed. For instance, they may contribute to erosion (trails, building footbridges, etc.), dog waste not picked up may accumulate and wash off after rainfall, new trails may be put into areas that didn't have human activity before and they may put added pressure on wildlife to congregate in other places where we may see water quality decline, etc. The mere presence of humans/dogs doesn't necessarily mean there is an actual pollution source, but it is a potential pollution source.

There are several day use beaches and picnic areas including St. Croix Island National Park, Robbinston Boat landing, Devils Head recreational area, and Shackford Head State Park. There are two commercial campgrounds located in Eastport, Seaview Campground and RV Park located along the St. Croix near Johnson Cove and Harris Point Cabins located on Harris Point. Figure10. Neither facility had any identifiable risk to the receiving waters with Harris Point Cabins having septic systems and holding tanks for the RV's. Seaview Campground has nine pump stations w/ 1000 gal tanks that pump into two leach fields, two tanks; the recreation hall has individual IG w/ 1500 gal tank w/ grease trap, all tanks are on a rotating schedule so that they are pumped every three years. Harris Point Cabins; Motel has 2000 gal tank, eight cabins share 2000 gal tank, RV trailers 1500 gal tank, all other cabins/house 1500 gal tank, all tanks pump to large leach field, tanks are usually pumped every one to two years.

Figure 12 Campgrounds



Marine Biotoxins

The Marine Biotoxin Monitoring Program is administered by the Maine Marine Resource's Public Health Division. It uses the standards outlined in the National Shellfish Sanitation Program (NSSP) to monitor levels of PSP ("Red Tide") and other marine Biotoxin in the shellfish of the State of Maine. When toxin is found at levels near or above where human illness may occur, closures to the harvest of shellfish areas are implemented. Maine has historically had high levels of Paralytic Shellfish Poison (PSP), more commonly known as "Red Tide" during the warmer periods of the year. Shellfish samples are collected statewide between March and October and evaluated at the two PSP laboratories (Boothbay Harbor, in the western portion of the state and Lamoine, in the eastern portion). Data is then transmitted to the director of the Biotoxin program at the Boothbay Facility for interpretation and appropriate closures are made when necessary. This area is frequently included in larger near shore Biotoxin closures in eastern Maine during summer months.

Land Based Chemicals

Information from the Pesticides Board of Maine in Augusta:

"*Inland blueberry fields close to the marine environment use several chemicals that may have some effect temporarily on fish or shellfish. Guthion is sprayed on blueberry fields in July and August to control the fruit fly larva. The half-life is variable around 21 days in aerobic soils and about 62 days in anaerobic soils. The soils in our area are generally considered to be aerobic. Guthion is short lived in water, however heavy rain after application causes high runoff of the chemical. Guthion is not very persistent in the environment. The chemical is degraded to many other compounds by microorganisms found in soil and water, by sunlight and by reacting with water. Guthion does not evaporate very quickly from soil and water. It attaches strongly to soil surfaces and does not easily move into groundwater below the soil surface. Valpar (Hexazinone) is a chemical used for the control of weeds and grasses. Hexazinone has a half-life of one month in blueberry soils. Breakdown varies depending on temperature and moisture with the main reason for degradation by soil microorganisms. Other factors affecting half-life include soil leaching, uptake by plants and breakdown by sunlight. Hexazinone has a low acute toxicity. It has an acute oral LD50 for mice (dose to kill 50 percent of test animals) of 1,690 mg/kg (or 0.026 oz/lb of body weight). Aspirin has the same toxicity level. Hexazinone is a class D compound - not classifiable as to human carcinogenicity. Hexazinone has been detected at low levels, in the parts per billion (ppb), range in ground-water in Maine that is under or near to blueberry fields that have been treated with Velpar. All detections were well below the maximum exposure guides of 210 ppb set by the Maine Department of Health and Human Services. The EPA "believes that water containing Hexazinone at or below the Health Advisory Level of 400 ppb is acceptable for drinking over the course of one's life, and does not pose any health risk. Round-Up is used for weeds resistant to Valpar. Published data and use regulations support minimize health risk from the use of these pest sprays. This information supports a minimal health risk for consumers of shellfish from chemicals used on blueberry fields outside of the immediate "footprint" of the field."*

Aquaculture/Wet Storage Activity
Please refer to Figure 11.

