



**GROWING AREA WR**  
**Towns of**  
**South Bristol and Bristol**

**Sanitary Survey Report**

**Report Date: 2012**

**Fran Pierce**

**APPROVAL**

\_\_\_\_\_ Date: \_\_\_\_\_  
Print name signature



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Figure 1. Growing Area WR, Overview Map

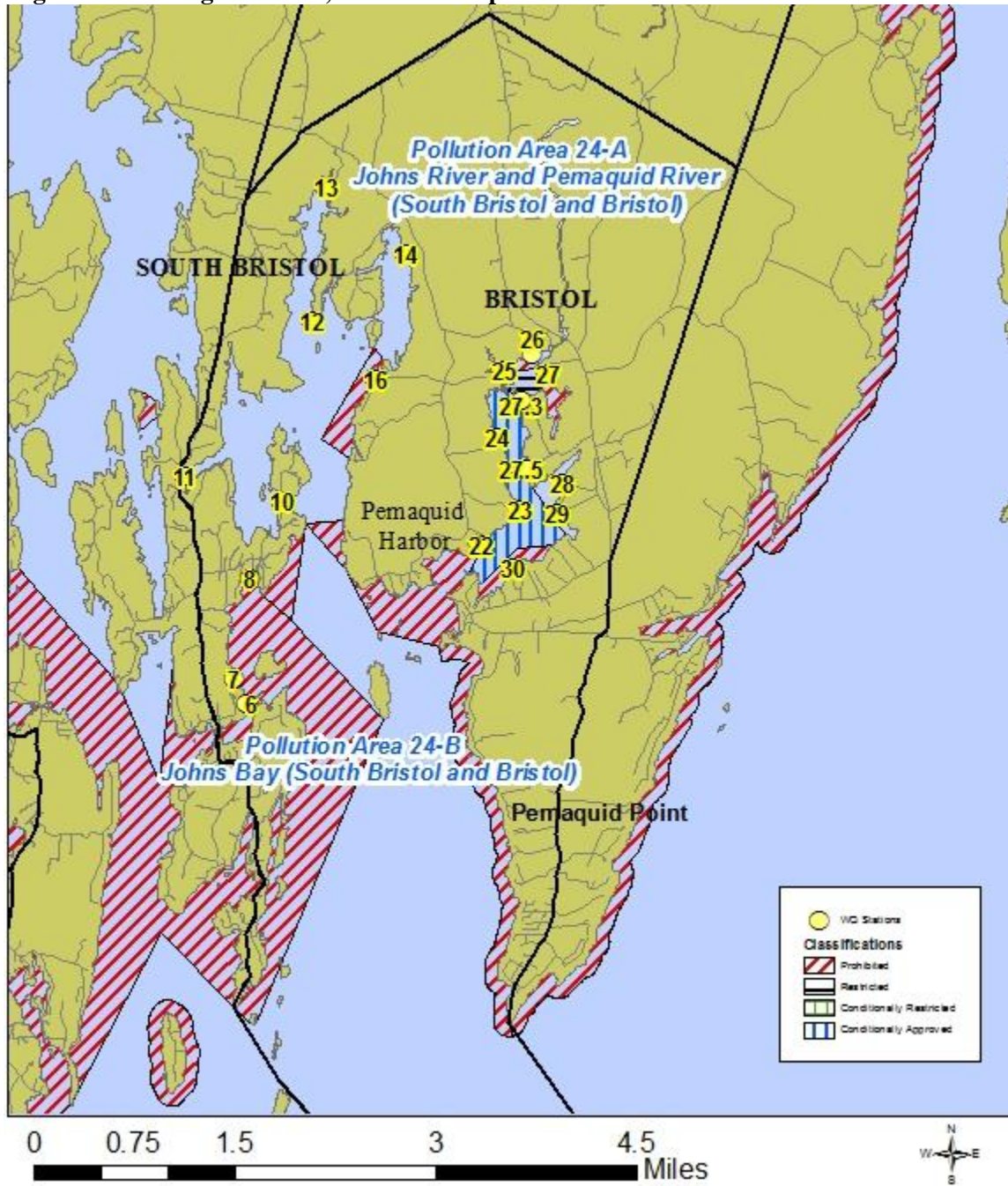




Figure 2. Pollution Area 24-A, Johns River and Pemaquid River

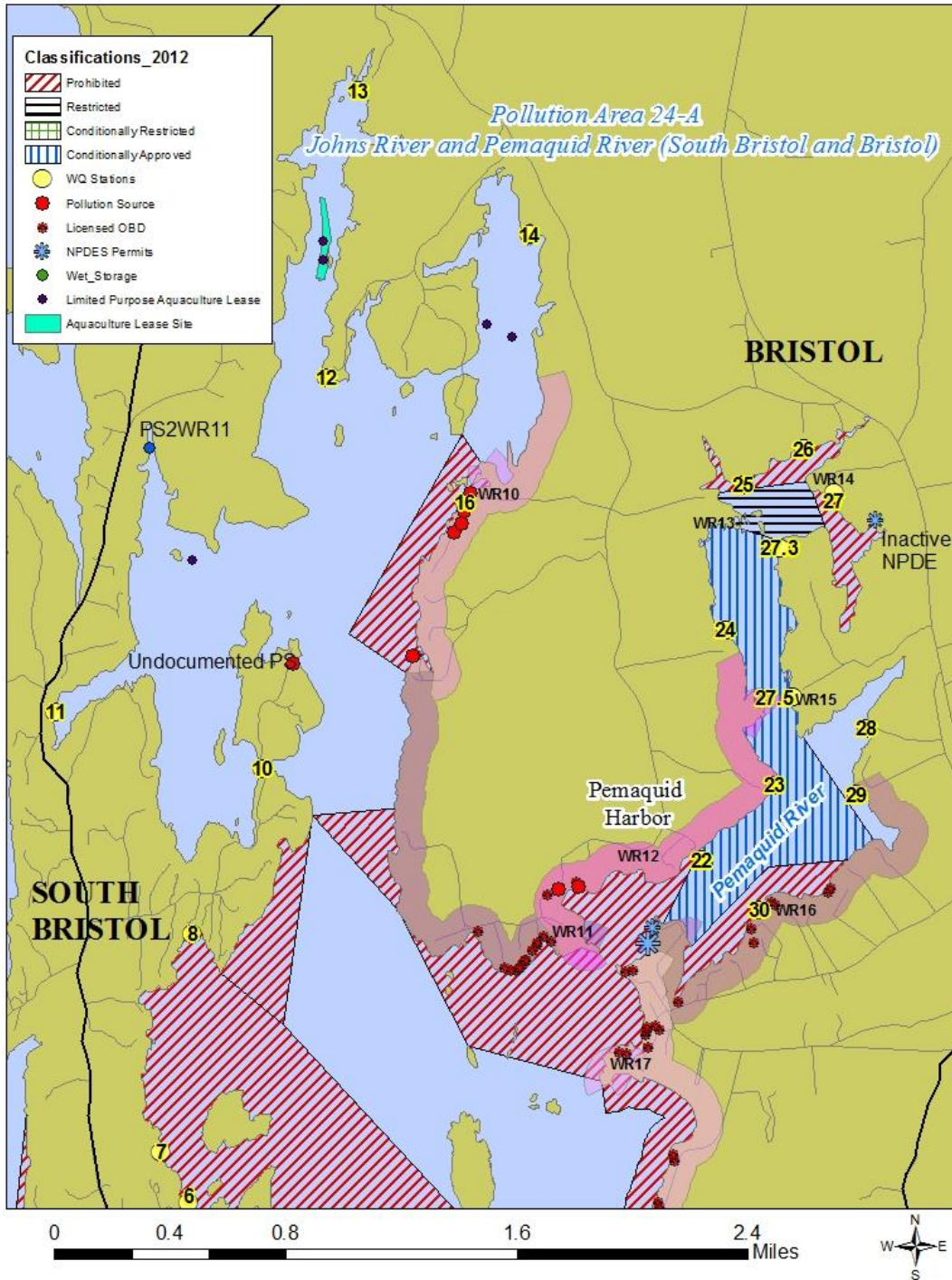
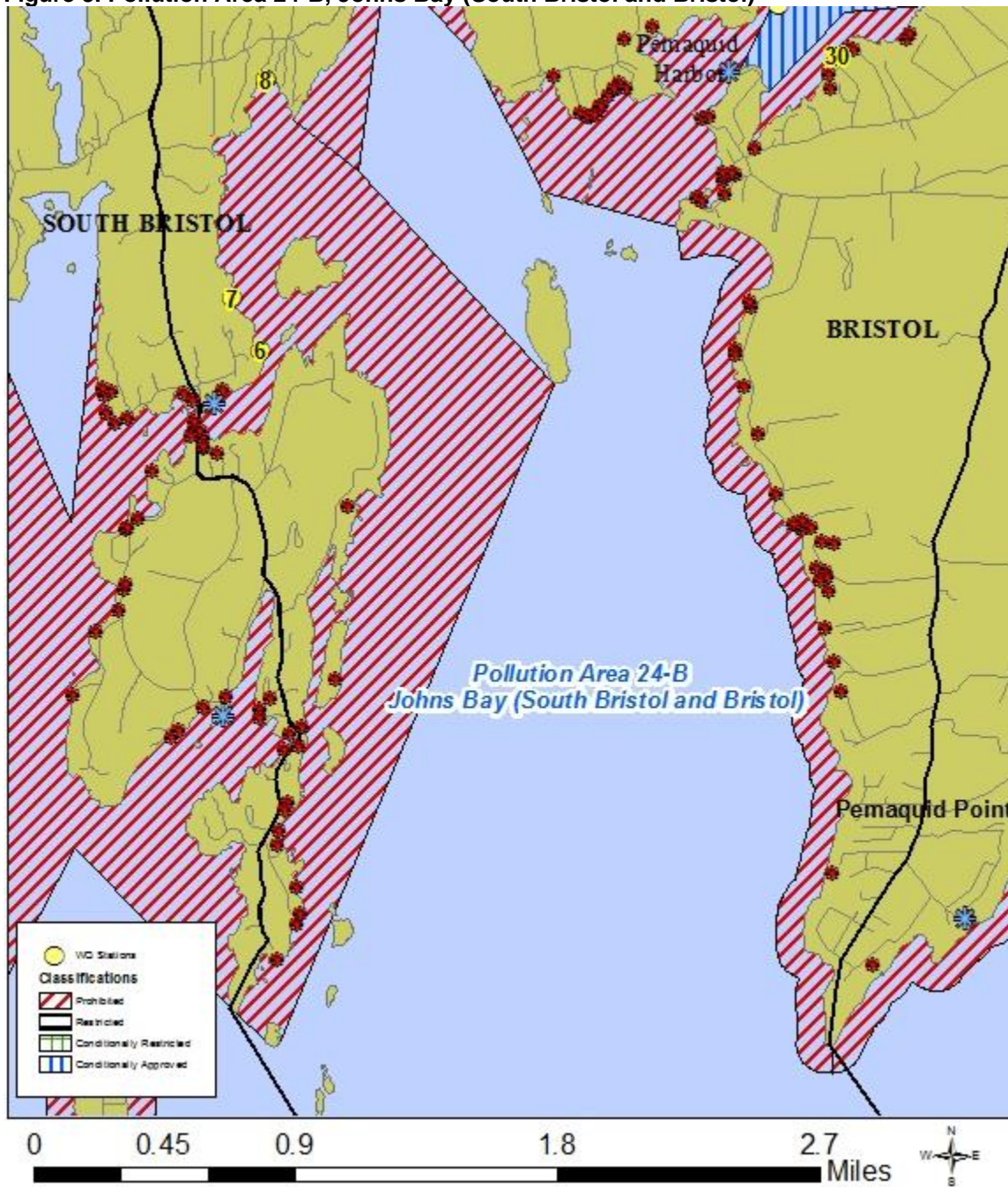






Figure 3. Pollution Area 24-B, Johns Bay (South Bristol and Bristol)





## Executive Summary

This is a sanitary survey report for growing area WR written in compliance with the requirements of the 2009 Model Ordinance and the National Shellfish Sanitation Program. The last twelve year sanitary survey report was completed in 2006. The next triennial report is due in 2015 and the next sanitary survey report is due in 2024. This sanitary survey report reviews shoreline survey information which was compiled during the 2012 survey of the growing area.

During the 2011 review year, Bradstreet Cove, monitored by station WR11, was reclassified from prohibited to approved (March 3, 2011), due to the confirmation of a properly functioning septic system and water quality meeting approved standards. Sampling station WR 23 was reactivated (October 18, 2011) and station WR27.5 was created (November 4, 2011) to better monitor the middle of the Pemaquid River. Stations WR34 and WR35 were deactivated on March 8, 2011 due to lack of resource and the presence of OBDs

## Growing Area Description

Growing area WR is located in mid-coast Maine, and lies between Shipley Point, on Rutherford Island, in South Bristol and Pemaquid Point in the town of Bristol (Figure 1). The area is comprised of Johns River in the towns of South Bristol and Bristol and Pemaquid River which includes Pemaquid Harbor in the town of Bristol. There are no municipal treatment facilities in this growing area. Potential pollution sources in the area include 76 active licensed over board discharge systems (OBDs) and numerous private in-ground septic systems. Five OBDs were removed in 2012 and two OBDs were removed in 2011. There are also several outhouses, chemical toilets or composting toilets at seasonal properties. Marine related businesses and mooring areas for both commercial