

ENVIRONMENTAL HEALTH

WATER POLLUTION IDENTIFICATION & CORRECTION PROGRAM
2016 ANNUAL WATER QUALITY REPORT



Protecting Public Health and Improving Water Quality



KITSAP PUBLIC
HEALTH DISTRICT

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Clean Water Kitsap
Partners in Stormwater Solutions

INTRODUCTION

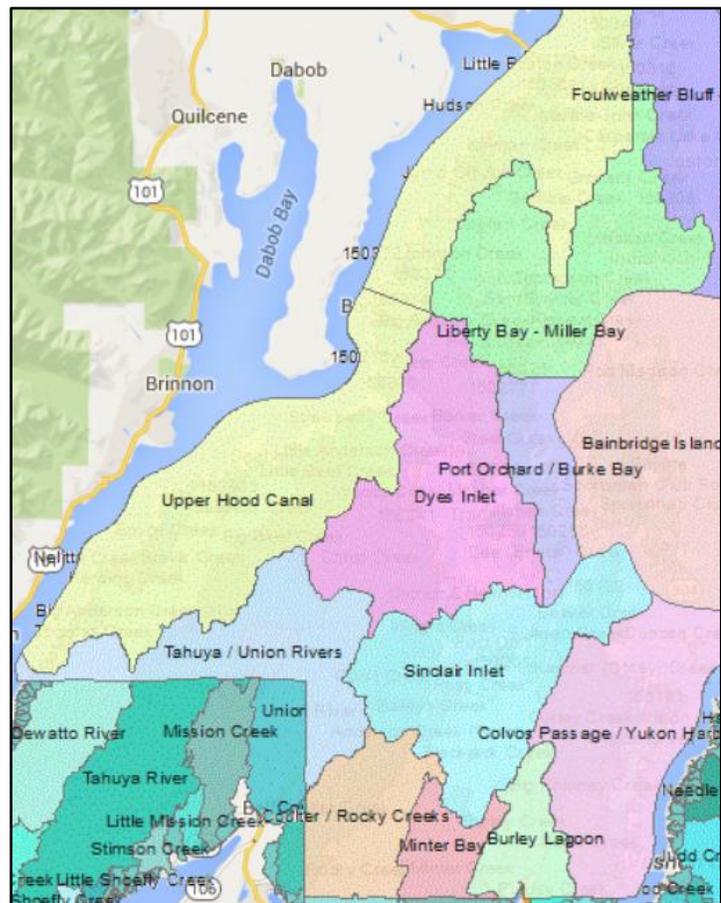
The overall goal of the Water Pollution Identification and Correction (PIC) program is to protect public health and prevent pollution of Kitsap County surface waters. To accomplish this, we have been monitoring the water quality of our streams, lakes and marine waters since 1996. We use monitoring data to identify areas affected by bacterial pollution, usually from human or animal waste. Then we work to find the sources and correct them by providing education, technical assistance and regulatory enforcement when necessary.

This report summarizes the Kitsap Public Health's recent annual water quality data for streams, lakes, marine waters and shoreline areas collected during the 2016 water year (October 2015-September 2016), and includes highlights of our clean-up efforts. The majority of this work is funded by Clean Water Kitsap¹ with grant funding provided by the Washington State Department of Ecology (DOE) and the Department of Health (DOH).

The introductory section provides background information and explains our methods of data collection and analysis. Use the links below to access chapters discussing each of the watersheds shown on the adjacent map, plus our shoreline monitoring results, and lake sampling.

REPORT CHAPTERS

1. Introduction
2. [Burley /Minter](#)
3. [Colvos Passage / Yukon Harbor](#)
4. [Coulter Creek / Rock Creek](#)
5. [Dyes Inlet](#)
6. [Foulweather Bluff / Appletree Cove](#)
7. [Liberty Bay / Miller Bay](#)
8. [Port Orchard Passage / Burke Bay](#)
9. [Sinclair Inlet](#)
10. [Tahuyeh / Union Rivers](#)
11. [Upper Hood Canal](#)
12. [Shoreline Monitoring Program](#)
13. [Lakes & Swimming Beaches](#)
14. [Appendix A: 4A & 4B List Streams](#)



¹ Stormwater management fees from unincorporated Kitsap County fund a unique multiagency partnership managed by Kitsap County Public Works. Programs are implemented by Public Works Stormwater Division and partner agencies; Kitsap Public Health District, Kitsap Conservation District and Washington State University Extension Kitsap.