COBJK: This is a pen culture lease for; salmon Atlantic (*Salmo salar*) - trout rainbow / steelhead (*Oncorhynchus mykiss*) - halibut Atlantic (*Hippoglossus hippoglossus*) - cod Atlantic (*Gadus morhua*). The lease is 22 acres and is located in Johnson Cove, Eastport. Station EU 9 is located in the immediate area and has a P90 of 13.6
http://www.maine.gov/dmr/aquaculture/leaseinventory/documents/cobjk.pdf

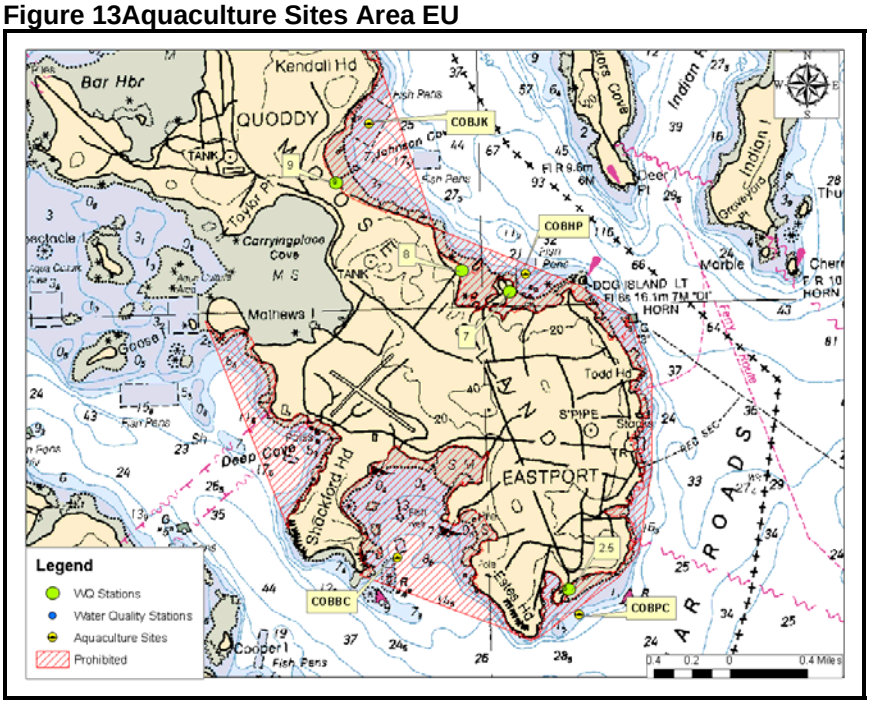
COBHP: This is a pen culture site for; salmon Atlantic (*Salmo salar*) - trout rainbow / steelhead (*Oncorhynchus mykiss*) - cod Atlantic (*Gadus morhua*) - halibut Atlantic (*Hippoglossus hippoglossus*) - haddock (*Melanogrammus aeglefinus*). The lease site is 10 acres and is located in Harris Cove, Eastport. Stations EU 7 and 8 are located nearby and have P90's of 10.3 and 3.9 respectively.
http://www.maine.gov/dmr/aquaculture/leaseinventory/documents/COBHP.pdf

COBPC: This is a pen culture site for; salmon Atlantic (*Salmo salar*) - trout rainbow / steelhead (*Oncorhynchus mykiss*) - halibut Atlantic (*Hippoglossus hippoglossus*). The lease site is 26.5 acres and is located in Prince Cove, Eastport. Stations EU 2 and 2.5 are located nearby and have P90's of 10.1 and 25.8 respectively.