fishing boats and pleasure boats can be found in Pemaquid Harbor and the South Bristol Gut. There is one seasonal conditional area in effect in Pemaquid Harbor due to the many moorings in this area during the summer months. This seasonal area is open during the period that  $\leq 10$  boats are present on the moorings in the harbor (open period 10/1-4/30). There are also several piers which provide support for local fishing activities in the South Bristol Gut and Pemaquid Harbor. A detailed boundary description for growing area WR can be found in DMR central files.



## History of Growing Area

The following Pollution Area activity occurred in the last six years (2007-2012).

### Activity in 2007:

**January 24, 2007;** (Area No. 25-B); This new rule administratively combines the areas previously described in Closed Areas No. 25-B, 25-C, part of 25-D, 25-F, and 25-G, and places them in one legal notice (25-B); and re-classifies the entire Pemaquid River as "Prohibited".

### Activity in 2008:

**March 27, 2008:** the entire growing area WR was placed under an administrative closure due to an expired shoreline survey.

**April 11, 2008:** several areas in John River that were classified as Approved prior to the March 27 administrative closure were reclassified back to Approved due to an updated shoreline survey. Additionally, the area east of McFarlands Point, South Bristol (east of station WR 10) was reclassified from Prohibited to Approved due to a removal of an OBD.

### Activity in 2009:

**Feb 11, 2009:** Area No. 24-A, Johns River and Pemaquid River (South Bristol and Bristol), amendment creates a prohibited area in Bradstreet Cove (South Bristol) due to a malfunctioning septic system.

**May 29, 2009:** Area No. 24-A, Johns River and Pemaquid River (South Bristol and Bristol)- amendment reduces the size of the closure on the Eastern Branch of the Johns River, due to a replacement of a malfunctioning septic system.

**Activity in 2010:** There were no classification changes in 2010.

Three OBDs in Growing Area WR were removed in 2010

### Activity in 2011:

**March 3, 2011:** Area 24-A Johns River and Pemaquid River (South Bristol and Bristol) (cove at station WR11), was reclassified from Prohibited to Approved, due to the confirmation of a properly functioning septic system and water quality meeting approved standards.