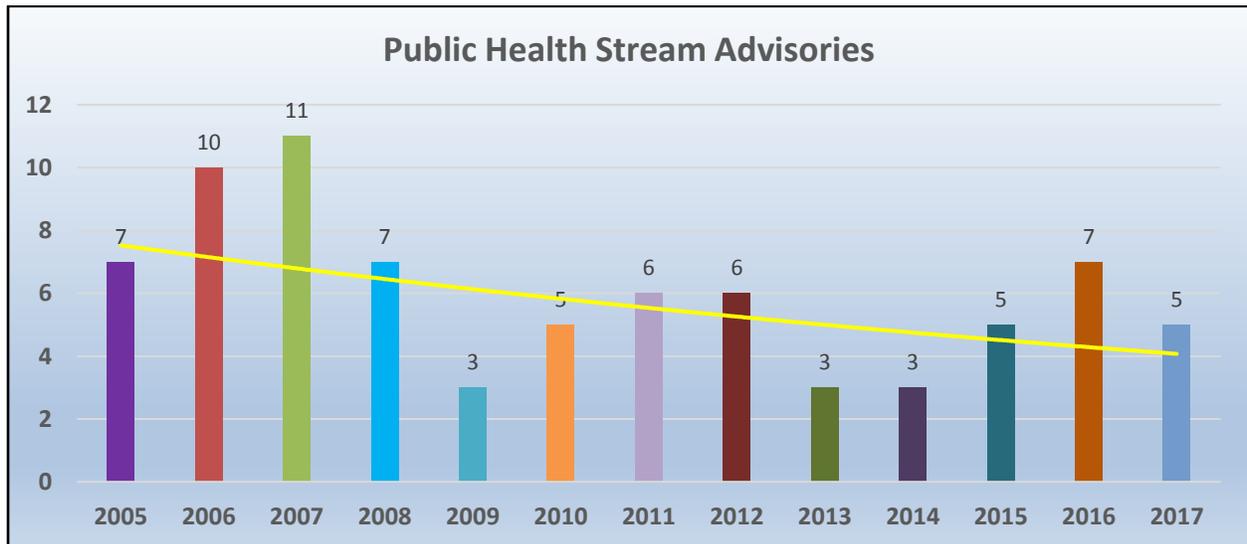
PUBLIC HEALTH STREAM ADVISORIES

The Health District issues public health advisories for streams that have chronic problems with high bacteria levels during the summer. (3-year geometric mean value > 270 FC/100 ml) High levels of fecal coliform bacteria indicate the presence of viruses and other pathogens that can make people sick. Kitsap Public Health issues these advisories to protect the health of people, especially children, who may play in streams. The advisory uses data from the summer months, when people are more likely to come into contact with streams.

Based on the water quality monitoring results for 2013-16, **five** streams will have public health advisories in 2017; Lofall, Phinney, Ostrich Bay, Bjorgen, and Little Scandia Creeks. The Health Advisories on Lofall, Phinney, Ostrich Bay, Bjorgen Creeks have been continued from 2016, and a new advisory has been added on Little Scandia Creek. Previous advisories have been lifted for Karcher, Barrantes, and Bear Creeks.