http://www.maine.gov/dmr/aquaculture/leaseinventory/documents/COBPC.pdf

COBBC: This is a pen culture site for; salmon Atlantic (*Salmo salar*) - trout rainbow / steelhead (*Oncorhynchus mykiss*) - nori/laver (*Porphyra*) dulse (*Palmaria palmata*). The lease site is 45 acres and is located in Broad Cove, Eastport. Station EU 1 is located near the site and has a P90 of 16.4.
http://www.maine.gov/dmr/aquaculture/leaseinventory/documents/cobbc.pdf

Figure 13Aquaculture Sites Area EU



Hydrographic and Meteorological Assessment

Tides

Coastal Maine experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. National Oceanic and Atmospheric Administration data for a station at Eastport, Maine indicate a mean tidal range of 18.35 ft, a spring tidal range of 21.18 ft, and a mean tide level of 9.60 ft above mean lower low water. Currents in the area are predominantly driven by the tides. All along the coast of eastern Maine, the tide generally floods to the north and east and ebbs to the south and west. Weather conditions affect tidal ranges and current speeds, sometimes very strongly. Strong winds may reverse the direction of currents.

To examine the effects that tidal stage might have on fecal coliform concentrations, data collected under the Systematic Random Sampling strategy (all months, all samples) were queried for all active sample sites (2000-2010) . P90's were then run for the Ebb Tide stage and

the Flood Tide stage and compared to the P90 for all tides. The P90 comparison can be seen in Table 6 below. For the purpose of this analysis Flood tide includes the following tide stages; High Flood, Flood, High and Low Flood and Ebb tide includes; Low, Low Ebb, Ebb, and High Ebb.

Table 6 Tide Stage P90 2000-2010

Station	Class	Count all	Count ebb	Count Flood	P90 all tides	P90Ebb	P90 Flood
EU002.50	P	72	32	40	36.6	38.2	36.3
EU007.00	P	74	21	53	11.2	17.8	9.2
EU008.00	P	72	19	53	7.8	13.5	6.2
EU009.00	P	73	20	53	10.8	17.2	8.9
EU010.00	P	75	23	52	14.6	21.2	12.4
EU011.00	P	75	23	52	5.7	5.5	5.8
EU015.00	R	73	27	46	66.7	124.2	43.3
EU016.00	A	75	32	43	10.7	18.2	6.3
EU017.00	R	73	29	44	26.2	43.5	18
EU018.00	R	79	35	44	65	72.7	60.6
EU018.50	A	37	18	19	19.7	36.4	9.9
EU020.00	CA	83	42	41	21.5	39.2	9.5
EU022.00	P	78	39	39	33.4	61.8	15.3
EU022.50	A	33	18	15	9.1	13.1	5.5
EU023.00	A	75	35	40	8.5	15	3.8
EU025.00	P	75	28	47	17.7	10.2	23.4
EU026.00	P	59	20	39	17.2	20.4	16.1

All stations that showed an increase in P90 of 10% or more for a particular tide stage versus the P90 for all tide stages are highlighted in yellow. Those stations that showed a decrease of 10% or more are highlighted in blue. The data in this table indicates that the growing area shows a marked increase in P90 during the Ebb tide stage and a decrease in P90 for most stations during the Flood tide stage. This data is not unexpected as the ebbing tide stage tends to bring the fresher river water down into the growing area and the flood tide brings in the open ocean water. One stations 25 showed an increase on the flood tide and this is most likely due to pollution from other areas being brought into this station on the flooding tide. Station 15 showed the largest increase of all the stations on the ebb tide stage and is not surprising as this station is located along the Little River and drains an extensive upland with farms and wildlife.

Rainfall

The mean annual precipitation in growing area EU is approximately 40 inches. The precipitation is not evenly distributed throughout the year. The wettest months are February-June and September-November. August is typically the driest month. Much of the precipitation in the winter comes as snow and may affect runoff rates when melting in spring. It is likely that after prolonged periods of dry weather, significant rainfall (>1" over 24 hours) will cause some pollution from non-point runoff. It is unclear how much of an effect major rainfall events have on water quality due to variability of ground water saturation, history of recent significant rainfall

that may have washed non-point pollution sources away, hard ground, ledge, wildlife or agriculture activities. Rainfall is monitored locally at Machias and Eastport. Rain stations in the eastern part of Maine area are few and much of the rain data is found on weather web sites.

