



Sanitary Survey Report Growing Area WM
Effective Date. 10-17-2018
Revision No. 4

GROWING AREA WM

Kennebec River

**Small Point, Phippsburg to east of Indian Point, Georgetown through Salter Island; Rt 127 bridge;
Upper Hells Gate**

Sanitary Survey Report

Final

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APPROVAL

_____ Date: _____
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Executive Summary

This is a sanitary survey report for growing area WM written in compliance with the requirements of the 2011 Model Ordinance and the National Shellfish Sanitation Program. This sanitary survey report reviews shoreline survey information which was compiled during the 2011 and 2012 survey of the growing area.

During the last twelve years, five classifications changes occurred within Growing Area WM. In addition to classifications changes, twenty-four overboard discharges were removed over the twelve-year period.

Shoreline surveys were conducted in the growing area during 2011 and 2012. DMR and DEP staff visited 537 properties. A total of eight actual pollution sources were identified and the town officials of Arrowsic, Georgetown and Phippsburg were notified. Four outstanding problems remain.

After review of the 2012 P90 analysis, water quality has remained consistent. No reclassifications are required. Additional analysis is recommended to modify the existing conditional areas.



Growing Area Description

Growing area WM is the lower Kennebec River, and includes that portion of the river which passes through the towns of Phippsburg, Bath, Woolwich, Arrowsic, and Georgetown (Figure 1). This portion of the river begins at the mouth of Merrymeeting Bay, located between West Chops Pt., North Bath and Chops Pt., Woolwich. The distance from the Chops downstream to the nearest open shellfish growing beds is approximately 12 miles, and 17 miles to the mouth of the river at Popham Beach, Phippsburg. The Kennebec River is the second largest river in the state of Maine. The Androscoggin River, the third largest river, drains into the Kennebec River, and the two rivers come together in Merrymeeting Bay. Together, these two rivers have a drainage area of 8,600 squares miles, which is more than 1/5 of the total state acreage.

The Kennebec River study area consists of Drummore Bay, Squirrel Point flats, Parker Head flats, Wyman Bay, Todd Bay, Atkins Bay, and the Back River, south of the Arrowsic bridge, Also, Sagadahoc Bay is on the southern end of Georgetown Island between Kennebec Point and Indian Point.

Drummore Bay is a large tidal flat on the western shore of the Kennebec River in Phippsburg. It contains 90 acres of flats that are currently classified restricted for depuration. The Back River lies along the western shore of Georgetown Island and the eastern shore of Arrowsic and converges into the Kennebec River at Bald Point, Arrowsic. The southern end of Arrowsic is known as Squirrel Point flats. The Arrowsic flats on the southern end of Back River are known as Newtown Creek flats. These areas have also been classified for depuration. Drummore Bay, Squirrel Point and Newtown Creek flats meet approved standards during the summer months, but are adversely affected by unchlorinated effluent from treatment plants upriver during the winter. There is a licensed overboard discharge at the Squirrel Point lighthouse that is seldom used, but will require a closure around it. There is also a seldom used licensed overboard discharge in West Georgetown that will require a closure.

Fresh water influence comes from the Kennebec River and Androscoggin River, which converge in Merrymeeting Bay, north of Bath, and from the Back River. The Kennebec River drains a watershed of 10,700 square miles and salinity is significantly reduced in Drummore Bay and the Back River.

Parker Head flats, Phippsburg, are a narrow strip below high bluffs, with no development on the immediate shore. Wyman Bay and Atkins Bay, Phippsburg, and Todd Bay, Georgetown, have moderate development and extensive mud flats. All dwellings within 500 feet of shore were surveyed. These flats have been classified conditionally approved based on 1.5" of rain in 24 hours, but now meet approved standards year-round. However, there is data to confirm that these flats are impacted by unchlorinated effluent from treatment plants upriver after rainfall events of 1.5" in 24 hours from October 1 through May 14.

Mill Pond, Phippsburg, south of Parker Head, is currently being sampled for future evaluation. Not enough data has been collected at this time. There is a licensed overboard discharge for gray water at the mouth of Mill Pond, and there is a licensed discharge for waste water at the Squirrel Point lighthouse. There are several overboard discharges at Bay Point, and there is an unidentified pollution problem at West Georgetown. These areas will remain classified closed prohibited.

Georgetown is a large, heavily wooded, island connected to the mainland via bridges. Fresh water influence on the southwestern shore of Georgetown comes from the Kennebec River and Androscoggin River, which converge in Merrymeeting Bay, north of Bath. Just south of Bath, some of the Kennebec River water is channeled southeasterly to an area known as Hanson Bay and becomes the Sasanoa River.



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The Sasanoa River joins the Back River, which branches off of the Sheepscot River, in Hockomock Bay. The Sasanoa continues southeasterly toward the Five Islands area and joins the Sheepscot River as it flows down the eastern shore of Georgetown. The Back River continues south across Hockomock Bay and runs down the northwestern shore of the island to join the Kennebec River. There is a very complex flow of water around the upper half of Georgetown.

Most of the northern half of the island has been closed to shellfish harvesting due to variable water quality and overboard discharges.

Sagadahoc Bay is on the southern end of Georgetown Island between Kennebec Point and Indian Point. The bay is over a mile in length from north to south, with the mouth of the embayment on the southern end. It is a very shallow bay and drains completely at low tide. At the head of the bay is a narrow, winding marsh stream which drains an extensive wetland area that connects with the head of Robinhood Cove (in Area N), which is classified Approved.

Heal Eddy is another long embayment on the south end of the island and has complete tide water exchange with each tide cycle. The cove is sparsely developed, but there is a small, dense community of summer cottages at Bay Point. Stage Island, just offshore of Bay Point is undeveloped.

Todd Bay lies just north of Bay Point and the southwestern side of Georgetown Island. This bay is also sparsely developed, except for a small community of homes on the north end, called Marrtown. This bay is created by two long islands, Marr Island and Long Island, acting as separators from the Kennebec River.

North of Todd Bay, is the Back River which separates Arrowsic from Georgetown. There are a few homes on the river, set on large lots, and there are two overboard discharges near the bridge connecting the two islands.

There are ten sewage treatment plants (STP) located in the Kennebec River watershed, with some located as far as Waterville on the Kennebec River, and Lewiston on the Androscoggin River. The Bath STP is the only facility located below the "Chops" – the mouth of Merrymeeting Bay, which marks the confluence of the Kennebec and Androscoggin Rivers. This location is approximately seven miles north of the closest shellfish growing beds which are open for shellfish harvesting. The towns adjacent to Approved shellfish growing beds in area WM are Phippsburg, Woolwich, Arrowsic, and Georgetown; these towns have no municipal sewage treatment facilities. All disposal systems located in those towns are private inground systems, licensed overboard discharges, outhouses or composting toilet systems. There are no marinas south of the Bath Bridge. There are only two working piers which provide support to local lobstering and fishing activities. These are located in at the mouth of Atkins Bay and at the mouth of Back River.

Currently, all of the flats in this growing area (not including prohibited areas) located north of Popham Beach are Conditionally Approved based on river discharge. The amount of discharge required for closure varies by season. Pollution areas 20 B.1 thru 20 B.7 will close from October 1 – January 31 when river discharge reaches 30,000 cfs. Between February 1 and April 30 areas 20 B.1 thru 20 B.7 will close when discharge reaches 60,000cfs. And between May 1 and September 30 areas 20 B.1 thru 20 B.7 will close when river discharge reaches 40,000cfs. Pollution area 20 D (Heal Eddy and Sagadahoc Bay) closes when river discharge exceeds 60,000 cfs. In addition, area 20 C is classified as Conditionally Approved on river discharge and rainfall and shall be when rainfall meets or exceeds 1.5" within a 24 hour period during the period October 1st through May 14th and shall be closed when river discharge meets or exceeds



30,000 cfs between October 1st and January 31st; when river discharge meets or exceeds 60,000 cfs between February 1st and April 30th and when river discharge meets or exceeds 40,000 cfs between May 1st and September 30th.

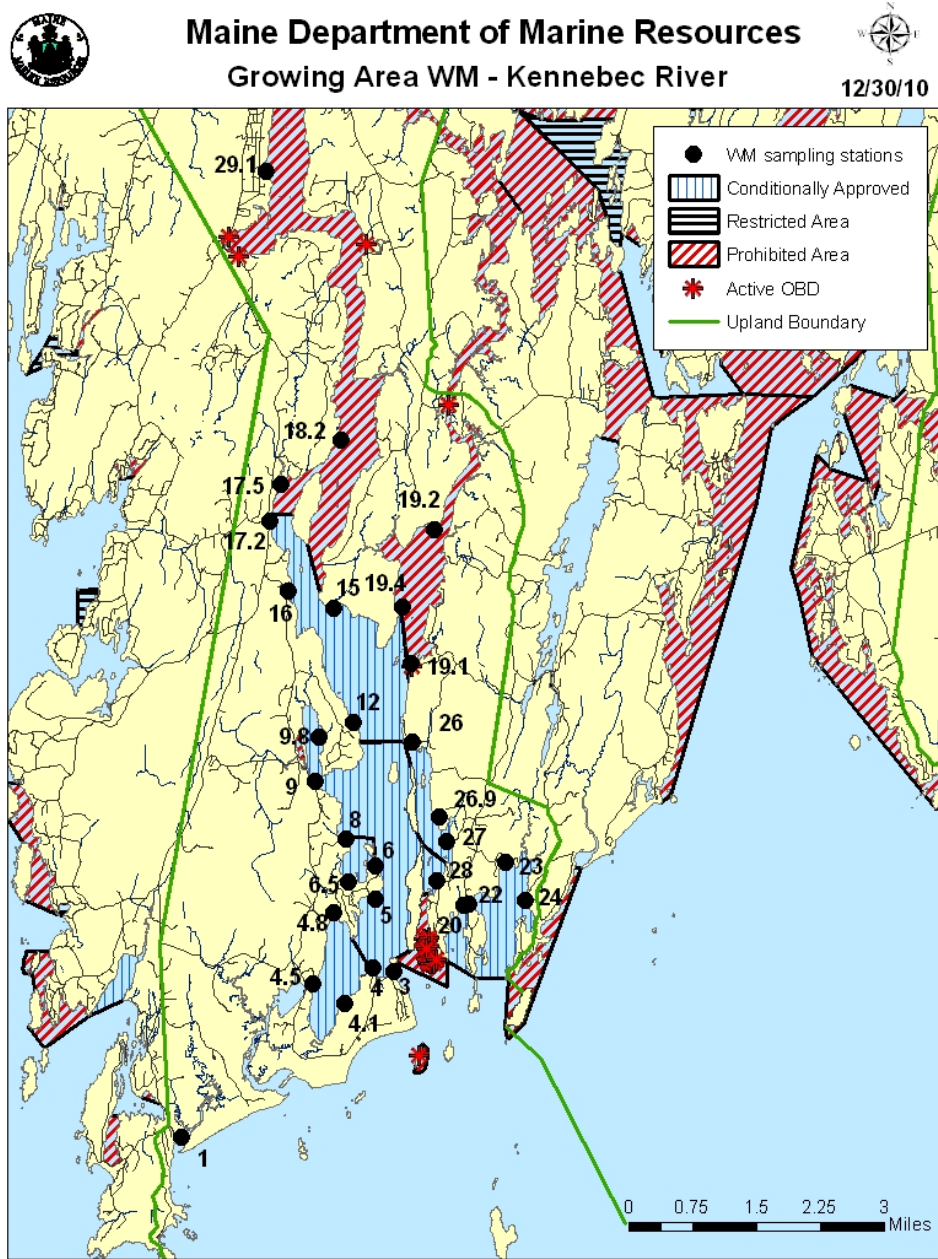


Figure 1. Growing Area WM, with 2012 Active Water Stations.