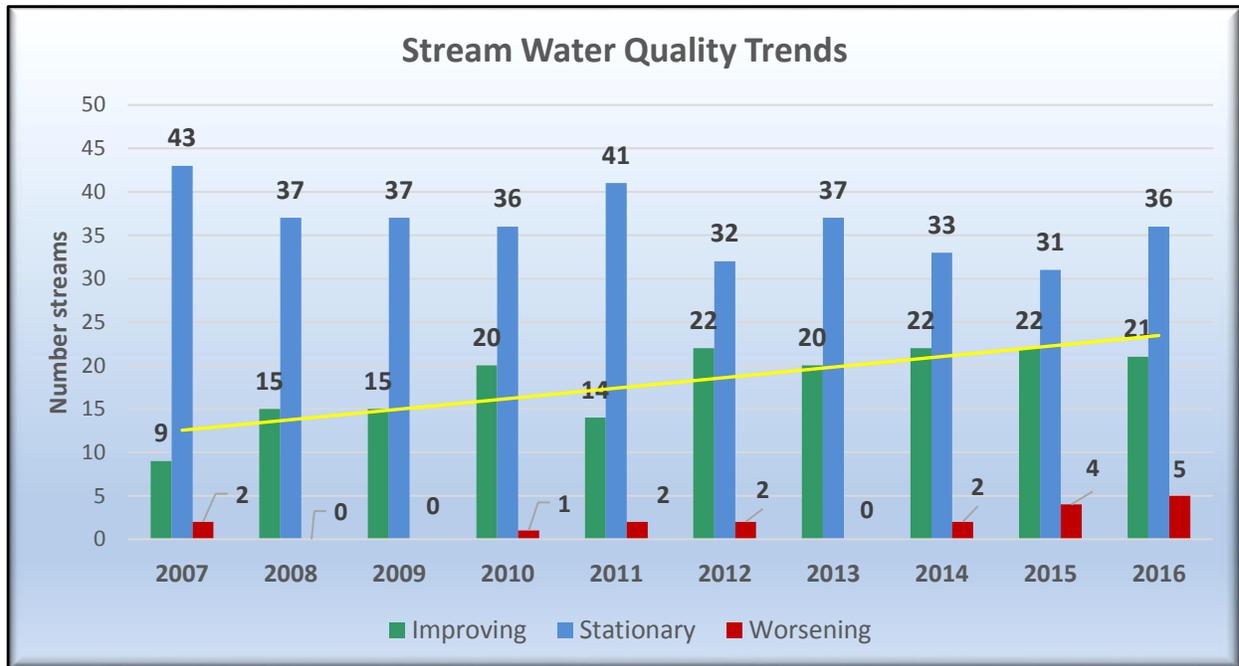
Stream Name	Fecal coliform Bacteria GMV
Lofall (LF01)	595
Phinney (PH01)	392
Ostrich Bay (OB01)	390
<u>Bjorgen (BN01)</u>	333
<u>Little Scandia (LS01)</u>	308

The chart below shows that the number of streams with health advisories changes each year, and the trend over time is that fewer streams in Kitsap County contain this level of pollution.



BACTERIAL POLLUTION TREND ANALYSIS FOR STREAMS

Streams are sampled monthly to determine which are being affected by bacterial pollution, and whether conditions are statistically improving, staying the same (stationary) or worsening. These streams have been monitored since 1996. Statistical analysis for long term trends began in 2007. An overall improving water quality trend is occurring in many of our streams.