Sampling station WR 23 was reactivated (October 18, 2011) and station WR27.5 was created (November 4, 2011) to better monitor the middle of the Pemaquid River. Stations WR34 and WR35 were deactivated on March 8, 2011 due to lack of resource and the presence of OBDs.

### Activity in 2012:

**February 3, 2012:** Area No. 24-A, Johns River and Pemaquid River (South Bristol and Bristol): a portion



of Pemaquid Harbor was classified as a seasonal conditional area (open season 10/1-4/30) due to increased boating activity during the summer months.

**November 2, 2012:** Area No. 24-A, Johns River and Pemaquid River (South Bristol and Bristol): this notice reclassified a portion of the shore at the end of Homestead Road, Bristol as Prohibited due to a known pollution source in the immediate area.

### **Current Classification(s)**

The following legal notices describe the shellfish classification boundaries in Shellfish Growing Area WS and can be found on the DMR website at:

[http://www.maine.gov/dmr/rm/public\\_health/closures/closedarea.htm#](http://www.maine.gov/dmr/rm/public_health/closures/closedarea.htm#)

Pollution Area 24-A Johns River and Pemaquid River (South Bristol and Bristol)

Pollution Area 24 B South Bristol and Bristol

### **Conditionally Managed Areas**

There is one conditional area located in growing area WR:

Pollution Area No. 24-A: Pemaquid River Seasonal Conditional Area; due to boating activity in Pemaquid Harbor; stations WR 22, 23, 24, 27.3, and 27.5. The open period is from 10/1-4/30. A copy of the management plan for this conditional area can be found in DMR central files; this plan was last updated on 8/20/2012.

A review of this management plan can be found in Appendix A.

### **Pollution Sources Survey**

The following sections include information on pollution sources which may impact water quality in growing area WR. This section includes information on pollution sources, identified during the 2012 shoreline survey conducted by staff from The Department of Marine Resources (DMR) in the towns of Bristol and South Bristol. In 2012 the DMR Public Health Program started using a new method for documenting shoreline surveys and recording pollution sources in the growing area. The shore within the growing area is broken into two mile, 500ft wide segments. Each segment is given a growing area shoreline survey (GASS) identification number. DMR staff takes coordinates of every waste disposal system within 500 feet of the shore. Each pollution source is identified by the GASS identification number that the pollution source was found on. All of the coordinates are downloaded into the new shoreline survey database and staff has the ability to query for just the actual pollution sources that were identified during the survey of the area. All pollution sources are reported to the local plumbing inspector (LPI) responsible for the town the pollution source was identified in. The DMR notifies LPIs of septic malfunctions on a new septic problem report form that plumbing inspectors are expected to sign upon receipt. After the property has been visited by the LPI they send a copy of the form with their findings to The Department of Health and Human Services documenting the course of action toward remediation of the pollution source.





Sources of pollution reviewed in this section may include domestic or industrial waste, discharges from boats, run-off from manure piles in agricultural areas, streams that have consistently elevated scores and anything that could cause impairment of the waters of the growing area. Current pollution sources are listed in table 1 and shown in Figures 2 and 3.

**Domestic Waste (IG Systems and OBDs)**

The majority of buildings in growing area WR have private waste disposal systems, including inground septic systems, holding tanks, licensed overboard discharges, composting or incinerating toilets, and outhouses. Individual septic systems are the principal form of residential wastewater treatment in the towns in WR.

The shoreline survey of shellfish growing area WR took place in the summer and fall of 2012. The survey was conducted by DMR staff members. Properties in areas of high numbers of licensed overboard discharge systems were not inspected because many of these areas consist of bold shore and the DMR is required to have closures in place around all OBDs. These areas will remain classified as Prohibited. During the shoreline survey properties are classified as actual or potential pollution sources based on the findings of the survey. Any property categorized as an actual pollution source, has a known malfunction or pollution source on the property. Any property categorized as a potential pollution source has a pollution source that is considered at risk of malfunctioning in the near future. An impact assessment is made for all of the pollution sources. Impact is assessed as being either direct or indirect. Any pollution source that is categorized as an actual, direct (A/D) pollution source is considered capable of impacting the waters of the growing area. All actual and potential pollution sources that have not been fixed before the next triennial review of the growing area will be re-inspected as part of the triennial review process. All of the actual pollution sources noted on table one are shown in figures 2, and 3. The column labeled GASS ID represents the new growing area shoreline survey (GASS) identification code that shows which two mile segment in the growing area the pollution source is located in. Only the two mile segments that have pollution sources associated with them are shown in figures 2, and 3. Islands in the growing area do not have segment numbers due to their distinct nature. A description of the type of pollution source is shown in Table 1.

**Table 1. Pollution Sources**

Town	DMR SLS ID	GASS_ID	Pollution Area	Major PS	PS Type	Problem	Impact	Description
South Bristol	SLS120920WLM	WR2	24A	OBD	OBD	Y	AD	
South Bristol	SLS120924WET	WR2	24A	Tank	UNK	Y?	AD?	LPI is checking this site - tank on shore
Bristol	SLS121001WFP	WR12	24A	OBD	OBD	Y	AD	
Bristol	SLS121001WFP	WR12	24A	OBD	OBD	Y	AD	
Bristol	SLS121002WFP	WR10	24A	OBD	OBD	Y	AD	
Bristol	SLS121004WFP	WR10	24A	Septic	IG	Y	AI	
Bristol	SLS121004WFP	WR10	24A	Septic	IG	Y	AI	
Bristol	SLS121004WFP	WR10	24A	OBD	OBD	Y	AD	
Bristol	SLS121004WFP	WR10	24A	OBD	OBD	Y	AD	



Town	DMR SLS ID	GASS_ID	Pollution Area	Major PS	PS Type	Problem	Impact	Description
South Bristol Wharf LLC	NPDE ME0023272	WR12	24B	Process waste water	Process waste water	N	PD	Treated Seafood Processing Water
Bristol Restaurant	NPDE MEU507046	WR16	24A	OBD	OBD	Y	AD	

### Licensed Overboard Discharges

There are 85 active licensed overboard discharges (OBDs) in growing area WR, with the majority of these discharges located in Pemaquid River and lower Johns Bay. An overboard discharge (OBD) 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 properties 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. OBDs are licensed and inspected by the Maine Department of Environmental Protection (DEP). 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 the growing area. The size of each closure is determined based on a dilution calculation, using the permitted flow rate of the OBD, and the depth of the receiving water that each OBD discharges to; the fecal concentration used for this dilution calculation is  $1.4 \times 10^5$  fc/100 ml. All closures are of adequate size to protect public health.

Four overboard discharges were removed in 2010 (highlighted in yellow); five OBDs were removed in 2012 (highlighted in blue).