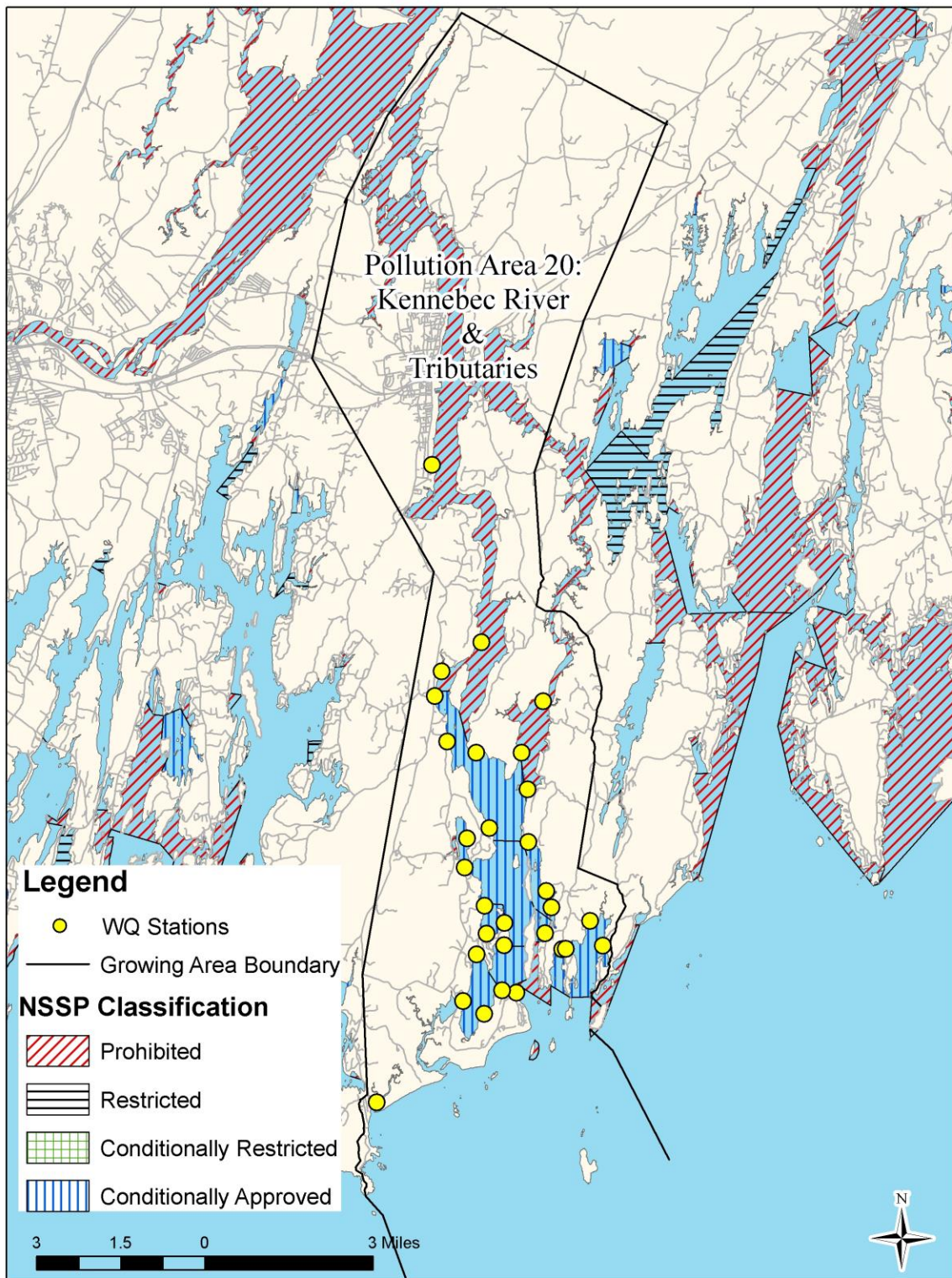


Figure 2. Pollution Area 20: Lower Kennebec River showing shoreline survey status and corresponding legal notice areas. Areas north of this map are not surveyed.

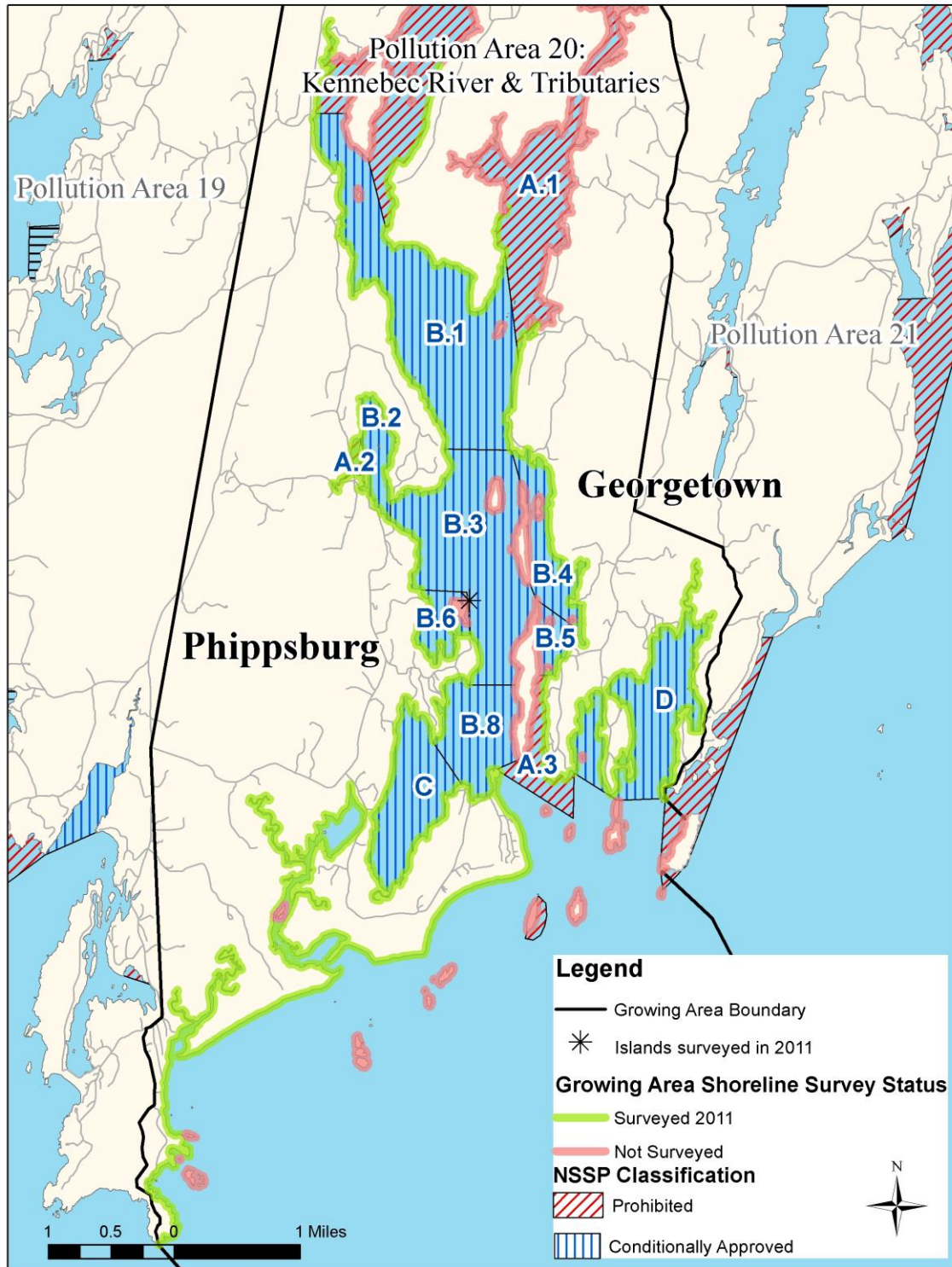


Figure 3. Pollution Area 20: Upper Kennebec River pollution sources, permits and discharges north of US Rt 1 bridge including corresponding legal notice areas and GASSID numbers.

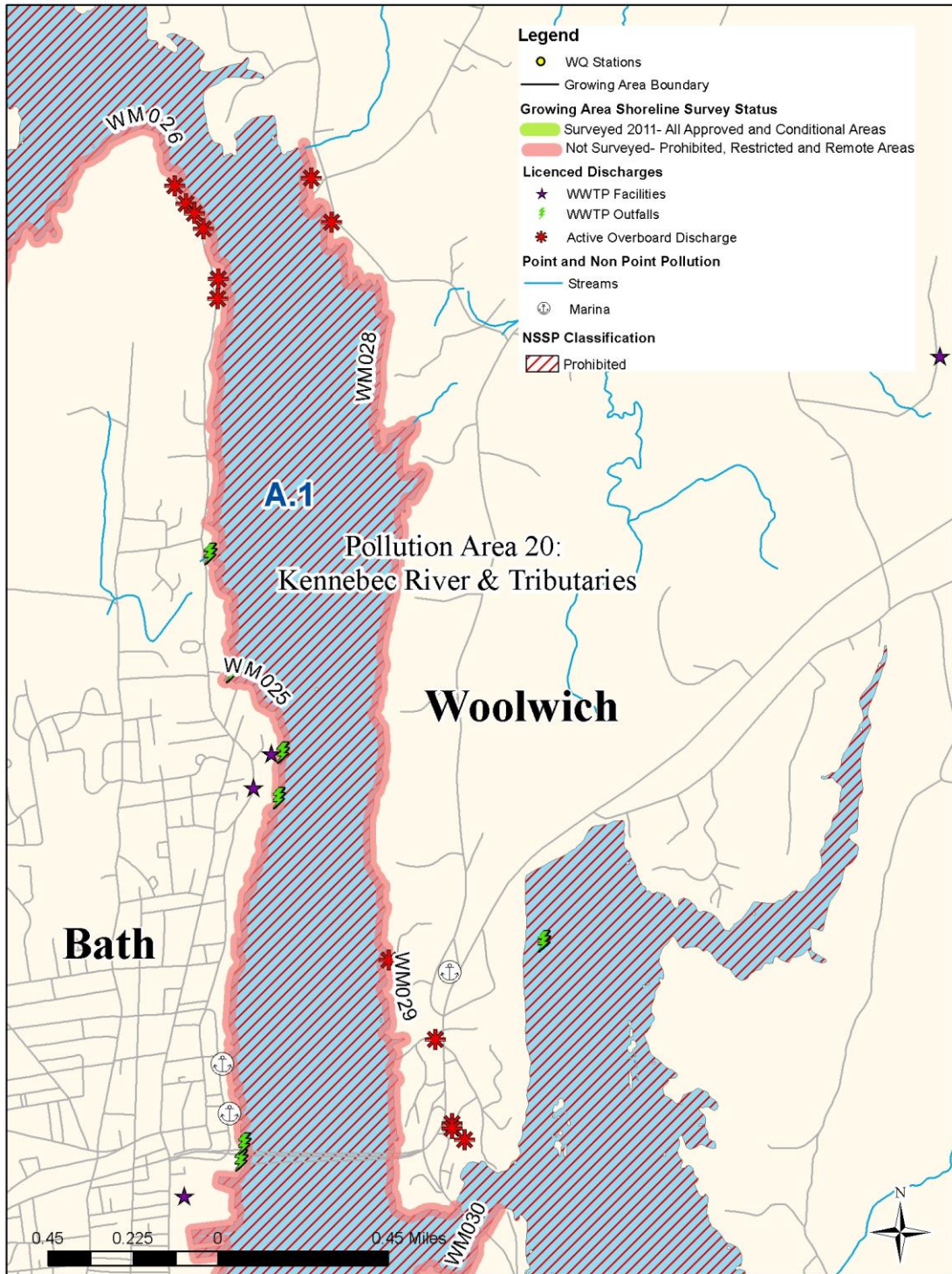


Figure 4. Pollution Area 20: Upper Kennebec River pollution sources, permits and discharges South of US Rt 1 bridge including corresponding legal notice areas and GASSID numbers.

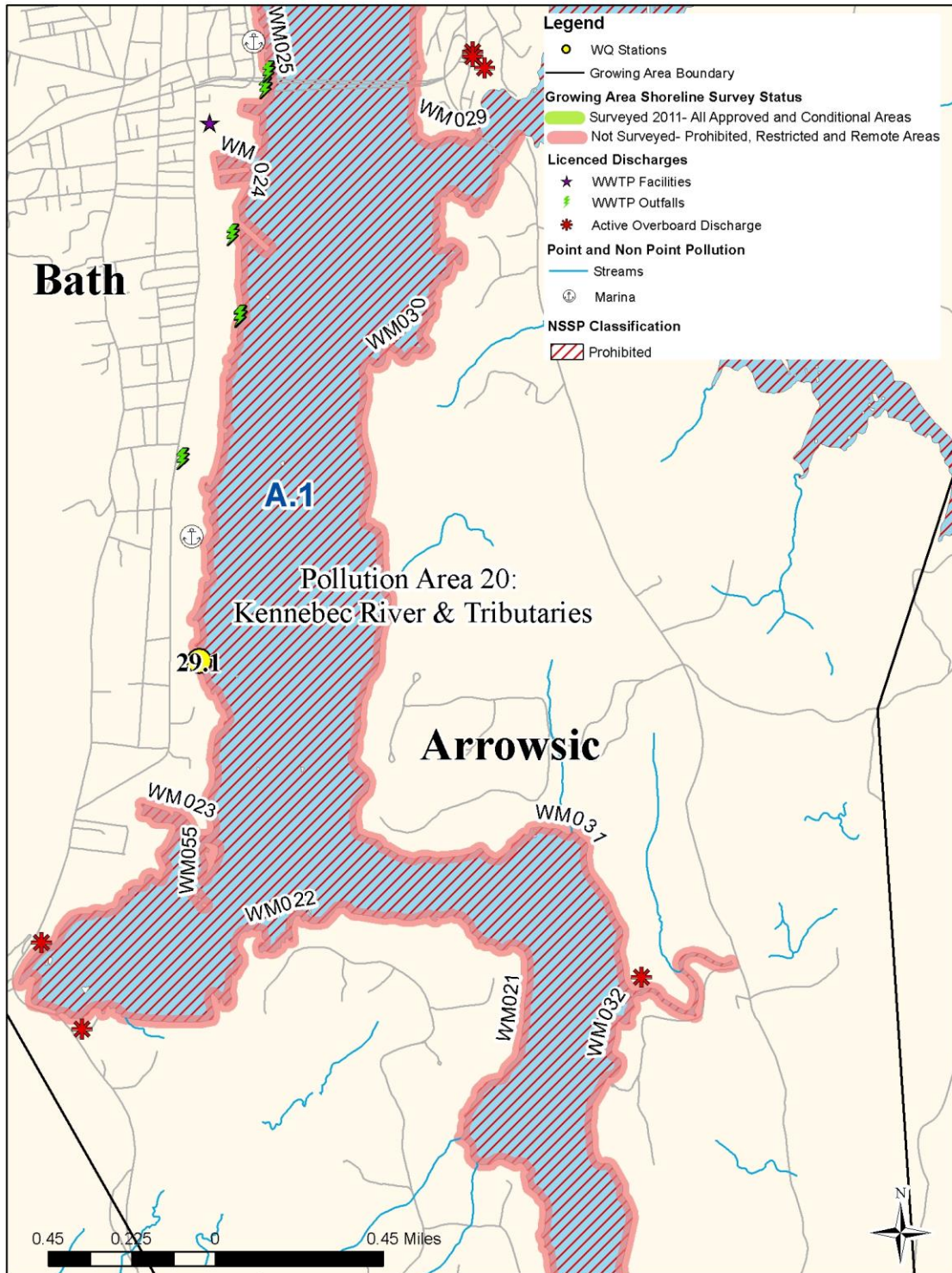


Figure 5. Pollution Area 20: Middle Kennebec River pollution sources, permits and discharges including corresponding legal notice areas and GASSID numbers.