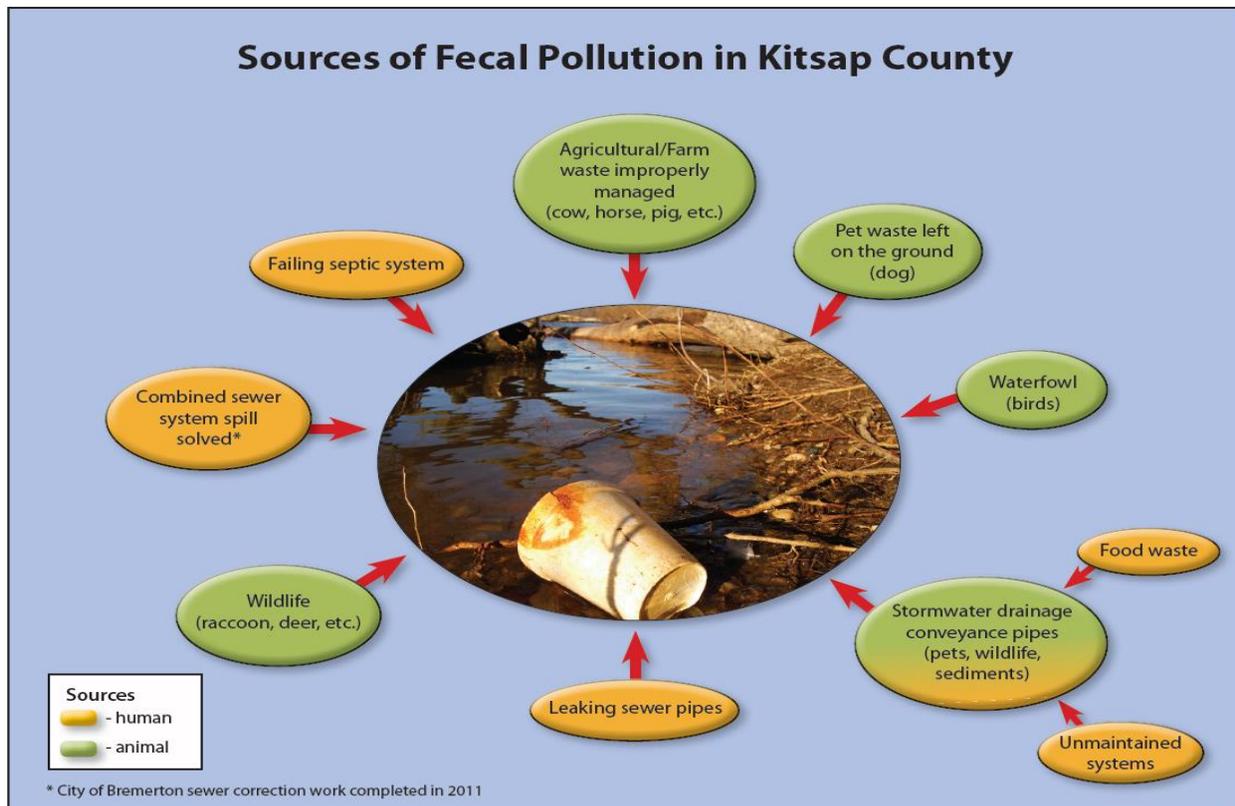


Long term and short term trend analysis is performed on the FC data collected at all stream mouth stations. For a given station, *long term trend* is determined over the entire data set (approximately 19 years) and a *short term trend* is determined over the last three (3) years. Trends are identified as “stationary”, “worsening”, or “improving”. In each watershed section, the water quality summary chart shows long term trend for each stream. The only time short term trends are noted in the report is when the stream is improving or worsening.

SOURCES OF WATER POLLUTION IN KITSAP COUNTY

The Health District focuses on fecal coliform (FC) bacteria as the primary indicator of surface water quality. High levels of this bacteria have been correlated with the presence of viruses or other pathogens that can cause human illness.

The primary cause of pollution in Kitsap County's streams, lakes, and marine water is "nonpoint source" pollution. Nonpoint source pollution can generally be defined as pollutants that come from many smaller sources, rather than a few large sources. This accumulation of fecal pollution sources occurs in both urban and rural areas and can often be prevented by using best management practices. Some major sources of fecal pollution are shown below.



Significant risks to our health can come from pollution caused by human sewage and animal waste. Sources of this pollution include failing on-site sewage systems, inadequate livestock keeping practices, pet and wildlife waste, sewage spills, combined sewer overflows, and sewage discharges from boats. Human and animal waste may contain organisms that can cause a variety of diseases and illnesses including giardia, cholera, hepatitis A, shigella, salmonella, and viral gastroenteritis. Humans are exposed to these pathogens through activities such as swimming in contaminated water, or eating shellfish that have been grown in polluted areas.

MONITORING FREQUENCY

During the 2015-16 water year, both stream and marine stations were sampled once each month. Fewer samples may be collected at a monitoring station due to lack of flow during the dry season, hazardous weather conditions, equipment failures, or other circumstances. Sampling frequency for lake swimming beaches is based on beach usage; popular lakes are sampled more frequently during the summer, e.g. weekly.

BACTERIAL ANALYSIS METHOD

Kitsap Public Health District contracts with a laboratory for analysis of water samples. The contract lab uses the membrane filtration (or MF) method for bacterial analysis of water samples. The MF results for marine water range from less than one (<1) to greater than two hundred (>200). Freshwater samples are diluted by a factor of 1:10 so the results range from less than ten (<10) to greater than two thousand (>2000).