**Table 2. Active Licensed Overboard Discharges with Required Closure Acreage**

DEP_ID	Town	Receiving Water	Depth Receiving Water	Licensed Flow (GPD)	Type*	Required Closure Acres	Acres Closed
4134	BRISTOL	JOHNS BAY	18	315	S	0.5	
3360	BRISTOL	JOHNS BAY	18	300	S	0.5	
7452	BRISTOL	JOHNS BAY	18	300	S	0.5	
5099	BRISTOL	JOHNS BAY	18	300	S	0.5	
7491	BRISTOL	JOHNS BAY	18	300	S	0.5	
6344	BRISTOL	JOHNS BAY	18	300	S	0.5	
6346	BRISTOL	JOHNS BAY	18	300	S	0.5	



DEP_ID	Town	Receiving Water	Depth Receiving Water	Licensed Flow (GPD)	Type*	Required Closure Acres	Acres Closed
6547	BRISTOL	JOHNS BAY	18	300	S	0.5	Entire Shoreline
6340	BRISTOL	JOHNS BAY	18	300	S	0.5	
6958	BRISTOL	JOHNS BAY	18	360	S	0.6	
6790	BRISTOL	JOHNS BAY	18	300	S	0.5	
7310	BRISTOL	JOHNS BAY	18	300	S	0.5	
6747	BRISTOL	JOHNS BAY	18	300	S	0.5	
6130	BRISTOL	JOHNS BAY	18	300	S	0.5	
7275	BRISTOL	JOHNS BAY	18	300	S	0.5	
2458	BRISTOL	JOHNS BAY	18	300	S	0.5	
4118	BRISTOL	JOHNS BAY	18	315	S	0.5	
3670	BRISTOL	JOHNS BAY	18	300	S	0.5	
1896	BRISTOL	JOHNS BAY	18	500	M	0.9	
4861	BRISTOL	JOHNS BAY	18	315	S	0.5	
1298	BRISTOL	JOHNS BAY	18	300	S	0.5	
4012	BRISTOL	JOHNS BAY	18	300	M	0.5	
3033	BRISTOL	JOHNS BAY	18	300	M	0.5	
2876	BRISTOL	JOHNS BAY	18	300	S	0.5	
2579	BRISTOL	JOHNS BAY	18	300	S	0.5	
2976	BRISTOL	ATL OCN AT JOHNS BAY	20	300	S	0.5	
1925	BRISTOL	ATL OCN AT JOHNS BAY	20	360	M	0.6	
2049	BRISTOL	ATLANTIC OCEAN AT JOHNS BAY	20	300	S	0.5	
2297	BRISTOL	ATLANTIC OCEAN AT JOHNS BAY	20	150	S	0.2	
1765	BRISTOL	JOHNS BAY	20	500	M	0.8	
1803	BRISTOL	JOHNS BAY	20	300	M	0.5	
1807	BRISTOL	JOHNS BAY	20	400	S	0.6	
1604	BRISTOL	JOHNS BAY	20	300	S	0.5	
2468	BRISTOL	JOHNS BAY	20	630	M	1.0	
1807	BRISTOL	JOHNS RIVER	14	400	S	0.9	70
6335	BRISTOL	JOHNS RIVER	14	600	S	1.3	
5326	BRISTOL	JOHNS RIVER	14	300	S	0.7	
3790	BRISTOL	JOHNS RIVER	14	300	S	0.7	
7455	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
4857	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
1897	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
6839	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
6382	BRISTOL	PEMAQUID HARBOR	30	350	S	0.4	



DEP_ID	Town	Receiving Water	Depth Receiving Water	Licensed Flow (GPD)	Type*	Required Closure Acres	Acres Closed
4212	BRISTOL	PEMAQUID HARBOR	30	300	M	0.3	Entire Shoreline
4093	BRISTOL	PEMAQUID HARBOR	30	500	M	0.5	
6111	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
4094	BRISTOL	PEMAQUID HARBOR	30	500	M	0.5	
3144	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
3635	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
3013	BRISTOL	PEMAQUID HARBOR	30	300	M	0.3	
2384	BRISTOL	PEMAQUID HARBOR	30	300	M	0.3	
1766	BRISTOL	PEMAQUID HARBOR	30	360	M	0.4	
2023	BRISTOL	PEMAQUID HARBOR	30	360	M	0.4	
1759	BRISTOL	PEMAQUID HARBOR	30	300	S	0.3	
2147	BRISTOL	PEMAQUID HARBOR	30	360	M	0.4	
1762	BRISTOL	PEMAQUID HARBOR	30	300	M	0.3	
1704	BRISTOL	PEMAQUID HARBOR	30	540	S	0.6	
1305	BRISTOL	PEMAQUID HARBOR	30	300	M	0.3	
1456	BRISTOL	PEMAQUID HARBOR	30	500	M	0.5	
6304	BRISTOL	PEMAQUID RIVER	4	300	S	2.3	Entire River >400 acres
6153	BRISTOL	PEMAQUID RIVER	15	180	P	0.4	
6042	BRISTOL	PEMAQUID RIVER	4	3500	S	26.9	
3592	BRISTOL	PEMAQUID RIVER	15	300	S	0.6	
3328	BRISTOL	PEMAQUID RIVER	15	300	S	0.6	
3604	BRISTOL	PEMAQUID RIVER	15	300	S	0.6	
2867	BRISTOL	PEMAQUID RIVER	4	300	S	2.3	
1558	BRISTOL	PEMAQUID RIVER	15	300	S	0.6	
3757	SOUTH BRISTOL	ATL OCEAN AT THE GUT	15	300	M	0.6	Entire Shore, >900 Acres
6829	SOUTH BRISTOL	ATLANTIC OCEAN AT THE GUT	15	300	M	0.6	
2056	SOUTH BRISTOL	JOHNS BAY	15	360	M	0.7	
2075	SOUTH BRISTOL	JOHNS BAY	40	330	S	0.3	
1755	SOUTH BRISTOL	JOHNS BAY	40	360	S	0.3	
2003	SOUTH BRISTOL	JOHNS BAY	40	300	S	0.2	
1751	SOUTH BRISTOL	JOHNS BAY	40	500	M	0.4	
1877	SOUTH BRISTOL	JOHNS BAY	40	600	S	0.5	
4524	SOUTH BRISTOL	JOHNS BAY	40	450	S	0.3	





DEP_ID	Town	Receiving Water	Depth Receiving Water	Licensed Flow (GPD)	Type*	Required Closure Acres	Acres Closed
1977	SOUTH BRISTOL	JOHNS BAY	40	660	S	0.5	
1653	SOUTH BRISTOL	JOHNS BAY	40	360	S	0.3	
6403	SOUTH BRISTOL	JOHNS BAY	40	300	S	0.2	
7451	SOUTH BRISTOL	JOHNS BAY	40	500	M	0.4	
1901	SOUTH BRISTOL	JOHNS BAY	40	450	S	0.3	
2421	SOUTH BRISTOL	SOUTH BRISTOL GUT	15	300	S	0.6	
6555	SOUTH BRISTOL	SOUTH BRISTOL GUT	15	300	M	0.6	
7453	SOUTH BRISTOL	THE GUT	15	300	S	0.6	
1614	SOUTH BRISTOL	THE GUT	15	300	M	0.6	
3129	SOUTH BRISTOL	JOHNS BAY	40	300	S	0.2	

**Municipal WWTP**

There are no municipal wastewater treatment facilities in this growing area.

**Industrial Pollution**

There are no major industries in shellfish growing area WR. The shores of South Bristol and Bristol are very rural. Several marine related businesses are located in the South Bristol Gut. The Gamage boat yard is located in growing area WQ in the town of South Bristol on the Damariscotta River side of the South Bristol Bridge within a large prohibited zone. Businesses within the growing area that are required to have National Pollution Discharge Elimination permits (NPDE) are shown in table 1. NPDES sites are licensed to discharge a variety of waste waters and are inspected by the EPA.

**Table 3. Licensed NPDES Discharges**

Pollution Area No.	License No	Type	Facility	Location	Notes
24 A	ME0023272	Fish Processing	S. Bristol Wharf Seafood Processing	South Bristol	Active

**Marinas and Mooring Fields**

There are no true marinas in this growing area. Working docks with fuel tanks are located at the south Bristol Co-op and the Pemaquid Co-op (Pemaquid River); these docks service commercial fishing boats.