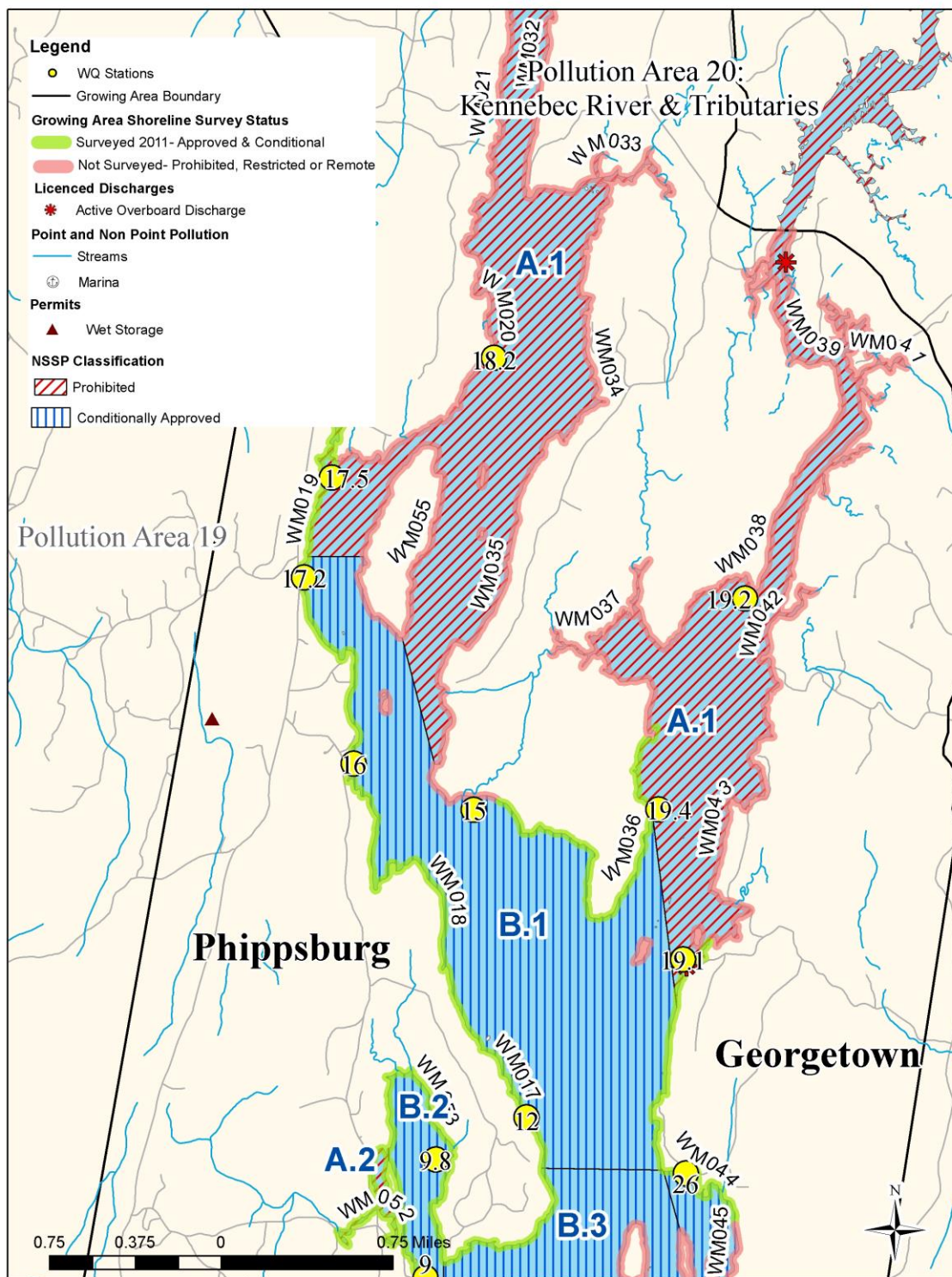


Figure 6. Pollution Area 20: Lower Kennebec River pollution sources, permits and discharges including corresponding legal notice areas and GASSID numbers.

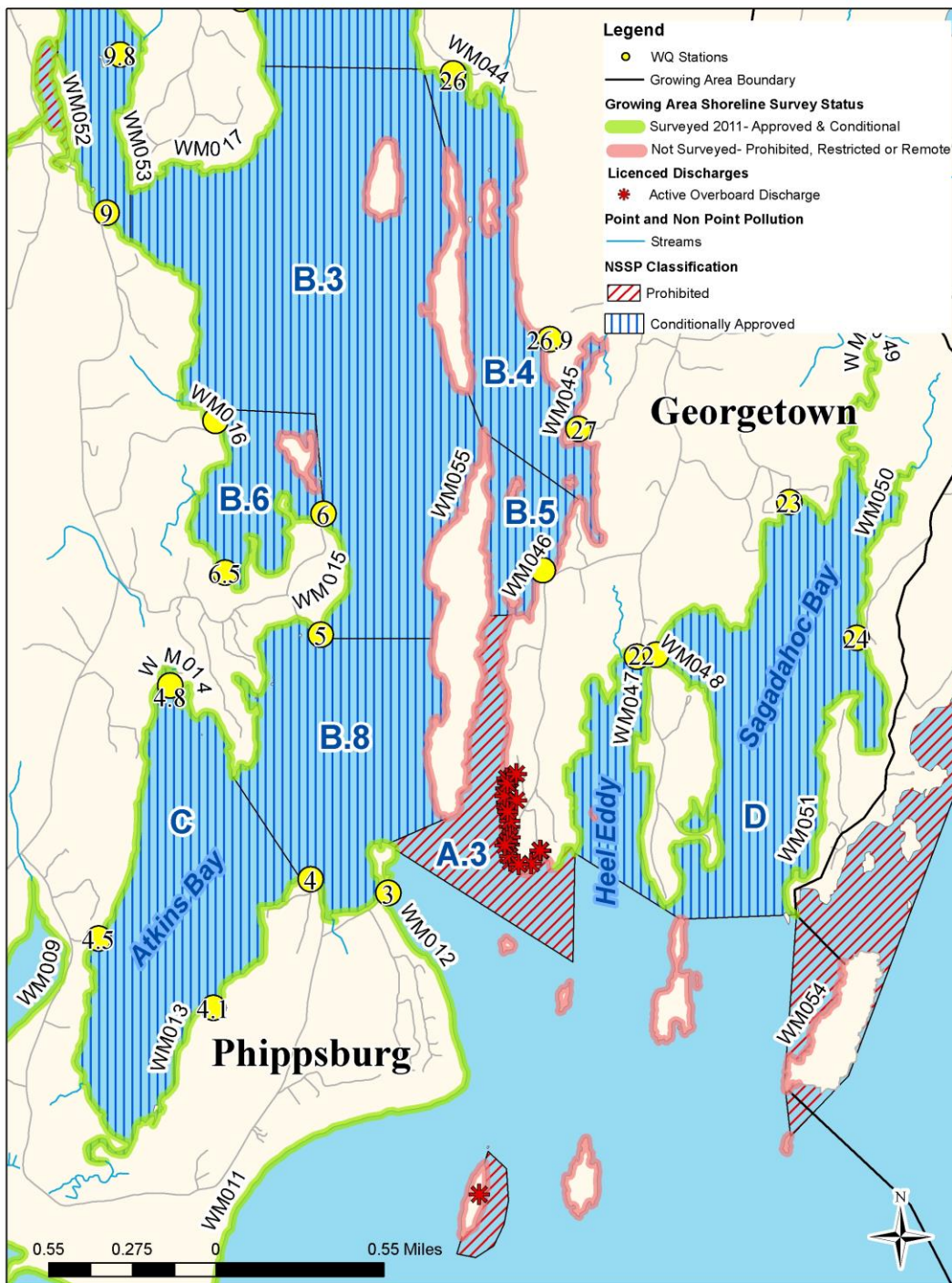


Figure 7. Pollution Area 20: Lower Kennebec River detail showing a high concentration area of active overboard discharges. Includes corresponding legal notice areas and GASSID numbers.

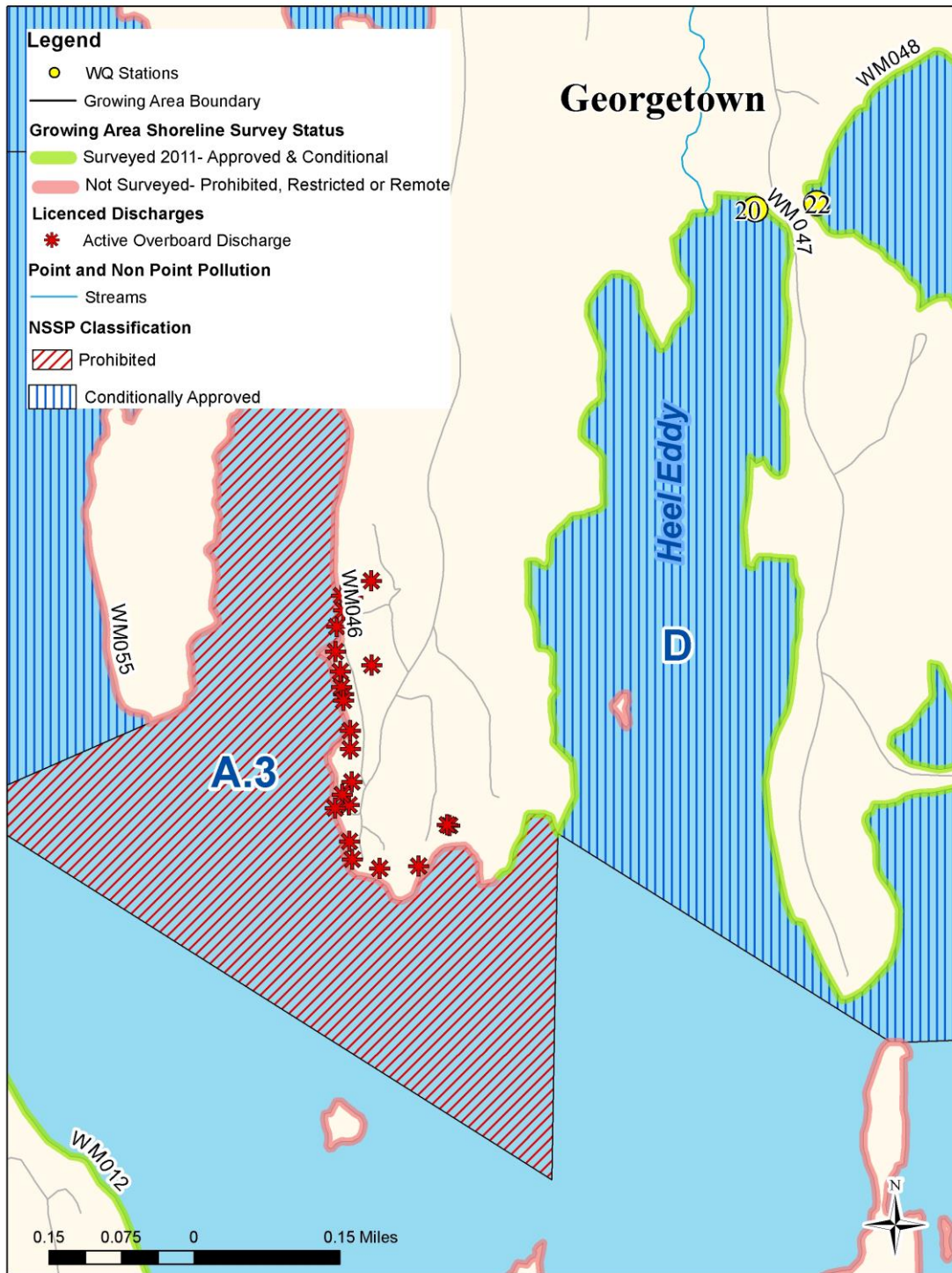


Figure 8. Pollution Area 20: Middle Kennebec River DOMESTIC pollution sources (septic) including corresponding legal notice areas and GASSID numbers.