Significant increases in the total yearly amounts of rain have taken place since 2005, most noticeable in 2005 and 2008. Much of this increased rain has taken place in the February-June and September-November periods with an exceptionally wet June in 2006. This increase in rainfall has occurred after several dry years (2000 to 2004) that historically diminished runoff impact on the growing areas.

To evaluate the impact of rainfall on the growing area, data from 2000-2010 where there was a rainfall event within 72 hours of the sample collection were analyzed. The rainfall was then broken up into those events where the 72 hour total was between.1 and 1inch greater than 1inch was not used in the analysis because there are not enough data points for this adversity. P90 values were then calculated and compared to those P90 values from periods with no rain. This can be seen in Table 7 below.

Table 7 Rain P90 2000-2010

Station	Class	Count	.1-1"P90	Count	dry P90
EU002.50	P	35	20.3	29	51.8
EU007.00	P	38	12.7	28	9.5
EU008.00	P	36	7.1	28	5.7
EU009.00	P	36	9.5	28	9.5
EU010.00	P	38	11.3	29	20.4
EU011.00	P	38	5.5	29	5
EU015.00	R	39	63.4	26	17.7
EU016.00	A	37	9.1	29	5.1
EU017.00	R	37	30.5	27	10.9
EU018.00	R	42	53.2	28	24.7
EU018.50	A	20	7.7	12	6.4
EU020.00	CA	46	12.7	27	17.7
EU022.00	P	46	24.6	26	12.3
EU022.50	A	15	7.1	12	7.7
EU023.00	A	40	4	27	12.6
EU025.00	P	39	10.8	28	19
EU026.00	P	28	21.1	25	8.9

Two stations, EU 15 and 18 are impacted by rainfall events of up to 1inch and both of these stations are located near the mouths of brooks. When the data was looked at for only the dry period, all stations except EU 2.5 showed P90 values that were below the standard for approved harvest. There was no clear explanation why this would be the case so the individual tabulated data for station 2.5 were looked at to help determine why this may be the case (Table 8).

Table 8 EU 2.5 Dry Period Tabulated data 2000-2010

Station	Date	Strategy	Tide	Sal	Score
EU002.50	21-Mar-00	R	HE	32	3.6
EU002.50	25-Jul-00	R	F	32	23
EU002.50	01-Aug-00	R	HF	32	240
EU002.50	12-Sep-00	R	HF	33	460
EU002.50	24-Apr-01	R	HF	30	9.1
EU002.50	22-May-01	R	HF	30	9.1
EU002.50	24-Jul-01	R	HE	30	2.9
EU002.50	18-Sep-01	R	H	32	3.6
EU002.50	22-Oct-01	R	H	32	23
EU002.50	23-Apr-02	R	E	30	2.9
EU002.50	23-Jul-02	R	HE	31	3.6
EU002.50	10-Sep-02	R	H	32	3.6
EU002.50	20-May-03	R	HF	29	39
EU002.50	25-Aug-03	R	F	30	5.7
EU002.50	09-Sep-03	R	F	32	9.1
EU002.50	12-Nov-03	R	HE	31	93
EU002.50	10-Oct-06	R	F	31	1.9
EU002.50	27-Feb-07	R	E	31	6
EU002.50	26-Jun-07	R	E	32	1.9
EU002.50	28-Aug-07	R	HE	32	48
EU002.50	08-Apr-08	R	HF	31	1.9
EU002.50	16-Jul-08	R	HF	32	1.9
EU002.50	22-Oct-08	R	E	31	6
EU002.50	16-Mar-09	R	F	30	1.9
EU002.50	17-Aug-09	R	H	31	12
EU002.50	15-Mar-10	R	F	30	1.9
EU002.50	14-Jun-10	R	F	30	1.9
EU002.50	19-Jul-10	R	E	30	2
EU002.50	30-Aug-10	R	LF	32	6

As indicated in Table 7, there were two high scores collected during the late summer and fall of 2000 that cause the P90 values to be elevated. When these scores are removed, the P90 for the dry period data is below the standard for approved harvest as seen in Table 8 below.