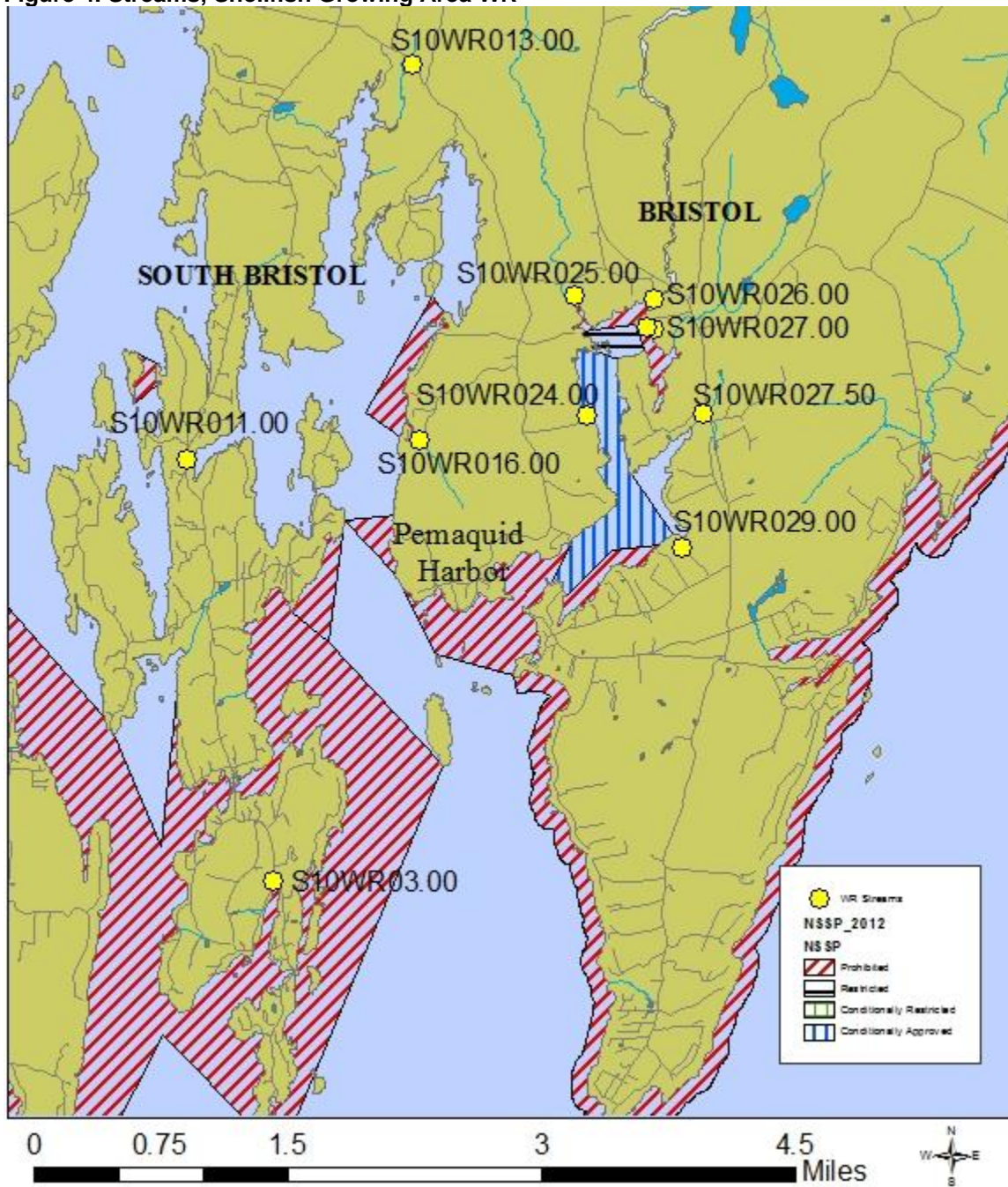
There are numerous moorings located in the area surrounding the Bristol Gut (west of Witch Island), Pemaquid River and McFarlands cove. These moorings are used by both fishing/work boats, smaller pleasure boats and occasionally larger sailboats which are large enough to have on-board heads. It is unknown if any of the boats are used for overnight stays. The highest concentration of large boats has been observed in the Pemaquid River. During peak activity in the summer months, up to 25 large boats have been observed moored in the river. This portion of the river was reclassified as Conditionally Approved based on the season boats are most abundant in the harbor. This seasonal conditional area went into effect on February 3, 2012.

**Stormwater**

The towns of South Bristol and Bristol are very rural. There are no municipal stormwater systems in this growing area.



Figure 4. Streams, Shellfish Growing Area WR





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

Small streams can be found along the shores of Bristol and South Bristol. Many of these streams were sampled in 2009, 2010 and during the 2012 shoreline survey of the area (Figure 2, Table 4). Many of the streams enter the shore near DMR’s established water sampling stations. The stream sample site numbers are associated with the proximity of the stream to the closest water sampling station. The classification of the water body that each stream drains into is also shown.

Two stream samples received elevated fecal scores (230 FC/100 ML or higher) and are highlighted in yellow.

**Table 4. 2012 Stream Samples, Growing Area WQ**

Town	Pollution Area	Stream	GASS ID	Area	Date	Fecal	Class
South Bristol	24A	S10WR003.00			9/19/2012	88	P
					10/10/2012	5.5	
South Bristol		S10WR011.00	WR4	Poorhouse Cove	9/16/2009	1.9	A
					9/30/2009	8	
					10/14/2009	18	
					3/15/2010	1.9	
					11/1/2012	6	
South Bristol		S10WR013.00	WR6	North Branch	9/19/2012	420	A
					11/1/2012	16	
Bristol		S10WR016.00	WR10	East Branch	9/19/2012	124	A
Bristol		S10WR024.00	WR13		9/16/2009	24	CA
					10/14/2009	20	
					3/15/2010	1.9	
					10/10/2012	16	
					11/1/2012	6	
Bristol		S10WR025.00	WR13	Pemaquid River	9/16/2009	16	P
					9/30/2009	72	
					10/14/2009	11	
					9/19/2012	620	
					10/10/2012	20	
	11/1/2012				29		
Bristol	S10WR026.00	WR13		9/16/2009	46	P	
				9/30/2009	25		
				10/14/2009	22		
				9/19/2012	132		
				10/9/2012	36		
				11/1/2012	80		





**WS Sanitary Survey 2012  
Effective Date**

Town	Pollution Area	Stream	GASS ID	Area	Date	Fecal	Class
Bristol		S10WR027.00	WR14		8/27/2012	29	P
					9/19/2012	64	
					10/9/2012	4	
					11/1/2012	2	
Bristol		S20WR027.00	WR14		10/9/2012	16	P
Bristol		S10WR027.50	WR14		10/9/2012	58	CA
					11/1/2012	16	
Bristol		S10WR029.00	WR16		11/1/2012	74	A



### Agricultural Activities

No farms were noted during the shoreline survey of the area.

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

Pemaquid Beach is located at the mouth of the Pemaquid River, on the southeast edge of Pemaquid Harbor. It has public restroom facilities, including showers, which operate through a licensed OBD. Fort William Henry State Park is a day tourist location at the southeastern edge of Pemaquid Point. It houses a small museum, but does not offer camping or public restroom facilities. A gravel boat launch frequented by many salt water fishing enthusiasts is located just outside Fort William Henry State Park. All of these recreational areas are located within a large prohibited area.

## Hydrographic and Meteorological Assessment

### Tides

In order to investigate the frequency of elevated scores (those that surpass the variability standard) at various tidal stages, a tidal assessment for all stations in growing area WR was completed (Table 4). For this assessment, all Systematic Random Sampling data collected between 2000 and 2012 were grouped by tidal stage (ebb vs. flood); geometric means and P90 scores were calculated using this data grouping. The specific tidal intervals that were grouped into the ebbing tide stage are ebb, high ebb, low, and low ebb. Tidal intervals that were grouped in the flood tide stage were flood, high flood, high and low flood. Several stations showed differences by tidal stage. Seven stations exceeded the P90 standard on an ebbing tide and four stations exceeded the standard on a flood tide stage. The three prohibited stations that exceeded the P90 standard on an ebb tide stage also exceeded the P90 standard on flood tide stages suggesting that the elevated scores are not tide related but caused by pollution in the immediate area. Two approved stations showed impact which caused the scores to surpass the P90 during ebb tide stage; conditional stations WR24.5 and WR27.3 also showed an impact during ebb tide stages. Conditional station WR 24 showed impact on during both ebb and flood tide stages.