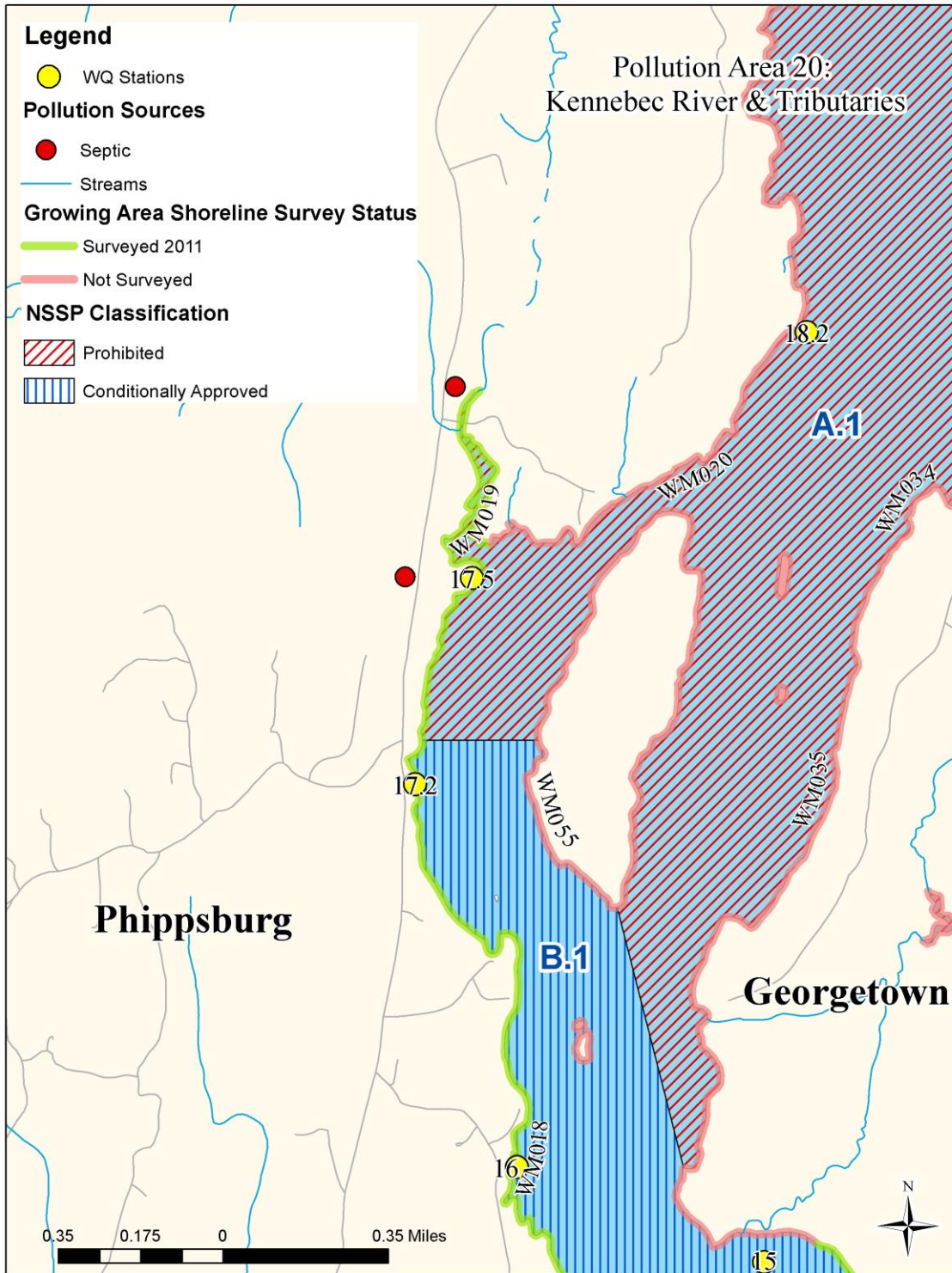
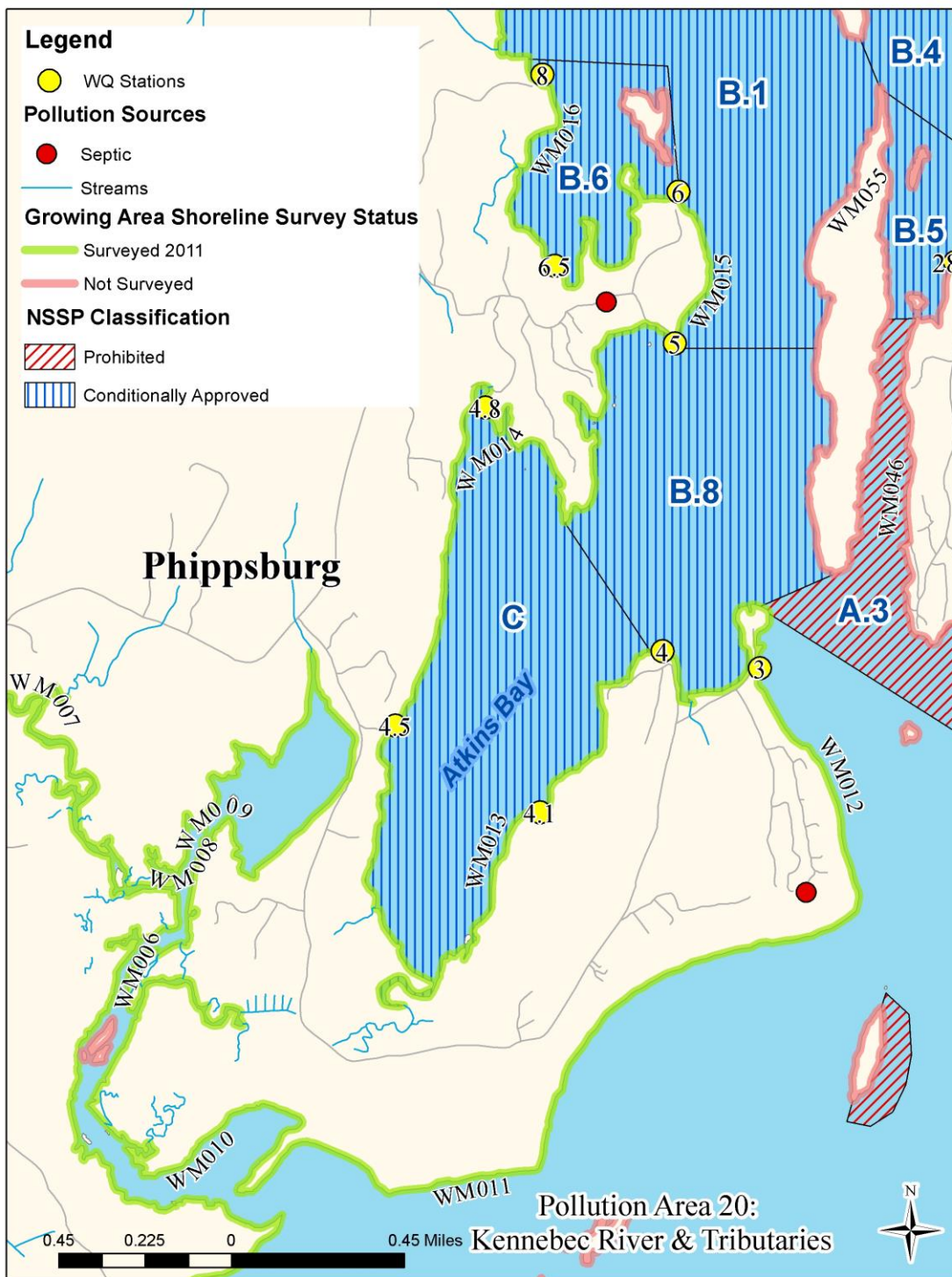


Figure 9. Pollution Area 20: Lower Kennebec River DOMESTIC pollution sources (septic) including corresponding legal notice areas and GASSID numbers.



Current Classification(s)



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

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

- Area No. 20 Kennebec River and Tributaries

Pollution Area Activity 2000-2012

Pollution activity changes are completed through a legal notice review and posting process. These activities are documented and archived at the DMR.

No classification changes in 2000

Activity 2001

1. March 22, 2001 - Closed Area No. 20-H, Lower Kennebec River: This new regulation closes the conditional areas of Atkins Bay, Wyman Bay, Parker Flats and Todd Bay. This emergency closure is enacted due to rainfall in excess of 1.5 inches of rain in 24 hours.
2. April 4, 2001- Closed Area No. 20-H, Lower Kennebec River: This new regulation reopens the conditional areas in the southern portion of the Kennebec River following the rainfall closure.

Activity 2002

1. May 14, 2002: Closed Area No. 20-H, Lower Kennebec River, Phippsburg, Georgetown and Arrowsic: This new regulation closes the area of Drummore Bay, the east side of Lee Island, and a portion of Back River, Arrowsic. It also closes a portion of Todd Bay, Georgetown. Squirrel Point Flats and Parker Head Flats will be open 5/15 to 9/30. And this new regulation also closes Atkins Bay inside and west of a line beginning at the southern tip of Little Cox Head, Phippsburg and extending southeasterly to the land end of the pilings at Sabino Head, Phippsburg due to rainfall of $>1.5''$ in 24 hours.
2. May 24, 2002- Closed Area No. 20-H, Lower Kennebec River: This new regulation reopens Atkins Bay west of a line from the southern tip of Little Cox Head southeasterly to the land end of the pilings at Sabino Head.
3. October 17, 2002: Closed Area No. 20-H, Lower Kennebec River: This new regulation closes Atkins Bay inside and west of a line beginning at the southern tip of Little Cox Head, Phippsburg and extending southeasterly to the land end of the pilings at Sabino Head, Phippsburg due to rainfall of $\geq 1.5''$ in 24 hours. And this new regulation also closes that area in Phippsburg locally known as Hunnewell Cove.
4. November 1, 2002- Closed Area No. 20-H, Lower Kennebec River: This new regulation reopens Atkins Bay west of a line from the southern tip of Little Cox Head southeasterly to the land end of the pilings at Sabino Head.
5. December 16, 2002- Closed Area No. 20-H, Lower Kennebec River: This new regulation closes Atkins Bay inside and west of a line beginning at the southern tip of Little Cox Head, Phippsburg and extending southeasterly to the land end of the pilings at Sabino Head, Phippsburg due to rainfall of $\geq 1.5''$ in 24 hours.



6. December 31, 2002- , Closed Area No. 20-H, Lower Kennebec River: This new regulation reopens Atkins Bay west of a line from the southern tip of Little Cox Head southeasterly to the land end of the pilings at Sabino Head.

Activity 2003

1. October 16, 2003: Closed Area No. 20-H, Lower Kennebec River: This new regulation closes Atkins Bay due to rainfall of $\geq 1.5''$ in 24 hours.

Activity 2004

1. January 13, 2004 - Closed Area No. 20-H, Lower Kennebec River: This new regulation reopens Atkins Bay west of a line from the southern tip of Little Cox Head southeasterly to the land end of the pilings at Sabino Head.
2. August 11, 2004- Closed Area No. 20-H, Lower Kennebec River, Phippsburg, Georgetown, and Arrowsic: This new regulation, Closed Area 20-H, describes the permanent closures in the Kennebec River. The new regulation, for Closed Area 20-G, describes the conditional shellfish areas in the Kennebec River. This is an administrative change only.
3. August 11, 2004- Closed Area No. 20-G, Middle Kennebec River: This new regulation describes the seasonal conditional area in the middle of the Kennebec River, which was previously described in Closed Area No. 20-H. Atkins Bay continues to be conditional on 1.5 inches of rain in 24 hours from October 1 through May 14. This is an administrative change only.

Activity 2005

1. March 30, 2005- Closed Area No. 20-G, Middle Kennebec River: This new regulation describes the closure of Atkins Bay due to 1.5'' of rain in 24 hours.
2. April 21, 2005 - Closed Area No. 20-G, Middle Kennebec River: This new regulation reopens the rainfall conditional area of Atkins Bay.
3. October 17, 2005- Closed Area No. 20-G, Middle Kennebec River: This new regulation describes the closure of Atkins Bay due to 1.5'' of rain in 24 hours.

Activity 2006:

1. February 23, 2006 - Closed Area No. 20-G, Middle Kennebec River: This new regulation reopens the rainfall conditional area of Atkins Bay.
2. April 5, 2006 - Closed Area No. 20-G, Middle Kennebec River: This new regulation describes the closure of Atkins Bay due to 1.5'' of rain in 24 hours.
3. April 26, 2006 - Closed Area No. 20-G, Middle Kennebec River: This new regulation reopens the rainfall conditional area of Atkins Bay.



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4. August 17, 2006 - Closed Area No. 20-G, Middle Kennebec River: This is an administrative change, and the conditional area described in this closure has been included in Closure No. 20.
5. August 17, 2006 - Closed Area No. 20-H, Lower Kennebec River: This is an administrative change, and the area described in this closure has been included in Closure No. 21.
6. August 17, 2006 - Closed Area No. 20, Upper Kennebec River and Tributaries: This new rule removes Brookings Bay, Woolwich from the closure, administratively changes current closure lines in Hockomock Bay, and includes the areas previously defined in closures 20-G and 20-H.
7. August 17, 2006 - Closed Area No. 20-E: This is an administrative change, and the area described in this closure has been included in Closure No. 20.
8. August 23, 2006 - Closed Area No. 20: This new rule administratively corrects the seasonal classification for a portion of the lower Kennebec River.
9. October 12, 2006 - Closed Area No. 20: This new rule closes the Conditionally Approved area in Atkins Bay on the Kennebec River due to excessive rainfall.
10. December 14, 2006 - Closed Area No. 20: This new rule reopens the Conditionally Approved area in Atkins Bay on the Kennebec River.