Table 9 P90 for EU 2.5 dry data high scores in 2000 excluded

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std
EU002.50	P	27	13	5.7	0.48	93	23.8	39

Based on this data it is my opinion that some type of local pollution problem was evident during the fall of 2000 that was remediated and no longer affecting the dry data. This station is prohibited because it is in the WWTP dilution zone and in a cove that is nearby to the old

Eastport dump where we are not sure what type of contamination may have accumulated in the sediment.

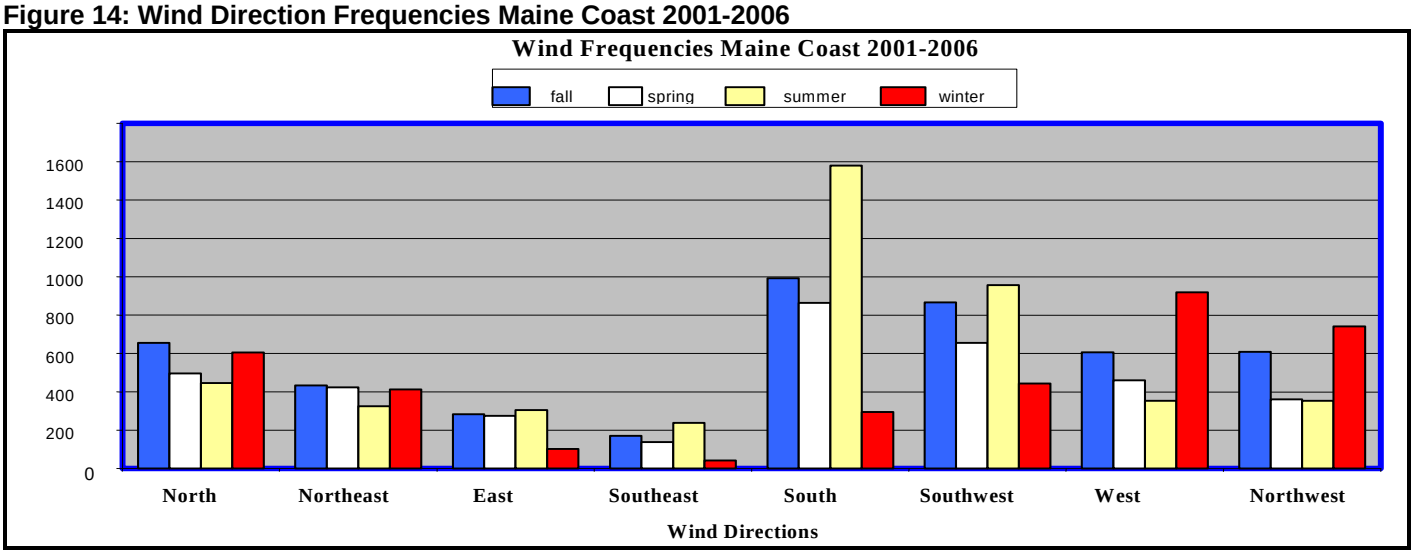
Winds

Analysis of GOMOOS data (2001-2006) show winter winds along coastal Maine are typically from the west-northwest during clear periods and from the northeast during storms. Migratory weather systems cause winds that frequently change in strength and direction.

Gulf of Maine winds are generally westerly, but often take on a northerly component in winter and a southerly one in summer (Figure 12). Strongest winds are generated by lows and cold fronts in fall and winter and by fronts and thunderstorms during spring and summer. Extreme winds are usually associated with a hurricane or severe northeaster and can reach 125 knots. Sustained winds of 100 knots occur about every 50 years on average; gusts are usually about 30 percent higher.