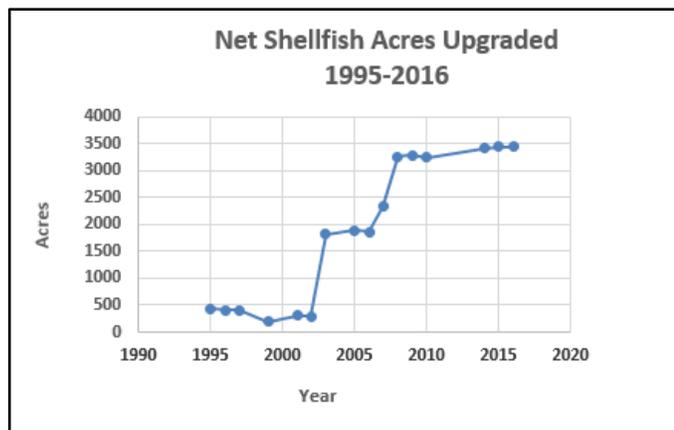
BACTERIAL WATER POLLUTION CLEANUP PROGRAMS

Pollution Identification and Correction (PIC) projects are conducted in an effort to improve the water quality in a polluted waterbody. The goal of each project is to identify possible pollution sources and correct them to reduce the overall amount of bacteria and other potential human health risks. This work helps ensure that people can safely enjoy recreational activities on our streams, lakes, marine water, and harvest shellfish from local beaches. Clean up projects are funded from the Clean Water Kitsap Program and from State or Federal government grants.

SHELLFISH CLASSIFICATIONS

The Washington State Department of Health (DOH) Office of Shellfish and Water Protection is responsible for classifying commercial shellfish growing areas in Washington State. Areas are classified as *Approved*, *Conditionally Approved*, *Restricted*, or *Prohibited*. These classifications are based on DOH shoreline investigations for potential contamination sources, and marine water monitoring for bacterial pollution. Applicable shellfish classifications are listed in each chapter.

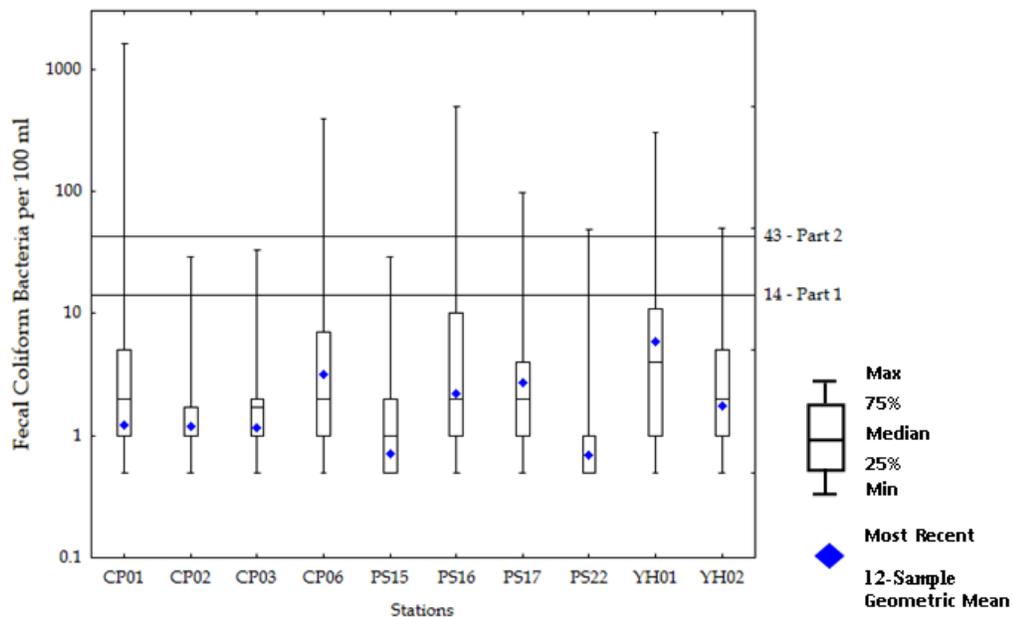
Since Pollution Identification and Correction efforts began approximately 20 years ago, there has been a net **increase of shellfish growing areas approved for harvest of 3,443 acres** in Kitsap County! This is one benefit of completing comprehensive pollution source identification and correction projects.