Activity 2007:

1. April 17, 2007 - Closed Area No. 20: This new rule closes the Conditionally Approved area in Atkins Bay on the Kennebec River due to excessive rainfall.
2. May 11, 2007 - Closed Area No. 20: This new rule opens the Conditionally Approved area in Atkins Bay on the Kennebec River. It also delays the opening of the seasonal Conditionally Approved area in the Kennebec River until water quality meets approved standards.
3. June 5, 2007 - Closed Area No. 20: This new rule reopens the seasonal Conditionally Approved area in the Kennebec River. Water quality in the area has returned to approved standards.
4. October 22, 2007 - Closed Area No. 20: This new rule closes the Conditionally Approved area in Atkins Bay on the Kennebec River due to excessive rainfall.
5. October 26, 2007 - Closed Area No. 20: This new rule enlarges the size of the lower Kennebec River seasonal conditional area and changes the open season. It also reclassifies Hunnewell Cove, Phippsburg to Approved.
6. October 30, 2007 - Closed Area No. 20: This new rule reopens the rainfall conditional area in Atkins Bay, Phippsburg. This area will remain open until rainfall meets or exceeds 1.5" within a 24 hour period during the period October 1st through May 14th.

Activity 2008:



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1. February 14, 2008 - Closed Area No. 20: This amendment closes the rainfall conditional area in Atkins Bay, Phippsburg for the harvest of shellfish.
2. February 28, 2008 - Closed Area No. 20: This amendment reopens the rainfall conditional area in Atkins Bay.
3. February 28, 2008 - Closed Area No. 20: This amendment reclassifies Todd Bay as Conditionally Approved with a closed season of 9/1-12/31.
4. March 10, 2008 - Closed Area No. 20: This amendment closes the rainfall conditional area in Atkins Bay, Phippsburg for the harvest of shellfish.
5. March 27, 2008 - Closed Area No. 20: This amendment opens the Conditionally Approved area in Atkins Bay, Phippsburg.
6. April 29, 2008 - Area No. 20: This amendment closes the rainfall conditional area in Atkins Bay, Phippsburg for the harvest of shellfish.
7. May 13, 2008 - Area No. 20: This amendment opens the Conditionally Approved area in Atkins Bay, Phippsburg.
8. November 26, 2008 - Area No. 20: This amendment closes the rainfall conditional area in Atkins Bay, Phippsburg for the harvest of shellfish.

Activity 2009:

1. January 6, 2009 - Area No. 20: This amendment reopens the rainfall conditional area in Atkins Bay, Phippsburg for the harvest of shellfish due to water quality returning to the approved standard.
2. April 29, 2009 - Area No. 20: This amendment reclassifies Approved and Conditionally Approved areas in the Kennebec River, included Atkins Bay (Phippsburg), Heal Eddy and Sagadahoc Bay (Georgetown), to Conditionally Approved based on river discharge, and all areas shall close when river discharge meets or exceeds 30,000 cubic feet per second (cfs).
3. May 12, 2009 - Area No. 20: This amendment reopens the rainfall and river discharge conditional areas in the Kennebec River due to water quality returning to approved standards.
4. June 22, 2009 - Area No. 20: This amendment closes the river discharge conditional areas in the Kennebec River, Heal Eddy and Sagadahoc Bay, due to river discharge exceeding 30,000 cfs.
5. August 19, 2009 - Area No. 20: This amendment re-opens the river discharge Conditionally Approved areas in the Kennebec River, due to water quality returning to the approved standard. This amendment also expands the Prohibited area at Mill Pond, due to the presence of a wastewater discharge source to the river.
6. October 10, 2009 - Area No. 20: This amendment closes the Atkins Bay rainfall conditional area, due to rainfall exceeding 1.5 inches in 24 hours.



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7. October 19, 2009 - Area No. 20: This amendment opens the Atkins Bay rainfall Conditionally Approved area (Phippsburg), due to water quality returning to the approved standard.
8. October 26, 2009 - Area No. 20: This amendment closes the river discharge conditional areas in the Kennebec River, due to river discharge exceeding 30,000 cfs.
9. November 9, 2009 - Area No. 20: This amendment re-opens the river discharge Conditionally Approved areas in the Kennebec River, with exception of Atkins Bay. Atkins Bay remains closed due to water quality not meeting the approved standard.
10. November 10, 2009 - Area No. 20: This amendment re-opens Atkins Bay conditional area, due to water quality returning to the approved standard.
11. November 16, 2009 - Area No. 20: This amendment closes the river discharge and rainfall conditional areas in the Kennebec River, due to river discharge exceeding 30,000 cfs, and rainfall exceeding 1.5 inches in 24 hours.
12. December 18, 2009 - Area No. 20: This amendment re-opens the river discharge conditional areas in the Kennebec River due to water quality returning to the approved standard. Atkins Bay remains closed due to water quality exceeding the approved standard.
13. December 22, 2009 - Area No. 20: This amendment re-opens Atkins Bay conditional area in Phippsburg, due to water quality returning to the approved standard.

Activity 2010:

1. January 27, 2010 - Area No. 20: This amendment closes the river discharge conditional areas in the Kennebec River, due to river discharge exceeding 30,000 cfs. This amendment also modifies the river discharge closure trigger for Sagadahoc Bay and Heal Eddy, by increasing it from 30,000 cfs to 60,000 cfs, due to a recent data review of water quality sample results and an evaluation of the management plan. Sagadahoc Bay and Heal Eddy are currently open, and shall close when river discharge meets or exceeds 60,000 cfs. This amendment also clarifies the location of the boundary between the Prohibited and the Conditionally Approved areas near Parker Head Pond, a.k.a. Mill Pond (Phippsburg) due to the removal of a straight pipe.
2. January 28, 2010 - Area No. 20: This amendment closes the river discharge conditional areas in Sagadahoc Bay and Heal Eddy on the Kennebec River, due to river discharge exceeding 60,000 cfs.
3. February 10, 2010 - Area No. 20: This amendment reopens the river discharge conditional areas in the Kennebec River, due to water quality returning to the approved standard.
4. March 4, 2010 - Area No. 20: This amendment closes the Kennebec river discharge areas, including Atkins Bay, due river discharge exceeding 30,000 cfs; Sagadahoc Bay and Heal Eddy conditional areas are currently open, due to river discharge not exceeding 60,000 cfs.
5. March 11, 2010 - Area No. 20: This amendment reopens the Kennebec river discharge areas, including Atkins Bay, due to water quality returning to the approved standard.



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6. March 15, 2010 - Area No. 20: This amendment closes the Atkins Bay conditional area, due to rainfall exceeding 1.5 inches in 24 hours.
7. March 29, 2010 - Area No. 20: This amendment closes all Kennebec river discharge areas, due to river discharge exceeding 60,000 cfs.
8. April 15, 2010 - Area No. 20: This amendment reopens the river discharge conditional area in Sagadahoc Bay, Georgetown, due to water quality meeting the approved standard. The remaining Kennebec River discharge conditional areas, including Heal Eddy, remain closed due to water quality exceeding the approved standard.
9. April 22, 2010 - Area No. 20: This amendment reopens the Kennebec River discharge conditional areas, including Heal Eddy due to water quality meeting the approved standard.
10. September 9, 2010 - Area No. 20: This amendment modifies the boundary line between the conditionally approved area and prohibited area at the mouth of Mill Pond (Phippsburg), in order to extend the line to the nearest station meeting the approved standard in the open status.
11. October 4, 2010 - Area No. 20: This amendment closes the Kennebec river discharge conditional areas, due to river discharge exceeding 30,000 cfs.
12. October 29, 2010 - Area No. 20: This amendment reopens the Kennebec river discharge areas due to water quality returning to the approved standard.
13. November 3, 2010 - Area No. 20: This amendment re-opens Atkins Bay conditional area due to water quality returning to the approved standard.
14. November 5, 2010 – Area No. 20: This amendment closes Atkins Bay rainfall conditional area, due to rainfall exceeding 1.5 inches in 24 hours.
15. November 7 2010 – Area No. 20: This amendment closes the river discharge conditional areas on the Kennebec River, due to river discharge exceeding 30,000 cfs.
16. December 2, 2010 – Area No. 20: This amendment re-opens the Kennebec River discharge conditional areas due to water quality returning to the approved standard.
17. December 3, 2010 - Area No. 20: This amendment closes the Kennebec River discharge conditional areas due to river discharge exceeding the 30,000 cfs.
18. December 15, 2010 - Area No. 20: This amendment closes all of the Kennebec River discharge conditional areas due to river discharge exceeding the 60,000 cfs.
19. December 30, 2010 - Area No. 20: This amendment reclassifies Mill Pond (Phippsburg) from Prohibited to Conditionally Approved due to a remediation of a pollution source and water quality meeting the approved standard in the open status. This amendment also re-opens the river discharge Conditionally Approved areas on the Kennebec River, due to water quality returning to the approved standard.



Activity 2011:

1. March 11, 2011 - Area No. 20: This amendment closes the river discharge and rainfall conditional areas on the Kennebec River, due to river discharge exceeding 30,000 cfs and rainfall exceeding 1.5 inches in a 24 hour period.
2. March 29, 2011 - Area No. 20: This amendment re-opens the river discharge Conditionally Approved areas on the Kennebec River, due to water quality returning to the approved standard.
3. April 12, 2011 - Area No. 20: This amendment closes most of the river discharge conditional areas on the Kennebec River, due to river discharge exceeding 30,000 cfs.
4. April 13, 2011 - Area No. 20: This amendment closes Sagadahoc Bay and Heal Eddy, due to river discharge exceeding 60,000 cfs.
5. May 3, 2011 - Area No. 20: This amendment opens the river discharge conditional areas in Sagadahoc Bay and Heal Eddy, due to water quality meeting the approved standard, and river discharge dropping below 60,000 cfs.
6. May 4, 2011 - Area No. 20: This amendment opens all of the river discharge conditional areas, due to water quality meeting the approved standard, and river discharge that is a direct result of rainfall and/or terrestrial runoff dropping below 30,000 cfs.
7. May 16, 2011 - Area No. 20: This amendment closes most of the river discharge conditional areas on the Kennebec River, due to river discharge exceeding 30,000 cfs.
8. May 17, 2011 - Area No. 20: This amendment closes all of the river discharge conditional areas on the Kennebec River, due to river discharge exceeding 60,000 cfs.
9. June 1, 2011 - Area No. 20: This amendment opens all of the conditional river discharge areas in the Kennebec River, due to water quality meeting the approved standard, and river discharge decreasing.
10. August 24, 2011 - Area No. 20: This amendment closes the northern portion of Atkins Bay due to a malfunctioning septic system identified in the area.
11. August 29, 2011 - Area No. 20: This amendment closes all of the river discharge conditional areas in the Kennebec, due to river discharge exceeding 60,000 cfs.
12. September 12, 2011 - Area No. 20: This amendment reopens the river discharge conditional area based on a river discharge of 60,000 cfs for Heal Eddy and Sagadahoc Bay due to water quality meeting the approved standard.
13. September 22, 2011 - Area No. 20: This amendment reopens the river discharge conditional areas on the Kennebec River, that are based on a river discharge of 30,000 cfs due to water quality meeting the approved standard.
14. October 3, 2011 - Area No. 20: This amendment closes all of the river discharge conditional areas that are managed on 30,000 cfs in the Kennebec River, due to river discharge exceeding



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30,000 cfs. Atkins Bay, Phippsburg is also closed due to rainfall exceeding 1.5 inches in a twenty-four hour period.

15. October 12, 2011 - Area No. 20: This amendment removes the Prohibited area in Atkins Bay due to a remediated pollution source and water quality scores meeting the approved standard.
16. October 31, 2011 - Area No. 20: This amendment reopens the river discharge conditional areas on the Kennebec River that are based on a river discharge of 30,000 cfs, due to water quality meeting the approved standard.
17. November 12, 2011 - Area No. 20: This amendment closes the river discharge conditional areas on the Kennebec River that are based on a river discharge of 30,000 cfs due to water quality not meeting the approved standard and closes Atkins Bay due to rainfall exceeding 1.5" in 24 hours.
18. November 23, 2011 - Area No. 20: This amendment reopens on FRIDAY at 12:01 am, NOVEMBER 25, 2011, the following Conditionally Approved areas; the Lower Kennebec, Atkins Bay and the area east of Long Island (E.) due to water quality meeting approved standards.
19. December 2, 2011 - Area No. 20: This amendment closes the river discharge conditional areas on the Kennebec River that are based on a river discharge of 30,000 cfs, due to water quality not meeting the approved standard.
20. December 16, 2011 - Area No. 20: This amendment reopens the river discharge conditional areas and Atkins Bay that are based on a river discharge of 30,000 cfs and rainfall, due to water quality meeting the approved standard.