In the open sea, away from the influence of land, winds are stronger and less complex. From December through March, winds are mainly out of the west through north with gales occurring about six to 12 percent of the time. In general, wind speeds increase with distance from the coast. If winds persist for a long time over a long fetch they will generate rough seas. In the Gulf of Maine, winter wind speeds of 15 knots or more persist for more than 12 hours about 70 to 80 percent of the time. However, these winds often shift and a new fetch is established. Summer winds are usually out of the south through southwest, and gales are infrequent. During the spring and fall, winds are more variable.

Figure 14: Wind Direction Frequencies Maine Coast 2001-2006



Coastal winds are complex since they are influenced by the topography. Over land speeds are reduced. However, channels and headlands can redirect the wind and even increase the speed by funneling the wind. In general, winds have southerly components in summer and northerly

ones in winter. In sheltered waters there are a large percentage of calms, particularly during the morning hours. When the existing circulation is weak and there is a difference between land and water temperatures, a land-sea breeze circulation may be set up. As the land heats faster than the water, a sea breeze is established during the day; this onshore flow may reach 15 knots or more. At night, the land cools more rapidly, often in a weak breeze off the land. In many locations, the sea breeze serves to reinforce the prevailing summer wind. Wind data specific to each sampling site has been collected since the spring of 2005. While the database now has three years of data, it is not yet adequate to determine whether wind has an impact on sample scores.

River Discharge

The St. Croix River Basin occupies approximately 1,650 square miles in northeastern Maine. Table 10presents the major tributaries to the St. Croix River along with their respective drainage areas.
(http://www.maine.gov/spo/flood/docs/maineriverbasin/maineriverbasinreport_chap8and9.pdf) accessed May 2011

Table 10 St. Croix River, Tributaries and Contributing Areas

Tributary	Drainage Area(square miles)
Spednick Lake	410
West Grand Lake	230
Big Lake at Peter Dana Point	120
St. Croix River at Grand Falls	70
St. Croix River at Spednick Falls	220
Big Musquash Stream	120
Tomah Stream	150
St. Croix River at Robbinston	330
Total	1650

Water Quality Review

Table 10 lists all active approved, restricted and prohibited stations in Growing Area EU, with their respective Geomean and P90 calculations for 2010. Please refer to Appendix A for a key to interpreting the headers on the columns of Table 10. The approved and restricted standards for each station are also displayed. These standards will fluctuate yearly as a result of the DMR transition from a most probable number (MPN) fecal coliform test method to a membrane filtration (MF) method and are dependent on the number of sample analyzed by MPN verses MF. The total number of data points used in the calculations is displayed in the Count column and includes both MPN and MF values. The number of data points analyzed by MF is displayed in the MFCNT column. This fluctuating standard will cease when all 30 data points have been analyzed by the MF method. A more detailed explanation of this transition can be found in DMR central files.

Station EU 20 was downgraded in its classification and made prohibited in March of 2010. based on the data analysis and results of the 2009 shoreline survey. Station EU 17 highlighted in green, which is currently classified as restricted, now meets the approved standard. As this area is of a low resource priority, and has shown high variability over the last few years it will be left restricted to see if this trend continues. Station 22 now meets the standard for approved harvest but is located near a suspected septic breakout at property EU00231.00. The house has now become a seasonal residence but the septic field has remained unchanged. This area will be left prohibited because we have no control over when the property will be occupied or for how long the property may be occupied. Stations 2 through 11 are currently classified as prohibited even though they meet the approved standard as they are located in the current WWTP dilution zone for the Eastport and Quoddy outfalls. Station 25 was located near an OBD that is no longer used but is still in place. The new system is now a holding tank. Station 26 was an old station that was reactivated in 2008 to help defend a possible opening of Brooks Bluff Cove. With the OBD no longer discharging at station 25 and station 26 now having 26 samples and reaching the 30 sample mark at the end of year 2011, this area should be reviewed for a possible upgrade in classification at the end of sampling year 2011.