**Table 5. Ebb and Flood Tide Stage Impact, 2000-2012**

Station	Class	Ebb Tide						Flood Tide					
		Count	GM	MAX	P90	Appd_Std	Restr_Std	Count	GM	MAX	P90	Appd_Std	Restr_Std
WR006.00	P	30	5.2	240	26.7	42	244	30	2	8	3	31	166
WR007.00	P	30	2.8	43	6.2	40	235	30	2	4	2.6	32	173
WR008.00	P	30	3.2	43	8.7	42	244	30	2.7	88	9.3	31	166
WR010.00	A	30	3.5	93	9.7	42	244	30	2.4	40	6.2	31	166
WR011.00	A	30	5.1	240	25.4	42	249	30	3.3	240	14	31	163
WR012.00	A	30	4.1	180	16.2	40	235	30	3.6	92	15	32	173
WR013.00	A	30	5.6	43	20.8	42	249	30	4.4	106	20	31	163
WR014.00	A	30	4.2	240	17.7	40	235	30	2.8	23	6.4	32	173
WR016.00	P	30	3.5	93	10.5	40	230	30	3.1	140	11	32	176
WR022.00	CA	30	3.3	73	10.1	37	212	30	2.2	20	4.2	31	163
WR023.00	CA	20	5	240	21.7	47	290	26	3.4	43	10	42	248



Station	Class	Ebb Tide						Flood Tide					
		Count	GM	MAX	P90	Appd_Std	Restr_Std	Count	GM	MAX	P90	Appd_Std	Restr_Std
WR024.00	CA	30	7.1	240	39.4	36	203	30	6.2	1700	39	34	187
WR025.00	P	30	11.7	280	67.4	38	216	30	9.9	134	62	35	191
WR026.00	P	30	15.9	1200	151.6	37	212	30	12	150	62	35	191
WR027.00	P	30	13.7	1200	134.5	36	203	30	12	460	91	35	195
WR027.30	CA	17	8	460	57.1	31	163	28	6	93	26	32	174
WR027.50	CA	4	3.1	14	11.5	31	163	9	4.4	32	21	31	163
WR028.00	A	30	5.5	460	37.1	36	203	30	4.5	460	30	35	195
WR029.00	A	30	7.2	500	46.7	35	191	30	4	43	15	37	208
WR030.00	P	30	5.2	108	22.6	33	184	30	3.4	38	10	38	216

**Winds**

Wind direction can have an impact on the water quality in an area if the wind is found to be predominantly blowing from an area associated with large concentrations of pollutants such as industries or large farming operations bordering on the shore. The Department of Marine Resources started collecting wind direction data in March of 2005. The direction the wind is blowing is noted on the sample collection field sheet at each sample site during the collection of the random run. Using data collected from 2008-2012, the percentage of samples collected at each of the wind directions was placed on a pie chart (Figure 9) to illustrate which wind directions were most frequently noted on the field sheet. The predominant wind direction noted was a calm condition (41%) which is little to no wind at all. The next most common wind direction noted is a southwesterly direction (13.6%). The wind blew from a northerly direction 10.3% of the time. Figure 6 shows the percentage of elevated scores associated with each wind direction.



Figure 5. Predominant Wind Direction, Growing Area WR

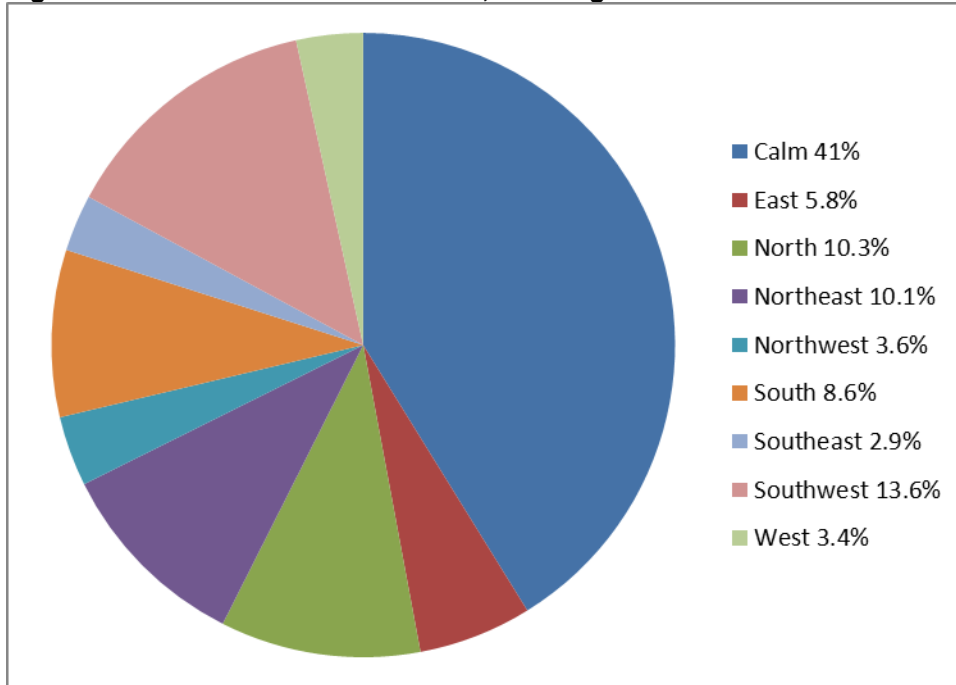
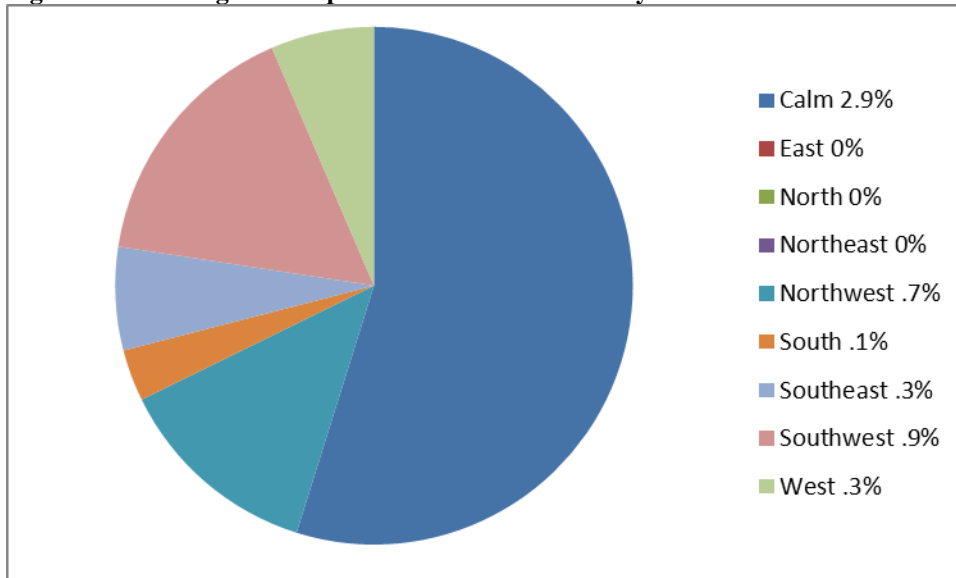


Figure 6. Percentage of Samples with Elevated Scores by Wind Direction







**River Discharge**

There are no major river systems in this growing area. The Pemaquid River is actually a large drainage from Boyd Pond to the head of Pemaquid Harbor.

**Water Quality Review**

Table 6 lists all active, approved, and prohibited stations in Growing Area WR, with their respective Geomean and P90 calculations for 2012. Please refer to Appendix C for a key to interpreting the headers on the columns of Table 6. All approved and stations have continued to meet their NSSP classification standard. No changes in classification are needed at this time.