Activity 2012:

1. February 17, 2012 - Area No. 20: This amendment redefines the trigger limits for conditional areas managed by the river gauge and eliminates seasonal closures.
2. April 23, 2012 - Area No. 20: This amendment closes the rainfall conditional area on the Kennebec River (Atkins Bay) due to rainfall exceeding 1.5 inches in a 24 hour period.
3. May 6, 2012 - Area No. 20: This amendment opens the Todd Bay conditional area due to water quality and shellfish meats meeting approved standards.
4. April 25, 2012 - Area No. 20: This amendment closes all Kennebec River conditional areas due to river discharge exceeding 60,000 cfs.
5. May 7, 2012 - Area No. 20: This amendment opens the Upper Kennebec River (B.1), Middle Kennebec River (B.3) and Wyman Bay (B.6) due to water quality and shellfish meats meeting approved standards.
6. May 8, 2012 - Area No. 20: This amendment reopens the river discharge conditional areas Sag Bay and Heal Eddy on the Kennebec River, that are based on a river discharge of 60,000 cfs due to water quality meeting the approved standard.



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7. May 9, 2012 - Area No. 20: This amendment opens the Atkins Bay conditional area (C) and Popham Bar Conditional Area (B.7) due to water quality and shellfish meeting approved standards.
8. May 11, 2012 - Area No. 20: This amendment reopens Outer Mill Pond (Phippsburg) due to water quality and shellfish meeting approved standards.
9. June 2, 2012 - Area No. 20: This amendment closes Atkins Bay due to predictions of rainfall exceeding 1.5" in 24 hours.
10. June 4, 2012 - Area No. 20: This amendment closes all Conditionally Approved areas in the Kennebec River, with the exception of Heal Eddy and Sag Bay, due to river flow exceeding 40,000 cubic feet per second.
11. June 5, 2012 - Area No. 20: This amendment closes the Conditionally Approved areas in Sagadahoc Bay and Heal Eddy due to river flow exceeding 60,000 cubic feet per second.
12. June 17, 2012 - Area No. 20: This amendment reopens Atkins Bay, Popham Bar and Todd Bay conditional areas due to shellfish and water quality meeting approved standards. All other conditional areas remain closed.
13. June 19, 2012 - Area No. 20: This amendment reopens all conditional areas with the exception of Outer Mill Pond (Phippsburg) in the Kennebec River, due to water quality and shellfish samples returning to approved standards.
14. June 28, 2012 - Area No. 20: This amendment closes all conditional areas with the exception of Sagadahoc Bay and Heal Eddy (Georgetown) in the Kennebec River due to river flow exceeding 40,000 cubic feet per second.
15. July 6, 2012 - Area No. 20: This amendment opens the Atkins Bay, Wyman Bay and Popham Bar conditional areas.
16. July 11, 2012 - Area No. 20: This notice opens the Middle Kennebec conditional area.
17. July 13, 2012 - Area No. 20: This notice opens the Todd Bay and Upper Kennebec conditional areas.
18. November 1, 2012 - Area No. 20: This notice closes all of the Conditionally Approved areas in the Kennebec River, including Heal Eddy and Sag Bay, due to river flow exceeding 30,000 and 60,000 cubic feet per second.
19. November 11, 2012 - Area No. 20: This notice opens Popham Bar and Atkins Bay Conditionally Approved areas in the Kennebec River.
20. November 14, 2012 - Area No. 20: This notice reopens the rainfall conditional areas: Upper Kennebec, Middle Kennebec, Todd Bay, Lower Todd Bay and Wyman Bay due to water quality returning to approved standards. Outer Mill Pond, Sagadahoc Bay and Heal Eddy remain closed.



21. November 16, 2012 - Area No. 20: This notice reopens the rainfall conditional areas in Heal Eddy and Sagadahoc Bay, (Georgetown) due to water quality returning to approved standards.
22. December 18, 2012 - Area No. 20: This notice closes the rainfall conditional area in Atkins Bay (Phippsburg) due to greater than one and a half inches of rainfall in a twenty-four hour period.
23. December 23, 2012 - Area No. 20: This notice closes the river discharge conditional area due to flow exceeding 40,000 cfu.

Shoreline Survey Activity 2000-2012

The Approved and Conditionally Approved areas of growing area WM were surveyed in 2011. DMR and DEP staff visited 537 properties. A total of eight actual pollution sources were identified and the town officials of Arrowsic, Georgetown and Phippsburg were notified. Additional work was completed in 2012 for specific areas that were not covered in the 2011 survey period including Dix Island, the Mill Pond and Wyman Bay which were also targeted as hot spot areas from ongoing data collection from the Kennebec shellfish and water study work conducted in 2011. All actual or potential pollution sources have been either remediated or classified Prohibited. Table 2 lists all current outstanding domestic pollution sources that have been identified. Two problems did not result in a reclassification in waters open to harvesting. Due to the distance to shore and the unconfirmed nature of the pipe in GASS ID WM015, "UK Broken Pipe", resulted in no management action being taken. The other potential indirect pollution source was a malfunctioning holding tank and a recommendation to the LPI was made to follow up with the owner in GASSID WM012 (Figure 9.) to pump the holding tank on a regular basis. The location of the holding tank did not pose a direct risk to the growing area waters.

Overview of Pollution Sources

Tables 1 - 3 lists all new and pre-existing pollution sources in Growing Area WM that are considered discharges to the Growing Area that could affect water quality. Sources of pollution may include domestic or industrial waste, discharges from boats, run-off from manure piles in agricultural areas, streams that have consistently elevated scores or anything else that could cause impairment of the waters of the growing area. Pollution sources are categorized in the database as a problem with a Y (yes) or N (no). Each pollution source is given an impact rating which advises whether the pollution source is an actual or potential pollution source with a direct or indirect discharge to the shore. All of the domestic pollution sources have been reported to the local plumbing inspector. Pollution sources noted on Tables 1 through 3 are shown in Figures 3 thru 9. 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. Pollution sources with a GASS ID of NA (not applicable) are located in areas that as of 12/31/2012 have yet to be assigned a two-mile segment.

Federally Permitted Discharges

There are five National Pollution Discharge Elimination System (NPDES) permits in growing area WM. The permits consist of a combination of waste water treatment plant operations and industrial operations (see Table 1 and Figures 3 and 4). All NPDES facilities are located in a 2100 acre Prohibited area.



Table 1. Area WI NPDES Permitted Discharges:

Pollution Area #	GASS ID	Permit #	Type	Facility	Water Body
20 A1	NA	ME0036358	Discharge	Bath Water District	Sasanoa River
20 A1	NA	ME0100021	WWTP	Bath WWTP	Kennebec River
20 A1	WM024	ME0001732	Discharge	Bath Iron Works	Kennebec River
20 A1	WM024	ME0100021	Discharge	City of Bath	Kennebec River
20 A1	NA	ME0000949	Discharge	Stinson Seafood	Kennebec River

Residential Domestic Waste

Shellfish Growing Area WM currently has a total of 24 two-mile segments. Each segment has its' own growing area shoreline survey (GASS) ID number and pollution sources are identified by the two-mile segment where the source was found. As each growing area's survey is updated, each property will have their septic system's coordinates entered into the new Public Health Division shoreline survey database which will then have the ability to show each property on a GIS map along with the specifics of the property's waste disposal. Growing area WM includes portions of the towns of Bath, Phippsburg, Woolwich, Arrowsic, and Georgetown. Each of these towns has their own licensed plumbing inspectors (LPI).

Table 2. Area WM Shoreline Survey Identified Pollution Sources:

Town	GASS ID	Source	Survey Date	Impact	Action Taken
Phippsburg	WM019	Grey Water	08/02/2011	Potential indirect	Prohibited Area
Phippsburg	WM019	Septic Pipe Leak	08/04/2011	Potential indirect	Prohibited Area
Phippsburg	WM015	UK Broken Pipe	08/10/2011	Potential Indirect	No Action
Phippsburg	WM012	Holding Tank	08/25/2011	Potential Indirect	No Action

Licensed Overboard Discharges

There is a total of 37 active licensed overboard discharges in growing area WM. 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 on 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 1.4×10^5 fc/100 ml. All closures are of adequate size to protect public health. Twenty-four OBDs were removed during the review period.

Table 3. Area WM Active Licensed Overboard Discharges:

Pollution Area #	Permit #	GASS ID	Location	Water Body	Flow	Acres Needed	Current Closure Area
20 A3	951	NA	Georgetown	Kennebec River	300	1.88	128
20 A1	1085	WM022	Phippsburg	Kennebec River	300	1.88	2100
20 A3	1588	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	1643	NA	Georgetown	Kennebec River	360	2.25	128
20 A1	1682	WM023	Bath	Winnegance Creek	450	2.82	2100
20 A1	1846	NA	Bath	Kennebec River	300	1.88	2100
20 A1	1850	NA	Bath	Kennebec River	300	1.88	2100
20 A1	1851	NA	Bath	Kennebec River	300	1.88	2100
20 A3	1908	NA	Georgetown	Kennebec River	360	2.25	128
20 A1	1987	NA	Bath	Kennebec River	300	1.88	2100
20 A1	2095	NA	Bath	Kennebec River	600	3.68	2100
20 A1	2184	NA	Woolwich	Kennebec River	360	2.25	2100
20 A3	2275	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	2329	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	2339	NA	Georgetown	Kennebec River	450	2.82	128
20 A1	2464	NA	Bath	Kennebec River	360	2.25	2100
20 A3	2855	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	2909	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	2955	NA	Georgetown	Kennebec River	300	1.88	128
20 A1	3153	NA	Woolwich	Sasanoa River	300	1.88	2100
20 A1	3154	NA	Woolwich	Sasanoa River	1000	6.37	2100
20 A1	3440	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	3441	NA	Arrowsic	Kennebec River	360	2.25	2100
20 A3	3738	NA	Georgetown	Kennebec River	300	1.88	128
20 A1	4390	NA	Georgetown	Kennebec River	500	3.07	128
20 A1	4689	NA	Woolwich	Kennebec River	300	1.88	2100
20 A1	6033	NA	Woolwich	Kennebec River	315	1.93	2100



20 A3	6739	NA	Georgetown	Kennebec River	360	2.25	128
20 A3	6849	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	6970	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	7003	NA	Georgetown	Kennebec River	900	5.31	128
20 A3	7150	NA	Georgetown	Kennebec River	300	1.88	128
20 A1	7186	NA	Woolwich	Sasanoa River	300	1.88	2100
20 A3	7246	NA	Georgetown	Kennebec River	600	3.68	128
20 A3	7530	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	7724	NA	Georgetown	Kennebec River	300	1.88	128
20 A3	7829	NA	Georgetown	Kennebec River	300	1.88	128

Municipal Waste Water Treatment Plant, Lift/Pump Stations and Combined Sewer Overflow

The Department of Environmental Protection (DEP) is responsible for monitoring municipal waste discharges in the state of Maine. Growing Area WM has one municipal waste water treatment plant.

Bath WWTP

The City of Bath Wastewater Treatment Plant (WWTP) is located at the town landing, with the plant’s outfall in the waters of the Kennebec River 300 feet from the plant. This plant was last evaluated on 8/12/11. The construction of the plant was completed in 2008 and serves approximately 8,500 residents. This plant intake system is a combined collection system with five combined sewer overflow (CSO) points. The max wet weather flow of this plant is six to seven million gallons a day (MGD). The amount of rainfall causing overflow is undetermined.

The plant has conventional activated sludge treatment, with a design flow of 3.5 MGD; there is no bypass capability at this plant and the plant is not subject to flooding during wet weather or high tides. No holding ponds are present but half of the aeration basins are used for wet weather storage (approximately 432,000 gallon capacity). The actual average daily flow rate is 2.1 MGD. There are 13 pump stations; two of the pumps have emergency bypasses. All pump stations are located in a large prohibited area (>2,100 acres).

The Bath wastewater treatment plant is located in a large Prohibited area. All of the Kennebec River north of the treatment plant is classified as Prohibited. In calculating the necessary closure around the Bath WWTP, only the area downstream (South) of the plant was considered. Since the Bath WWTP has a combined collection system that includes storm water, two dilution calculations were completed: 1) using the average daily flow of 2.1 MGD and a fecal concentration of 1.4×10^5 fc/100ml; and 2) using max wet weather flow of 7 MGD and a fecal concentration of 1.4×10^4 fc/100 ml. The average depth of receiving waters at mid-tide was estimated at 40 feet. The necessary closure sizes based on the two dilution calculations were



1,611 (average flow) and 537 acres (wet weather flow). The current closure size downstream of the treatment plant is greater than 2,100 acres.

Upriver WWTPs

In addition to the Bath WWTP, wastewater treatment facilities are also located in the upper portion of the Kennebec River watershed north of the city of Bath and discharge into the river: Anson-Madison, Augusta, Gardiner, Richmond, Skowhegan and Waterville. These facilities are 22 to 45 miles above the Bath bridge. Additionally, there are four major WWTPs located on the Androscoggin River: Lewiston-Auburn, Brunswick, Norway and Rumford-Mexico. Brunswick is the closest facility on the Androscoggin River being about 14 miles from the Bath bridge. The river distance from these facilities to the growing area is expected to result in considerable dilution. Prior to draining into the Atlantic Ocean, the Androscoggin River joins the Kennebec river at Merrymeeting Bay, approximately 20 miles inland. These wastewater treatment plants are north of the upland boundary of growing area WM, and therefore are not reviewed in this report but are assumed to potentially play a role during high river discharge events. All areas of the Kennebec north of the city of Bath are classified as Prohibited.