BACTERIAL POLLUTION TREND ANALYSIS FOR MARINE WATER

Trend analysis is performed on the FC data collected at all marine water sampling stations with a minimum of 36 samples. In addition to trend analysis for individual marine stations, the overall trend for the watershed is also analyzed. In each watershed section, a box plot is provided to show the distribution of all FC results. An example is shown below.

For each listed station, the diamond is the most recent 12-sample geometric mean. The horizontal line (within the box) is the median. The median is the middle value of all FC results; 50% of the FC results are below it, and 50% of the FC results are above it. The vertical lines that extend from the box show the minimum and maximum values. The lines that mark the bottom and top of the box represent the 25th percentile and 75th percentile values, respectively. Consequently, the middle 50% of the FC values fall within the box. The 25th and 75th percentile values are similar to the median value, for example the 25th percentile means that 25% of the FC values are below and 75% of the FC values are above the number.



WASHINGTON STATE WATER QUALITY STANDARDS

Surface water quality standards are established by the Washington Department of Ecology, and described in Chapter 173-201A of the Washington Administrative Code (WAC). The water quality standards which apply in Kitsap County are summarized below. State law classifies bodies of water as either Primary or Extraordinary, depending on designated beneficial uses such as human recreation and/or fish habitat.

Parameters	Freshwater Standard		Marine Water Standard	
	Extraordinary Primary Contact	Primary Contact	Extraordinary Aquatic, Primary Contact	Excellent Aquatic, Primary Contact
Fecal Coliform Bacteria (FC)	Part 1: ≤50 FC/100 ml (geometric mean) Part 2: Not more than 10% of all samples obtained for calculating a geomean >100 FC/100 ml	Part 1: ≤100 FC/100 ml (geometric mean) Part 2: Not more than 10% of all samples obtained for calculating a geomean >200 FC/100 ml	Part 1: ≤14 FC/100 ml (geomean) Part 2: Not more than 10% of all samples obtained for calculating a geomean >43 FC/100 ml	Same as Extraordinary Aquatic - Primary Contact waters
Dissolved Oxygen	> 9.5 mg/L	> 8.0 mg/L	> 7.0 mg/L	> 6.0 mg/L
pH	6.5 – 8.5 units	6.5 – 8.5 units	7.0 – 8.5 units	7.0 – 8.5 units
Temperature	≤16.0 ⁰ C ¹	≤18.0 ⁰ C ¹	≤13.0 ⁰ C ¹	≤16.0 ⁰ C ¹

These standards use a geometric mean value (GMV) for bacteria, which measures the central tendency of a data set. The GMV is especially useful for groups of data that contain a broad range of values. Since sample results for bacterial concentrations tend to be highly variable, the geometric mean is a more appropriate tool for analyzing this type of data than using an arithmetic mean or average.

BACTERIA LEVELS IN KITSAP COUNTY STREAMS

The following table summarizes stream monitoring results for the 2016 water year. Streams are listed alphabetically by watershed. A map of the watersheds is shown on page 1-2. The colors used in the sampling “Station” column indicate whether each stream met the applicable state water quality standard for fecal coliform bacteria, as explained on the previous page.

Red	- the stream had high levels of bacteria and failed Part 1 & 2 of the standard.
Yellow	- the stream had periodic bacteria problems and failed only part 2 of the standard.
Green	- the stream had low levels of bacteria & met both parts of the standard.

The Health District began sampling all the major streams in Kitsap County in 1995. At that time our monitoring program included 56 streams, and only 13 of them met the state water quality standard for fecal coliform bacteria. In 2016 our program included 65 streams, and 30 of those met the state standard.

Each stream is also evaluated to determine whether there is a statistically significant trend in bacteria levels over time. A long term trend is calculated for each stream using all the data collected since 1996, and is shown as either; **improving**, **worsening**, or stationary. See page 1-4 for a comparison of changes in stream trends over time.