**Table 6. Geometric Mean and P90 Scores Growing Area WR**

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WR006.00	P	30	30	2.4	0.25	16	5.2	31	163	1/9/2008
WR007.00	P	30	30	1.9	0.05	4	2.3	31	163	1/9/2008
WR008.00	P	30	30	2.4	0.35	88	6.9	31	163	1/9/2008
WR010.00	A	30	30	2.2	0.27	40	5.1	31	163	1/9/2008
WR011.00	A	30	30	3.8	0.54	240	19.3	31	163	1/9/2008
WR012.00	A	30	30	3	0.41	92	10.1	31	163	1/9/2008
WR013.00	A	30	30	5	0.53	106	24.6	31	163	1/9/2008
WR014.00	A	30	30	2.6	0.3	44	6.5	31	163	1/9/2008
WR016.00	P	30	30	3.1	0.43	140	11.5	31	163	1/9/2008
WR025.00	P	30	30	12.5	0.62	280	79.8	31	163	1/9/2008
WR026.00	P	30	30	12.7	0.53	240	62.4	31	163	1/9/2008
WR027.00	P	30	30	11.1	0.63	220	72.9	31	163	1/9/2008
WR028.00	A	30	30	3.6	0.46	126	14.5	31	163	3/5/2008
WR029.00	A	30	30	3.8	0.46	40	14.9	31	163	3/5/2008
WR030.00	P	30	30	4.2	0.5	108	18.4	31	163	3/5/2008

**Table 7. Geometric Mean and P90 Scores for Seasonal Conditional Stations**

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WR022.00	CA	30	24	2.4	0.27	43	5.5	33	184	1/31/2005
WR023.00	CA	30	7	3.3	0.28	23	7.7	44	260	10/14/1997
WR024.00	CA	30	21	4.3	0.45	54	16.6	35	195	3/10/2004
WR027.30	CA	23	22	3.5	0.37	22	10.7	31	167	4/19/2006
WR027.50	CA	8	8	3.2	0.45	32	12.8	31	163	1/31/2012

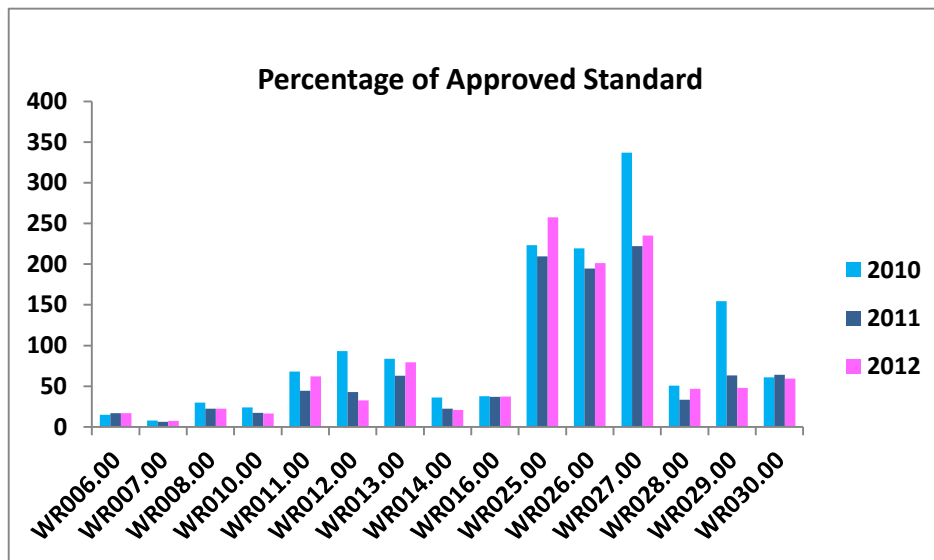
**Water Quality Discussion and Classification Determination**

Figure 7 shows the P90 scores, expressed as a percent of the approved standard, for approved and prohibited stations in growing area WR over the past three review years. Conditional stations WR27.3



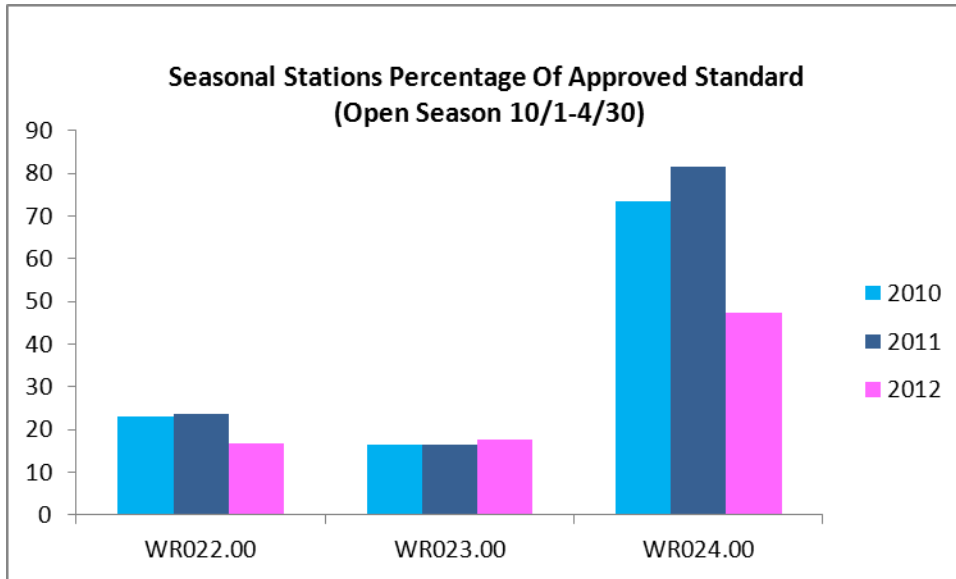
and WR27.5 were omitted from the seasonal conditional trend chart because these stations are new and do not have thirty samples. During the transition from MPN to MF analysis method, the approved standard will decrease every year, until all samples have been analyzed by the MF method. In order to show the trend of the P90 value over the years, the calculated P90 scores are expressed as a percentage of the standard; any station showing the 2012 column on or above 100 percent does not meet the approved classification standard. Most approved stations showed some variation in water quality among the three review years; all of the stations remained below the standard. Station WR13 is below the standard, however it showed an upward trend in 2012 which indicates a decline in water quality. Upward trends at this site may be attributed to the station's location which is nearby a stream which drains into the area. Station WR11 also showed an upward trend in 2012, but remains below 60% of the standard. This site is also influenced by fresh water. Stream site PS1WR11 flows into the area nearby this station's sample site. The stream was sampled twice in 2012 and received a score of 300FC/100ml on September 19<sup>th</sup> and a score of 152FC/100ml on October 31<sup>st</sup>. The remaining approved stations have continued to receive P90 scores that are below 50% of the approved standard. Prohibited stations WR 6, WR7, and WR8 have all received good water quality scores for each of the last three years these. The shoreline in these areas was surveyed in 2012 and no pollution sources were identified in the area. These areas should be proposed for an upgrade in classification.

**Figure 7. Area WR P90 Scores for Approved and Prohibited Stations (WR25, WR26 and WR27)**



The trend chart for the seasonal conditional stations is shown in figure 8. These stations are shown based on the approved standard during the open season when boats with heads are not in the mooring area (10/1-4/30). Stations WR 27.3 and WR27.5 are also conditional stations however they have less than 30 data points and were therefore not included in the trend chart. All of the conditional stations have P90 scores that are currently at less than 50 percent of the approved standard.