Treatment Plant Pollution Areas: Pollution area 20 A.1 is associated with a WWTP facility.

Stormwater

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

The City of Bath has a snow dump discharge permit to tidewater. The location of these snow dumps is located in a large Prohibited area (>2,100 acres).

Combined Sewer Overflows (CSOs) are discharges of untreated wastewater from municipal sewerage systems that carry mixtures of sanitary sewage, stormwater, and sometimes industrial wastes. They occur mostly during and after rain events or snowmelt. Flows within the combined sewer system during these wet weather events can be as high as fifty (50) times the normal dry weather flows. Large volumes of water entering the combined sewer system (CSS) through catch basins, old and leaky pipes, roof drains, cellar drains, sump pumps, and other sources cause the capacity of the system to be exceeded.

The City of Bath has four CSOs which discharge to the Kennebec River. The location of these CSOs is in a large Prohibited area (>2,100 acres).

Storm-water Pollution Areas: Pollution area 20 A.1 is classified as Prohibited due in part to stormwater pollution.



Non-point Pollution Sources

Non-point source (NPS) pollution is water pollution affecting a water body from diffuse sources, such as polluted runoff from agricultural areas draining into a river, or wind-borne debris blowing out to sea. Nonpoint source pollution can be contrasted with point source pollution, where discharges occur to a body of water at a single location, such as discharges from a chemical factory, urban runoff from a roadway storm drain or from ships at sea. NPS may derive from many different sources with no specific solution to rectify the problem, making it difficult to regulate.

Mill Pond (20 A.2) is classified Prohibited due to poor water quality scores and non-point source pollution.

Streams and Drainages

Streams and tidal creeks are a source of fresh water to the WM growing area, and carry stormwater, snowmelt and groundwater into the estuary system. Waste, including that containing fecal matter, which is deposited on land, may be washed into streams and tidal creeks and transported to shellfish growing areas, contributing to elevated fecal counts in waters that are filtered by shellfish.

Stream samples have been collected in WM throughout the 2000 to 2012 review period. Sample records prior to 2010 only have anecdotal location information and therefore cannot be used in identifying specific pollution sources.

Stream samples were collected in WM in 2010 (Table 4). The two highest scores were both associated with rainfall events. Additional data is needed to make any conclusions; however, the watershed is subject to large volumes of tidal flushing.

Table 4. Area WM Streams:

Town	Pollution Area	Stream ID	GASS ID	Sample Date	Score	Salinity
Georgetown	20 D	S10WM023.00	NA	23-Jun-10	16	28
Phippsburg	20 A.2	S10WM009.80	WM016	30-Jun-10	16	8
Phippsburg	20 A.2	S10WM009.80	WM016	14-Jul-10	1500	15
Georgetown	20 D	S10WM023.00	NA	11-Aug-10	110	26
Georgetown	20 D	S10WM024.00	NA	11-Aug-10	1700	0
Phippsburg	20 A.2	S10WM009.80	WM016	30-Aug-10	9.1	8
Phippsburg	20 A.2	S10WM009.80	WM016	13-Sep-10	6	20
Phippsburg	20 A.2	S10WM009.80	WM016	17-Dec-10	14	0

Stream Pollution Areas:



Pollution Area 20 A.2 is classified Prohibited due to poor water quality that may in part be seasonally impacted by stream discharge pollution.

Seasonal Impacts

Seasonal activity in growing area WM is based on river discharge and rainfall. Pollution areas 20 B.1-B.7 of the Kennebec River are classified as Conditionally Approved based on river discharge and the amount of discharge required for a closure varies seasonally. 20 B.1-B.7 close when discharge meets or exceeds 30,000 cubic feet per second October- January, 60,000 cubic feet per second February-April and 40,000 cubic feet per second May-September. Area 20 C is also classified on seasonal amount of river discharge. In addition, 20 C. closes seasonally (October 1 – May 14) when rainfall exceeds 1.5” in 24 hours.

Seasonal Pollution Areas:

Areas 20 B1 – B7 are conditional on river discharge and will close when discharge meets or exceeds 30,000 cubic feet per second October- January, 60,000 cubic feet per second February-April and 40,000 cubic feet per second May-September.

Area 20 C is conditional on river discharge and will close when discharge meets or exceeds 30,000 cubic feet per second October- January, 60,000 cubic feet per second February-April and 40,000 cubic feet per second May-September AND will close October 1 – May14 when rainfall exceeds 1.5” in a 24 hour period.

Marinas

Marinas and Mooring Fields

The three marinas located in growing area WM are located in a 2100 acre Prohibited area in the upper Kennebec River. These marinas are approximately six miles upriver from the nearest Conditionally Approved shellfish harvest area.

Marina Pollution Areas: Area 20 A.1 is classified Prohibited due in part to the presence of three marinas.

Industrial Pollution

Bath Iron Works Corporation (BIW) is a ship building facility located in Bath, ME on the Kennebec River. BIW has a NPEDES permit (# ME0001732) to discharge 0.84 MGD non-contact cooling water, miscellaneous dry dock and ship discharges, and snow dump discharge to tidewater; toxic testing is required on the cooling water effluent. Wastewater sources are detailed in Table 5. All of BIW’s outfalls are located in a large Prohibited area (see Bath WWTP review for closure details).

Table 5. Bath Iron Works (BIW) Permitted Discharges



Outfall No.	Description	Volume
#005A	Noncontact cooling (municipal) water from building #0045 XLE compressors and breath air compressor.	650,000 gpd maximum 132,000 gpd average
#006A	Treated ship ballast (river/sea) water discharged at 500 gallons per minute maximum rate, occurring before and after dry docking ships.	800,000 gpd maximum per ship
#007A	Noncontact cooling (municipal) water from air compressors at paint and blast facility (humidity, slave cooler, trim cooler).	45,000 gpd average

Industrial Pollution Areas: Area 20 A.1 is classified as Prohibited due in part to the presence of Bath Iron Works.

Agriculture Activities

Growing area WM has no commercial agricultural activity within the coastal zone.

Agriculture Pollution Areas:

There are no pollution areas associated with agricultural operations in growing area WM.

Domestic Animals and Wildlife Activity

The 2011 shoreline survey did not identify any problem areas associated with domestic animals and/or wildlife.

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

Popham Beach is 529 acre state park with sandy beaches, a bath house, and picnic areas. All the park facilities are hooked into septic systems. Dogs are allowed on the beach from October 1 to March 31.

Aquaculture/Wet Storage Activity

There are no aquaculture or wet storage sites in growing area WM.

Hydrographic and Meteorological Assessment

The NSSP program requires, as part of the sanitary survey, the evaluation of hydrographic and meteorological factors in order to determine the factors that may affect distribution and persistence of pollutants throughout the growing area (WM). Climate and weather can affect the distribution of pollutants or can be the cause of pollutant delivery to a growing area. Prevailing winds can determine the distribution of pollutants in a growing area. Rainfall patterns and intensity can affect water quality through pollutant delivery in runoff or cause flooding which can affect the volume and duration of



pollutant delivery. Examples of hydrographic factors that are evaluated in this report are tidal transport, and rainfall.

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 station at Portland, Maine indicate a mean tidal range of 9.2 ft. Currents in the area are predominantly driven by the tides. All along the coast of Maine, the tide flows generally to the north and east and ebbs to the south and west. Weather conditions effect tidal ranges and current speeds, sometimes very strongly.

In order to explore the effect of tide on water quality in growing area WM, samples collected at flood and ebb tides were analyzed and presented in the Tables 6 and 7.

Table 6. Geometric Mean and P90 Report for Samples Collected at Ebb Tide

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM001.00	A	18	16	3.3	0.4	35	11.3	32	174	6/15/2005
WM003.00	A	11	6	4.9	0.65	240	35.2	38	215	2/11/2003
WM004.00	CA	15	10	6.3	0.56	50	34.7	36	199	2/11/2003
WM004.10	CA	15	9	9	0.73	460	81	37	208	2/11/2003
WM004.50	CA	15	9	7.7	0.58	93	44.8	37	208	2/11/2003
WM004.80	CA	16	9	6.5	0.56	90	34.9	37	212	1/13/2003
WM005.00	CA	14	6	4.7	0.52	44	22.7	40	230	9/26/2002
WM006.00	CA	15	7	7.7	0.45	93	30.7	39	225	9/26/2002
WM006.50	CA	7	7	5.5	0.27	14	12.7	31	163	12/18/2006
WM008.00	CA	15	7	7.8	0.53	93	39.3	39	225	9/26/2002
WM009.00	CA	14	6	9	0.56	240	49.1	40	230	9/26/2002
WM009.80	CA	13	5	14	0.42	44	48.6	41	237	9/26/2002
WM012.00	CA	24	13	9	0.56	106	48.2	38	215	6/20/2002
WM015.00	CA	30	17	6.7	0.6	240	40.2	37	212	10/16/2002
WM016.00	CA	25	15	7.8	0.58	118	44	37	208	6/20/2002
WM017.20	CA	22	13	9.4	0.59	240	55.8	37	209	6/20/2002
WM017.50	P	25	15	15	0.54	93	75.1	37	208	6/20/2002
WM018.20	P	25	15	14	0.47	240	57.3	37	208	6/20/2002
WM019.10	P	10	4	9.7	0.55	93	52.2	40	235	10/26/2003
WM019.20	P	23	10	6	0.41	93	20.9	40	230	5/8/2002
WM019.40	P	22	11	7.9	0.42	75	27.6	38	221	12/4/2002
WM020.00	CA	12	6	4.8	0.62	280	31.6	38	221	2/22/2004
WM022.00	CA	11	6	4.2	0.6	220	26	38	215	2/22/2004
WM023.00	CA	13	7	5.3	0.65	220	37.7	38	216	2/22/2004
WM024.00	CA	16	5	4.8	0.56	280	26.1	42	247	4/27/2003
WM026.00	CA	12	6	9.2	0.53	93	45.2	38	221	10/20/2002



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WM026.90	CA	20	11	5.3	0.51	152	24.4	38	214	10/20/2002
WM027.00	CA	21	12	7.2	0.6	160	43.9	37	211	10/20/2002
WM028.00	CA	15	6	4.6	0.54	100	23.6	40	235	12/15/2002
WM029.10	P	27	10	20	0.59	460	115	41	239	6/19/2002

Table 7. Geometric Mean and P90 Report for Samples Collected at Flood Tide

Station	Class	Count	MFCOUNT	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM001.00	A	30	26	4.5	0.51	240	20.7	32	176	9/8/2005
WM003.00	A	30	30	4.2	0.59	125	24.1	31	163	6/18/2008
WM004.00	CA	30	30	6	0.62	140	38.5	31	163	5/14/2008
WM004.10	CA	30	30	5.4	0.56	136	29.2	31	163	5/14/2008
WM004.50	CA	30	30	5.1	0.56	130	27.6	31	163	5/14/2008
WM004.80	CA	30	30	5.2	0.48	92	22.2	31	163	5/14/2008
WM005.00	CA	30	30	3.8	0.52	122	18	31	163	8/11/2008
WM006.00	CA	30	30	4.9	0.52	120	23.1	31	163	11/4/2008
WM006.50	CA	30	30	5.7	0.53	146	27.4	31	163	11/4/2008
WM008.00	CA	30	30	6.9	0.57	140	38	31	163	8/11/2008
WM009.00	CA	30	30	6.4	0.53	120	31.3	31	163	11/4/2008
WM009.80	CA	30	30	5.5	0.45	74	21.5	31	163	2/24/2009
WM012.00	CA	30	30	10	0.57	160	55.9	31	163	10/24/2007
WM015.00	CA	30	30	7	0.53	120	34.8	31	163	6/26/2007
WM016.00	CA	30	30	6.2	0.54	116	31.2	31	163	7/11/2007
WM017.20	CA	30	30	8.4	0.51	140	38.6	31	163	2/21/2007
WM017.50	P	30	28	13	0.59	180	74.8	31	169	3/28/2006
WM018.20	P	30	28	15	0.54	154	73.1	31	169	3/20/2006
WM019.10	P	30	30	6.1	0.45	104	23.9	31	163	10/13/2008
WM019.20	P	30	30	8.5	0.6	160	51.1	31	163	11/13/2007
WM019.40	P	30	30	8.9	0.6	124	53.2	31	163	11/13/2007
WM020.00	CA	30	30	3.6	0.42	29	12.7	31	163	6/15/2008
WM022.00	CA	30	30	4.5	0.48	120	19	31	163	6/15/2008
WM023.00	CA	30	30	2.8	0.32	35	7.5	31	163	2/26/2008
WM024.00	CA	30	30	3.8	0.43	54	14.1	31	163	6/15/2008
WM026.00	CA	30	30	6.4	0.53	96	30.6	31	163	9/20/2009
WM026.90	CA	30	30	5.6	0.47	54	22.9	31	163	4/5/2009
WM027.00	CA	30	30	5	0.52	82	23.6	31	163	3/15/2009
WM028.00	CA	30	30	4.8	0.47	96	19.5	31	163	3/15/2009
WM029.10	P	30	30	17	0.63	760	113	31	163	11/7/2006



Rainfall

In order to investigate how water quality is impacted by rainfall events which do not necessitate an emergency flood closure, a rainfall assessment for all Approved and Conditionally Approved stations in growing area WM was completed. For this assessment, the geometric mean and P90 scores were recalculated using only data points which were collected after 0.50 or more inches of cumulative rainfall were recorded up to 72 hours prior to sample collection (sum of rainfall recorded in the AM on day of sample, day before sample and two days before sample was taken; Table 8) and for stations with at least 10 samples. In this calculation, all random data collected between 2005 and 2012 were included. In completing this assessment, the data collected under dry or near dry conditions (<0.50 inches of rainfall in 72 hours), were omitted from the calculation. While the results of this calculation show that all stations that are classified as Approved retain geometric mean scores of less than 14 when using data collected after rainfall, the P90 scores for multiple Conditionally Approved stations increase, indicating that multiple Conditionally Approved stations are impacted by intermittent pollution that occurs after rain events.