Table 11 P90 Most recent 30 Samples

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
EU002.50	P	30	27	4.2	0.63	560	27.3	32	173	5/2/2006
EU007.00	P	30	27	2.5	0.3	24	6.3	32	173	5/16/2006
EU008.00	P	30	27	3	0.39	62	9.5	32	173	5/2/2006
EU009.00	P	30	27	3.6	0.48	102	15.3	32	173	5/16/2006
EU010.00	P	30	27	3.2	0.53	700	15.5	32	173	5/16/2006
EU011.00	P	30	27	2.4	0.23	15	4.9	32	173	5/24/2006
EU015.00	R	30	28	6.2	0.67	1700	46	31	169	5/24/2006
EU016.00	A	30	28	3	0.47	260	12.3	31	169	5/24/2006
EU017.00	R	30	28	3.5	0.52	150	16.7	31	169	5/24/2006
EU018.00	R	30	28	6.1	0.76	1700	58	31	169	6/6/2006
EU018.50	A	30	27	4	0.6	1600	24	32	173	6/6/2006
EU020.00	P	30	30	4.4	0.7	1100	35.4	31	163	7/9/2007
EU022.00	P	30	27	5.4	0.58	500	30.5	32	173	4/5/2006
EU022.50	A	30	28	3	0.33	20	8.1	31	169	6/12/2006
EU023.00	A	30	27	2.8	0.36	39	8.3	32	173	5/16/2006
EU025.00	P	30	27	3	0.37	43	9.1	32	173	5/16/2006
EU026.00	P	23	18	2.9	0.3	43	7.1	34	186	4/13/2005

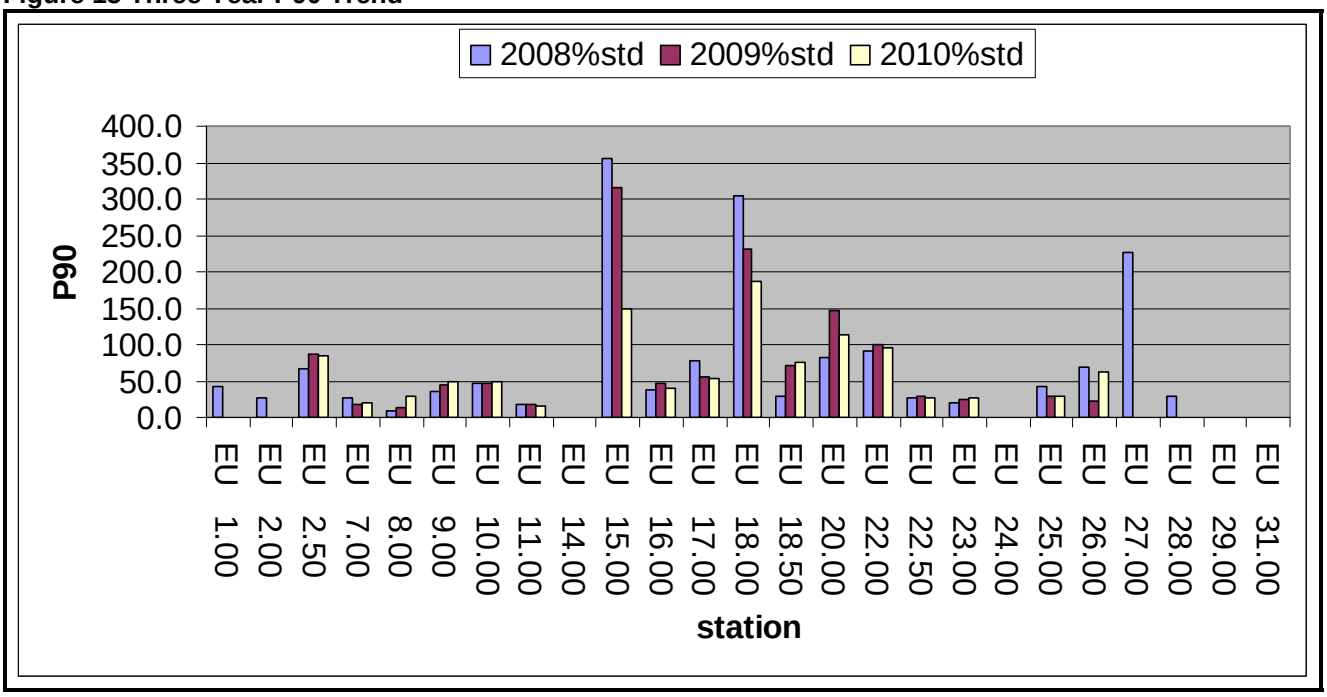
All approved and prohibited stations that were active at the beginning of 2010 were sampled at least six times during the year following the systematic random sampling (SRS) schedule (Table 11 and Appendix E). At some stations, additional samples were collected under adverse conditions.