One stream in the Hood Canal watershed, Lofall Creek, has a **split trend**. The long term trend was worsening, but bacteria levels have begun to drop and it now has a **short term improving trend** over the last three years indicating pollution correction efforts are making a positive difference in this drainage.

Another unusual aspect of the trend analysis this year is that several of the streams with statistically worsening trends have very low levels of bacteria, and still meet the state water quality standard. These streams; Coulter Creek, Stavis Creek, and Tahuyeh River, are all in watersheds with large forested areas and tend to have relatively little development.

2016 KITSAP STREAM WATER QUALITY SUMMARY

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend
Burley / Minter Creeks	Burley	BL01	20.0-890.0	82	Stationary
Burley / Minter Creeks	Bear	BR01	10.0-380.0	80	Stationary
Burley / Minter Creeks	Huge	HG01	4.0-290.0	29	Stationary
Burley / Minter Creeks	Minter	MN01	10.0-150.0	29	Stationary
Burley / Minter Creeks	Purdy	PR01	4.0-110.0	20	Stationary
Coulter Creek / Rock Creek	Coulter	CU01	4.0-170.0	17	Worsening
Colvos Passage / Yukon Harbor	Olalla	OC02	4.0-240.0	47	Improving
Colvos Passage / Yukon Harbor	Salmonberry	SM01	4.0-80.0	14	Improving
Colvos Passage / Yukon Harbor	Wilson	WN01	4.0-210.0	32	Improving
Colvos Passage / Yukon Harbor	Curley	CY01	10.0-120.0	35	Stationary
Colvos Passage / Yukon Harbor	Fragaria	FG01	4.0-380.0	27	Stationary
Colvos Passage / Yukon Harbor	Duncan	DU01	10.0-290.0	48	NA
Dyes Inlet	Barker	BK01	10.0-310.0	77	Improving
Dyes Inlet	Chico	CH01	4.0-90.0	21	Improving
Dyes Inlet	Clear	CC01	4.0-750.0	60	Stationary
Dyes Inlet	Kitsap Mall West	KW01	10.0-1310.0	109	Stationary
Dyes Inlet	Kitsap Mall	KM01	4.0-1520.0	71	Stationary
Dyes Inlet	Mosher	MS01	10.0-280.0	76	Stationary
Dyes Inlet	Ostrich Bay	OB01	20.0-1030.0	284	Stationary
Dyes Inlet	Pahrman	PA01	30.0-580.0	128	Stationary
Dyes Inlet	Phinney	PH01	20.0-2001.0	217	Improving
Dyes Inlet	Strawberry	SR01	4.0-460.0	42	Improving
Foulweather Bluff / Appletree Cove	Carpenter	CA02	4.0-560.0	18	Stationary
Liberty Bay / Miller Bay	Barrantes	BAR01	4.0-430.0	52	Stationary
Liberty Bay / Miller Bay	Big Scandia	BS01	10.0-540.0	56	Stationary
Liberty Bay / Miller Bay	Bjorgen	BN01	10.0-2001.0	51	Stationary
Liberty Bay / Miller Bay	Cowling	CW01	4.0-830.0	48	Stationary
Liberty Bay / Miller Bay	Daniels	DC01	4.0-610.0	39	Improving
Liberty Bay / Miller Bay	Dogfish	DF01	4.0-110.0	24	Improving
Liberty Bay / Miller Bay	Grovers	GC01	10.0-180.0	33	Stationary
Liberty Bay / Miller Bay	Indianola	IN01	4.0-90.0	24	Improving
Liberty Bay / Miller Bay	Johnson	JC01	4.0-240.0	17	Improving
Liberty Bay / Miller Bay	Kitsap	KT01	4.0-280.0	22	Stationary
Liberty Bay / Miller Bay	Little Scandia	LS01	4.0-2001.0	118	Stationary