Table 8. Geometric Mean and P90 Report for Samples Collected after >0.5 in. of Rainfall

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM001.00	A	19	14	6.2	0.47	35	25.7	34	191	3/30/2005
WM003.00	A	88	74	14	0.71	840	118	33	179	3/30/2005
WM004.00	CA	42	33	13	0.64	600	83.5	34	185	3/30/2005
WM004.10	CA	43	34	15	0.63	440	96.5	34	185	3/30/2005
WM004.50	CA	55	46	15	0.65	800	107	33	180	3/30/2005
WM004.80	CA	53	44	12	0.62	158	76.2	33	180	3/30/2005
WM005.00	CA	32	27	8	0.64	200	54.5	33	179	3/30/2005
WM006.00	CA	29	24	13	0.69	560	101	33	181	3/30/2005
WM006.50	CA	29	29	13	0.73	680	114	31	162	8/23/2006
WM008.00	CA	33	28	16	0.6	380	96.6	33	178	3/30/2005
WM009.00	CA	34	29	17	0.63	380	106	33	178	3/30/2005
WM009.80	CA	31	26	15	0.57	180	84.2	33	179	3/30/2005
WM012.00	CA	31	26	10	0.62	160	65.9	33	179	3/30/2005
WM015.00	CA	35	30	12	0.68	400	94	33	177	3/30/2005
WM016.00	CA	34	29	13	0.58	260	75	33	178	3/30/2005
WM017.20	CA	28	23	12	0.52	140	58.2	33	181	3/30/2005
WM017.50	P	25	20	27	0.51	180	127	33	184	3/30/2005
WM018.20	P	26	21	15	0.54	154	77.8	33	183	3/30/2005
WM019.10	P	18	13	24	0.63	360	156	35	193	3/30/2005
WM019.20	P	24	20	12	0.63	160	78.2	33	180	3/30/2005
WM019.40	P	24	22	12	0.61	124	74.8	32	171	3/30/2005

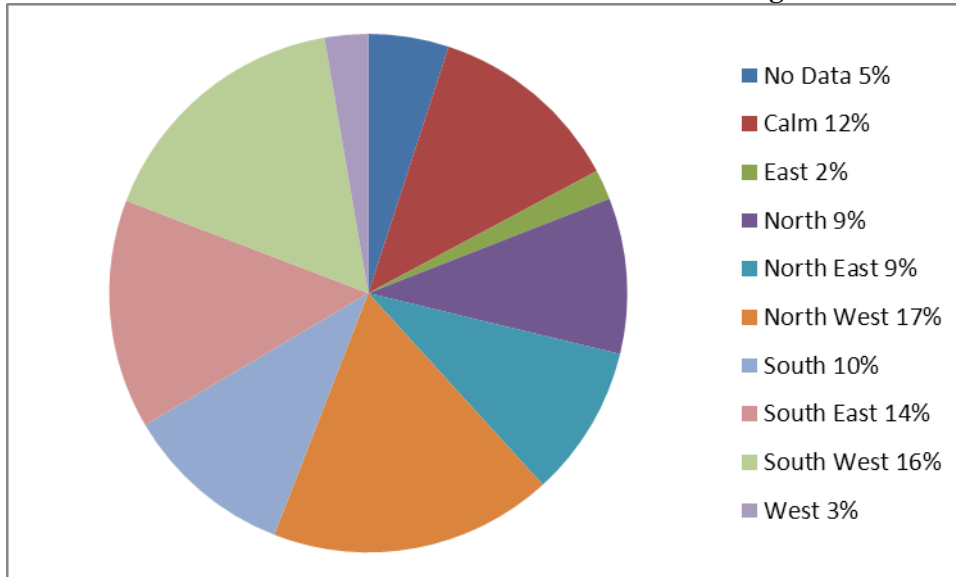


WM020.00	CA	47	42	13	0.71	1400	110	32	173	3/30/2005
WM022.00	CA	46	41	8.8	0.63	220	56.8	32	174	3/30/2005
WM023.00	CA	27	22	5.4	0.57	220	29.7	33	182	3/30/2005
WM024.00	CA	27	22	8.6	0.68	460	66	33	182	3/30/2005
WM026.00	CA	52	40	27	0.72	1100	228	34	187	3/30/2005
WM026.90	CA	22	18	14	0.81	460	156	33	182	3/30/2005
WM027.00	CA	31	26	12	0.73	460	108	33	179	3/30/2005
WM028.00	CA	43	38	12	0.72	580	103	32	174	3/30/2005
WM029.10	P	36	25	53	0.7	880	424	35	196	3/31/2005

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 2005-2010, the percentage of samples collected at each of the wind directions was placed on a pie chart (Figure 10) to illustrate which wind directions were most frequently noted on the field sheet. The predominant wind direction noted was Northwest (17%). The next most common wind direction noted is Southwest (16%). The industrial and commercial areas in the Kennebec River lie within a 2100 acre Prohibited area. It is unlikely that wind direction has any impact on pollution loading in this area.

Figure 10. Breakdown of wind direction values 2005 - 2012 in Growing Area WM



River Discharge

The Kennebec River system is one of the primary sources of freshwater to the Gulf of Maine.



At Merrymeeting Bay, the upper Kennebec River receives waters from the Androscoggin River and four other minor river systems. The Kennebec and Androscoggin, are the second and third largest rivers in Maine. From its source at Moosehead Lake to open ocean, the Kennebec River is approximately 225 km (140 mi) long and has a drainage area of approximately 14,775 km² (5,704 mi²). The Androscoggin River, whose source is Umbagog Lake in New Hampshire, is about 213 km (132 mi) long and drains 8,500 km² (3,282 mi²). The Sasanoa River joins the estuary on the bank opposite the city of Bath, which connects the Kennebec River with the Sheepscot River. Main channel depths at low tide typically range from 17 m (58 ft.) and 25 m (82 ft.).

The Kennebec's daily tidal range at its mouth averages 2.6 m (8.5 ft.). At Bath, the tidal range averages 2.1 m (6.8 ft.). The amount of seawater flowing in and out of the river on each tide is relatively large (1.0 x 10⁸ m³ or 130,795,061 yards³). Tidal waters in the estuary extend north to Augusta on the Kennebec and to the dammed series of falls separating Brunswick and Topsham on the Androscoggin River.

There is a significant presence of both point and non-point pollution sources in the Kennebec and Androscoggin rivers' watersheds, with the majority of these sources located north of Merrymeeting Bay. These pollution sources include eight municipal waste water treatment plants (six with combined sewer overflows), and multiple agricultural farms, as well as multiple acres of impervious surfaces located in urban and suburban areas of the watersheds. After heavy rainfall, pollution from these sources may be transported to the Kennebec and Androscoggin rivers as overland run-off, or discharged directly into the river via combined sewer overflows and WWTP bypasses. Ultimately, fecal pollution from these point and non-point sources are transported downriver and eventually to the lower Kennebec shellfish beds.

The lower Kennebec River sustains water quality impacts from rainfall events which occur throughout the entire Kennebec and Androscoggin rivers' watersheds. The impact from these rain events on water quality is cumulative and therefore cannot always be predicted by monitoring localized rain events at rain stations located in the lower Kennebec River. Accounting for the volume of water that drains the entire watershed by managing the shellfish flats on changes in the rates of river discharge provides an opportunity to consider pollution transport from upriver and its cumulative effect on water quality in growing area WM.

The majority of the lower Kennebec is classified as Conditionally Approved on river discharge.

Water Quality Review

Table 9 lists all active Approved, Restricted and Prohibited stations in Growing Area WM with their respective Geomean and P90 calculations for 2012. Please refer to Appendix A for a key to interpreting the headers on the columns of Table 9. The approved and restricted standards for each station are also displayed in Table 9.

All Approved stations met their NSSP classification standard in 2012.

Table 9. Growing Area WM Geometric Mean and P90 Report

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM001.00	A	30	30	3.4	0.41	35	12	31	163	9/9/2008
WM003.00	A	30	30	3.6	0.52	122	17	31	163	11/18/2008
WM017.50	P	30	30	14	0.52	160	64	31	163	8/11/2008
WM018.20	P	30	30	13	0.52	154	63	31	163	8/11/2008



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WM019.10	P	30	30	6.9	0.48	104	28	31	163	11/2/2008
WM019.20	P	30	30	8	0.57	160	44	31	163	8/11/2008
WM019.40	P	30	30	7.6	0.53	120	37	31	163	11/4/2008
WM029.10	P	30	30	15	0.6	760	92	31	163	6/18/2008

Geomean and P90 scores for conditional stations in WM are presented in Tables 10 and 11; data reflects open status only. All conditional stations in area WM met the NSSP approved standards in 2012.

Table 10. Conditional Areas 20B.1-B.7 and D, conditional on river discharge

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM005.00	CA	30	30	3.1	0.47	122	13	31	163	6/18/2008
WM006.00	CA	30	30	3.8	0.45	116	15	31	163	5/14/2008
WM006.50	CA	30	30	4	0.43	112	15	31	163	5/14/2008
WM008.00	CA	30	30	4.2	0.46	140	17	31	163	5/14/2008
WM009.00	CA	20	20	3.9	0.35	24	11	31	163	1/5/2010
WM009.80	CA	9	9	4.7	0.32	12	12	31	163	1/18/2011
WM012.00	CA	30	30	6.4	0.47	112	26	31	163	1/2/2008
WM015.00	CA	30	30	5.4	0.48	90	22	31	163	1/2/2008
WM016.00	CA	30	30	4.6	0.47	116	19	31	163	1/2/2008
WM017.20	CA	17	17	4.7	0.39	40	15	31	163	1/5/2010
WM020.00	CA	30	30	3.3	0.5	280	15	31	163	6/15/2008
WM022.00	CA	30	30	4.4	0.57	220	24	31	163	6/15/2008
WM023.00	CA	30	6	6.7	0.5	93	30	44	265	7/6/2003
WM024.00	CA	30	30	4	0.54	280	20	31	163	6/15/2008
WM026.00	CA	30	30	4.5	0.46	96	18	31	163	6/15/2008
WM026.90	CA	30	30	4.2	0.46	152	17	31	163	6/15/2008
WM027.00	CA	30	30	3.6	0.44	160	13	31	163	6/15/2008
WM028.00	CA	30	30	3.5	0.4	96	12	31	163	10/13/2008

Table 11. Conditional Area C, conditional on river discharge and rainfall (Oct 1 – May 14)

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WM004.00	CA	30	30	4.7	0.54	140	24	31	163	4/28/2008
WM004.10	CA	30	18	5.1	0.48	93	22	37	208	6/2/2004
WM004.50	CA	30	30	4.2	0.49	130	19	31	163	4/28/2008
WM004.80	CA	30	30	4.1	0.4	92	14	31	163	4/28/2008

Table 13. WM 2012 Sampling Effort

Station	Class	Closed			Open			Total
		Adverse	Extra	Random	Adverse	Extra	Random	
WM001.00	A						6	6



WM003.00	A				6		6	12
WM004.00	CA	15			2		6	23
WM004.10	CA	15			2		6	23
WM004.50	CA	15			2		6	23
WM004.80	CA	16			2		6	24
WM005.00	CA	16			2	3	6	27
WM006.00	CA	16			2	3	6	27
WM006.50	CA	16			2	3	6	27
WM008.00	CA	16			2	3	6	27
WM009.00	CA	16			2	3	6	27
WM009.80	CA	16	3	2	2		3	26
WM012.00	CA				2		6	8
WM015.00	CA	16			2		6	24
WM016.00	CA	15			2		6	23
WM017.20	CA				1		6	7
WM020.00	CA	4		1			6	11
WM022.00	CA	4		1			6	11
WM023.00	CA	4		1			6	11
WM024.00	CA	4		1			6	11
WM026.00	CA	15		1	1	3	7	27
WM026.90	CA	15		1	1	3	7	27
WM027.00	CA	17		1	1	3	7	29
WM028.00	CA	17		1	1	3	7	29
WM017.50	P	1		6				7
WM018.20	P	2		6				8
WM019.10	P			7				7
WM019.20	P	1		6				7
WM019.40	P	1		6				7
WM029.10	P	1		6				7

Water Quality Discussion and Classification Determination

Kennebec River

On February 17, 2012, the trigger limits for conditional areas managed by the river gauge were modified and seasonal closures were eliminated.

Recommendation for Future Work

- Evaluate the rainfall conditional area in Atkins Bay;
- Complete data analysis and water quality evaluation on lower river to determine if adjustments can be made to river flow trigger;



- Complete data analysis of shellfish and water study to determine automatic re-opening criteria after river flow events.

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.