**Figure 8. Area WR P90 Scores for Seasonal Conditional Stations in Open Season**



A seasonal and rainfall impact assessment was completed for the approved stations that are showing a deteriorating trend in water quality. Table 8 shows results from random and extra samples collected between 2008 and 2012. The data points are sorted by month and by cumulative rainfall amount; scores that exceeded the P90 standard are hi-lighted in yellow. Rain 3 refers to cumulative rainfall occurring on the date of sample collection and two days prior to the sample date; Rain 4 refers to cumulative rainfall 3 days prior, plus the day of sample collection. The salinity on the date of sample collection is also shown (Sal). Station WR 13 is located in the North Branch of John’s River in the town of South Bristol. This location has a stream located at the head of the cove, just beyond the sample site. The table shows that the area has had a number of dates with low salinities however the elevated scores aren’t always associated with the lower salinities or the dates with more rainfall and the scores do not appear to be associated with a season but seem to be fairly random and have occurred over a variety of years.

**Table 8. Approved Station WR 13 Pivot Table 2008-2012**

Rain 3	Rain 4	Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
0	0	08/17/09								11			
0	0	07/20/11							1.9				
0	0	04/18/12				2							
0	0.01	06/06/11						6					
0	0.04	07/10/12							1.9				
0.01	0.01	01/09/08	6										
0.01	0.43	08/21/12								4			
0.02	0.02	05/03/10					2						
0.03	0.03	11/16/10											1.9
0.03	0.56	09/27/10									40		
0.06	0.59	10/18/11										4	



Rain 3	Rain 4	Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
0.08	0.28	01/31/12	1.9										
0.12	0.12	08/09/10								20			
0.12	0.13	06/03/09						2					
0.13	0.13	05/22/12					106						
0.15	0.15	06/22/10						10					
0.21	0.31	09/16/09									15		
0.23	0.23	10/22/08										40	
0.29	0.29	08/19/08								1.9			
0.37	0.37	10/14/09										2	
0.52	0.66	10/17/12										12	
0.75	0.76	03/05/08			2								
0.86	1.75	02/28/11		2									
0.9	0.9	05/19/09					4						
0.95	0.95	03/15/10			2								
0.98	1.02	05/06/08					1.9						
1.11	1.11	07/01/08							78				
1.18	1.18	04/13/11				1.9							
1.71	1.71	03/31/09			1.9								
no data	no data	08/31/11								6			

**Aquaculture/Wet Storage Activity**

There are two limited purpose sites and one bottom culture site in growing area WR. There are no wet storage sites in this growing area. A list of current aquaculture leases with information on each operation can be accessed on the DMR website:

<http://www.maine.gov/dmr/aquaculture/leaseinventory/index.htm>



## **Conclusion**

Growing area WR has had fairly stable water quality at stations classified as Approved for shellfish harvest. Stations WR11 and WR13 both showed upward trends in 2012 and station WR13 is nearing the cut off for the approved standard with a current P90 of 24.6 and an approved standard of 31. Several pollution sources were identified and inspected by the LPI for the town of Bristol. It is likely that when these pollution sources are fixed water quality will improve and areas may be able to be reclassified. The licensed overboard discharge that formerly served the Bristol school system has been replaced with a new inground system. If water quality improves in this area, the upper Pemaquid River could be reclassified. No changes in classifications are proposed or required at this time.

## **Recommendation for Future Work**

Additional stream sampling should be done for all streams that received elevated scores during the 2012 survey of the area.

The area around station WR13 will be resurveyed and streams will be sampled several times over the course of the year to try to locate the source of variability in the water quality in this area.





## Appendix A. Pemaquid Harbor, Annual Review of Conditional Area Management Plan, 2012

### Conditional Area Management Plan- 2012 Annual Review

#### Growing Area WR: Pemaquid Harbor Mooring Area

**Scope:**

The Pemaquid Harbor seasonal conditional area is located in Bristol in Growing Area WR. This seasonal conditional area is based on the time period that boats are in the mooring area in Pemaquid Harbor, and is closed to shellfish harvest from May 1 through September 30. This area is monitored by Stations WR 22, 23, 24, 27.3, and 27.5.

**Compliance with the Conditional Area Management Plan (CAMP):**

This area is Conditionally Approved and is open from October 1 to April 30 based on water quality meeting the approved standard during this time period and decreased boating activity in the Harbor.

**Does water quality meet APPROVED standards during the conditional period?**

Yes, please see Table 1.

**Adequacy of reporting and cooperation of involved persons:**

The management plan for this conditional area does not require reporting.

Cooperation on behalf of the local shellfish warden is excellent. The local shellfish warden notifies DMR of any emergency situations.

Marine law enforcement efforts (Marine Patrol and the local shellfish warden) and illegal harvester activity determines the compliance level for this growing area during the prohibited period. There were no reported incidents of illegal digging in this area in 2012.

**Compliance with approved growing area criteria:**

Stations WR 22, 23, 24, 27.3, and 27.5 are in the conditional area and meet approved criteria based on geometric means and P90 values during the OPEN period (Table 1). Station WR27.5 is a new station that was established to monitor water quality at the site of the line that separates the conditional and approved areas. This station has been sampled eight times. Station WR27.3 is located on the line between the conditional area and the restricted area. This station has been sampled 23 times.

**Table 9. Area WR Conditional Area in Pemaquid Harbor, Geometric Mean and P90**

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WR022.00	CA	30	24	2.4	0.27	43	5.5	33	184	1/31/2005
WR023.00	CA	30	7	3.3	0.28	23	7.7	44	260	10/14/1997



WR024.00	CA	30	21	4.3	0.45	54	16.6	35	195	3/10/2004
WR027.30	CA	23	22	3.5	0.37	22	10.7	31	167	4/19/2006
WR027.50	CA	8	8	3.2	0.45	32	12.8	31	163	1/31/2012

**Water sampling compliance history:**

The monitoring stations are part of a scheduled sampling run. The monitoring stations were sampled (6 times) in the open status, meeting the NSSP Model Ordinance and Conditional Area Management Plan requirements. Table 2 lists water sampling history for the 2012 review period.

**Table 10. Conditional Area 2012 Sampling Effort**

Station	Class	Adverse	Extra		Random		Total	Comments
		Closed	Closed	Open	Closed	Open		
WR022.00	CA	1	3	2	3	6	15	
WR023.00	CA				3	6	9	
WR024.00	CA				3	6	9	
WR027.30	CA				3	6	9	
WR027.50	CA	1	3	2	3	6	15	

**Summary:**

This area meets the Conditionally Approved classification criteria based on water quality meeting the Approved standard during the open period. The OPEN period start date (10/1) and CLOSE date (4/30) continue to be appropriate. No recommendations for changes to the current management plan or conditional area classification status are needed at this time.

**Water sampling compliance history**

Table 31 shows the 2012 sampling effort for growing area WR. The 2012 flood sampling effort has been excluded from the sample count table. All conditionally approved stations were sampled 12 times in the open status in 2012.

**Table 11. Growing Area WR 2012 Sampling Effort**

Station	Class	Adverse	Extra		Random		Total	Comments
		Closed	Closed	Open	Closed	Open		
WR010.00	A					6	6	
WR011.00	A					6	6	
WR012.00	A					6	6	
WR013.00	A					6	6	
WR014.00	A					6	6	
WR028.00	A					6	6	
WR029.00	A					6	6	
WR022.00	CA	1	3	2	3	6	15	
WR023.00	CA				3	6	9	



**WS Sanitary Survey 2012  
Effective Date**

Station	Class	Adverse	Extra		Random		Total	Comments
		Closed	Closed	Open	Closed	Open		
WR024.00	CA				3	6	9	
WR027.30	CA				3	6	9	
WR027.50	CA	1	3	2	3	6	15	
WR006.00	P				6		6	
WR007.00	P				6		6	
WR008.00	P				6		6	
WR016.00	P				6		6	
WR025.00	P				6		6	
WR026.00	P				6		6	
WR027.00	P				6		6	
WR030.00	P				6		6	



## Appendix C. 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 = 90<sup>th</sup> percentile

APPD\_STD = the 90<sup>th</sup> 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 90<sup>th</sup> percentile, at or below which the station would meet restricted criteria.