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend
Liberty Bay / Miller Bay	South Dogfish	SF01	4.0-250.0	30	Improving
Liberty Bay / Miller Bay	Perry Creek	PER01	4.0-640.0	46	Stationary
Liberty Bay / Miller Bay	Sam Snyder	SAM01	4.0-1460.0	24	Stationary
Liberty Bay / Miller Bay	Lemolo	LEM01	4.0-500.0	45	Stationary
Port Orchard Passage / Burke Bay	Enetai	DE01	4.0-480.0	73	Improving
Port Orchard Passage / Burke Bay	Illahee	IC01	4.0-390.0	45	Stationary
Port Orchard Passage / Burke Bay	State Park	SP01	20.0-260.0	75	Stationary
Port Orchard Passage / Burke Bay	Steele	ST01	10.0-290.0	54	Improving
Sinclair Inlet	Beaver	BV01A	10.0-240.0	47	Stationary
Sinclair Inlet	Karcher	KA01	4.0-1470.0	45	Improving
Sinclair Inlet	Anderson	AN01	4.0-60.0	10	Stationary
Sinclair Inlet	Annapolis	AP01	4.0-360.0	72	Improving
Sinclair Inlet	Blackjack	BJ01	4.0-200.0	31	Stationary
Sinclair Inlet	Gorst	GR01	4.0-160.0	43	Improving
Sinclair Inlet	Ross	RS02	4.0-160.0	22	Improving
Sinclair Inlet	Sacco	SC01	10.0-370.0	40	Improving
Sinclair Inlet	Wright	WR01	4.0-120.0	16	Stationary
Tahuyeh / Union River	Tahuyeh	TR01	4.0-340.0	11	Worsening
Tahuyeh / Union River	Union	UN01	4.0-220.0	39	Stationary
Upper Hood Canal	Big Anderson	BA01	4.0-250.0	15	Stationary
Upper Hood Canal	Big Beef	BB01	4.0-150.0	19	Stationary
Upper Hood Canal	Boyce	BY01	4.0-80.0	12	Stationary
Upper Hood Canal	Jump Off	JJ01	4.0-1110.0	31	Improving
Upper Hood Canal	Kinmann	KN01	30.0-420.0	137	Worsening
Upper Hood Canal	Little Anderson	LA02	4.0-100.0	16	Stationary
Upper Hood Canal	Lofall	LF01	70.0-790.0	235	Split trend
Upper Hood Canal	Martha John	MJ01	4.0-100.0	20	Improving
Upper Hood Canal	Port Gamble	PG01	4.0-90.0	29	Stationary
Upper Hood Canal	Seabeck	SB01	4.0-210.0	14	Stationary
Upper Hood Canal	Stavis	SV01	4.0-120.0	18	Worsening
Upper Hood Canal	Vinland	VC01	20.0-1840.0	81	Stationary

WASHINGTON STATE WATER QUALITY ASSESSMENT

The federal Clean Water Act, adopted in 1972, requires that all states restore their waters to be “fishable and swimmable.” Washington's Water Quality Assessment lists the water quality status for water bodies in the state. This assessment meets the federal requirements for a report under Sections 303(d) and 305(b) of the Clean Water Act, which is submitted to the federal Environmental Protection Agency (EPA). The assessment divides waterbodies into 5 different categories based on impairment. These impairments may be due to such things as high bacteria levels, increased temperature, or low dissolved oxygen. The most current assessment was finalized and approved by the EPA in December 2012, with the new assessment to be finalized soon (2016). Additional information about the State’s assessment may be found at www.ecy.wa.gov/programs/wq/303d.

- Category 1: meets standard for clean waters
- Category 2: waters of concern (some evidence of problems)
- Category 3: insufficient data
- Category 4A: waterbodies that have an approved TMDL in place and are actively being implemented
- Category 4B: has a pollution control program other than a TMDL
- Category 5: polluted waters that require a TMDL; traditionally known as the 303(d) list

For copies of reports on specific projects, please check our website or call us for further information.

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INTERNET ADDRESSES FOR OTHER PROGRAMS AND DOCUMENTS

Clean Water Kitsap
<http://www.cleanwaterkitsap.org>

Washington State Department of Health
<http://www.doh.wa.gov>

Washington State Department of Ecology
<http://www.ecy.wa.gov>

Water Quality Standards for Surface Waters of the State of Washington
[Chapter 173-201A WAC](#)

United States Environmental Protection Agency
<http://www.epa.gov/>