Table 12 2010 Sample Count

		Adverse		Extra		Random		Total	Comments
Station	Class	Closed	Open	Closed	Open	Closed	Open		
EU002.50	P					6		6	
EU007.00	P					6		6	
EU008.00	P					6		6	
EU009.00	P					6		6	
EU010.00	P					6		6	
EU011.00	P					6		6	
EU015.00	R		1		1		6	8	
EU016.00	A	8					6	14	flood site
EU017.00	R		3		1		6	10	
EU018.00	R		1		1		6	8	
EU018.50	A		3				6	9	
EU020.00	A		1		2			3	Re-class A to P 3/10/10; flood sample site
	P	8		3		5	1	17	
				1				1	
		1						1	
EU022.00	P					6		6	
EU022.50	A	4					6	10	
EU023.00	A						6	6	
EU025.00	P					6		6	
EU026.00	P					6		6	

Figure 13 below shows all stations in area EU with their three year P90 trend expressed as a percentage of the standard for approved classification. Station EU 18.5 showed a marked increase in 2009 and 2010 but is still well below the standard for approved classification and adjacent station EU 18 has trended downward over the same time period. The only stream in the area runs directly past EU 18 and enters the St. Croix River approximately 500' from station 18.5. This leads me to believe that the increased scores at 18.5 are related to the main river and not the nearby upland stream. The reason for this is unknown. No problems either from human or non point runoff issues were identified during the 2010 Shoreline Survey near either station. Station 15 has trended downward the last two years but still exceeds the standard for approved classification. All other stations have remained consistent.

Figure 15 Three Year P90 Trend



Changes in Classification and Recommendation for Future Work

There was one change in classification during the 2010 year and that was the downgrade of Lewis Cove, Perry from approved to prohibited and this occurred on 3/10/10. This downgrade was in response to failing water quality at the end of year 2009 annual evaluation. However based on the 2010 year end data analysis and the results of the shoreline survey this area is being recommended for an upgrade to a seasonal conditional area based on intermittent bacterial pollution. Based on the fact that the OBD located near Brooks Bluff, Robbinston no longer discharges to the St. Croix River and that we will have 30 samples at station EU 26 this area will be analyzed at the end of year 2011 report to see if it will meet the standard for an upgrade to approved classification.

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Appendix A. Key to Water Quality Table Headers

Station = water quality monitoring station

Class = classification assigned to the station; prohibited (P), restricted (R), conditionally restricted (CR), conditionally approved (CA) and approved (A).

Count = the number of samples evaluated for classification, must be a minimum of 30.

MFCNT = the number of samples evaluated with the MTec method (included in the total Count column)

Geo_Mean = means the antilog (base 10) of the arithmetic mean of the sample result logarithm (base 10).

SDV = standard deviation
Max = maximum score of the 30 data points in the count column

P90 = 90th percentile

APPD_STD = the 90th percentile, at or below which the station would meet approved criteria in the absence of pollution sources or poisonous and deleterious substances.

RESTR_STD = the 90th percentile, at or below which the station would meet restricted criteria.