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Core Area Stormwater Quality

2016 Annual Report

Parks & Environmental Services | Environmental Protection

Including the jurisdictions of:

City of Colwood
Township of Esquimalt
City of Langford
District of Oak Bay
District of Saanich
City of Victoria
Town of View Royal
Esquimalt First Nation
Songhees First Nation
Department of National Defence

Prepared by
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CORE AREA STORMWATER QUALITY PROGRAM
2016 ANNUAL REPORT

INTRODUCTION

The Capital Regional District (CRD) Integrated Watershed Management Program (IWMP) plans, promotes and coordinates the management of stormwater quality. In the core area, this work is guided by the Core Area Liquid Waste Management Plan (LWMP) and done in consultation with the municipalities, First Nations, and community groups with the goal of protecting human health and the environment. The program works to identify and reduce contamination in stormwater, creeks and the ocean through monitoring, assessment, collaboration and education.

Program staff monitor stormwater, creeks and the ocean to identify contamination and impacts from stormwater due to various land use practices through bacterial and chemical sampling. The program assesses approximately 550 stormwater discharges and creeks in the Core Area and assigns priority ratings for mitigative action to be undertaken by the appropriate jurisdiction(s). Where contamination is found, CRD staff conduct investigations and work with municipal staff to find and eliminate the source. Recently, the program added Escherichia coli (*E.coli*) and enterococci as monitoring parameters, to align the program with provincial and federal programs and use the best indicators for health risk from recreational water contact.

This report summarizes the results of work completed by the program in 2016. Water and sediment quality data, including details about how the discharges were rated for public health and environmental concern and sampling locations, are available in the *Core Area Stormwater Quality Program 2016 Supplemental Data* on the CRD website (https://www.crd.bc.ca).

RESULTS AND DISCUSSION

1. Stormwater Discharge Evaluations

The program evaluates water and/or sediment quality in approximately 550 core area stormwater discharges from the coastline between the Colwood-Metchosin border in the west and the Saanich-Central Saanich border in the east, including Esquimalt Lagoon, Esquimalt and Victoria harbours, the Gorge, Portage Inlet and the City of Langford coastline along Saanich Inlet.

Public Health – *E. coli*

Each year, CRD staff collect water samples from a selection of stormwater discharges for measurement of bacteria levels. The extent of bacterial contamination and the potential for members of the public to contact the discharge flow, is used to rate each discharge for public health concern. This allows jurisdictions to undertake remedial measures where they will have the most benefit.

In 2016, the CRD assessed 164 stormwater discharges for *E.coli* concentrations in the winter and the summer. 104 of the discharges had 1 or more *E.coli* counts greater than 200 colony forming units (CFU)/100 mL. This level of contamination indicates sources of sewage or animal waste with potential to cause adverse effects for public health from primary recreational activities (e.g., swimming, diving). However, many of these discharges are located where there is little risk of contact. Considering the potential for public contact, CRD assigned the following public health concern ratings:

- 61 were assigned a low public health concern rating,
- 72 were assigned a moderate rating, and
- 31 were assigned a high rating.

In 2016, there were 4 fewer high-rated discharges compared to 2015. As usual, there was significant fluctuation in bacterial levels that resulted in 8 of the previously high-rated discharges to be assigned a lower rating and 4 of the previously low- or moderate-rated discharges to be assigned a high rating. The

City of Victoria, District of Oak Bay and Township of Esquimalt had the most high-rated discharges; these municipalities have some of the oldest sewer and stormwater infrastructure in the region.

Improvements in stormwater quality have resulted in a decline in the number of high-rated discharges in the recent years (Table A) despite the ongoing addition of new sources of contamination that come up as infrastructure ages and new developments and/or renovations have the potential to create stormwater-sewage cross-connections.

In 2007, the number of high-rated discharges increased to 41, prompting municipal and IWMP staff to concentrate efforts on decreasing bacterial concentrations in these discharges. In 2016, only 20 of the 41 discharges were still high-rated, a 51% reduction in this subset since 2007.

Environment – Chemical Contaminants

CRD staff also rate stormwater discharges for environmental concern based on the level of metals and organic contaminants measured in sediment collected within the stormwater collection system (i.e., pipes, manholes, ditches and creeks) relative to the marine sediment quality guidelines for protection of aquatic life. Discharges are sampled annually until the rating and contaminant(s) are confirmed. Once confirmed, a high rating results in an investigation to locate the sources of contamination.

In 2016, the CRD collected 15 sediment samples (13 at the discharge and 2 upstream). Contaminant ratings for the 13 stormwater flows sampled at the point of discharge are as follows:

- 8 were assigned a low environmental concern rating,
- 3 were assigned a moderate rating, and
- 2 were assigned a high rating.

Based on data collected over many years, 20 discharges are recommended for corrective action (Table C and Figures A and B). The number recommended for action has remained similar in the last 5 years (20 discharges were recommended for action in 2012), however, some discharges have seen improvement and were taken off the list while others have been added.

Many of discharges recommended for action have been a concern for more than 5 years. Sources of contaminants in stormwater sediment can be complex to find and eliminate, as sediment is not always present and contaminants levels fluctuate. In addition, non-point sources (i.e., from roadways, parking lots) and transient point sources (e.g., spills) exist. In some cases, sediment can remain for a long time; therefore, samples can reflect past practices that are no longer occurring.

Source control education has increased awareness of products used on commercial and private sites and contaminant levels leaving their properties. As well, the use and maintenance of stormwater rehabilitation units continues to increase. The CRD and municipalities will continue to work together to identify and eliminate potential sources of contamination for these discharges.

Table A. Number of Discharges with a High Public Health Concern Rating from 1993 to 2016

Area	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2011	2012	2013	2014	2015	2016
Colwood	0	2	2	1	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0
View Royal	1	0	0	0	0	0	0	0	0	1	0	1	2	1	1	1	0	0	0	0
Esquimalt	12	10	9	9	9	6	6	5	5	5	5	7	7	8	7	7	8	7	6	6
Esquimalt private[1]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0
DND	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Saanich	6	2	1	2	1	0	2	2	1	0	4	1	1	2	2	3	4	5	5	6
Saanich private[1]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	0
Victoria	22	17	12	10	9	11	13	9	8	13	14	14	15	15	20	17	13	12	14	11
Victoria private[1]	*	*	*	*	*	*	*	*	*	*	*	2	3	5	3	1	1	2	2	2
Oak Bay	8	7	3	4	3	4	5	6	8	6	5	9	9	10	9	9	7	9	8	6
Langford[2]	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**49**	**38**	**28**	**28**	**23**	**22**	**27**	**22**	**23**	**26**	**28**	**34**	**37**	**41**	**43**	**38**	**33**	**36**	**35**	**31**

Notes:
[1] Discharges that drain from private property do not fall under municipal jurisdiction and are separated out from the municipal totals.
[2] City of Langford stormwater discharges were sampled for the first time by the Stormwater Quality Program in 1998.
* Private discharges included in the municipal totals.

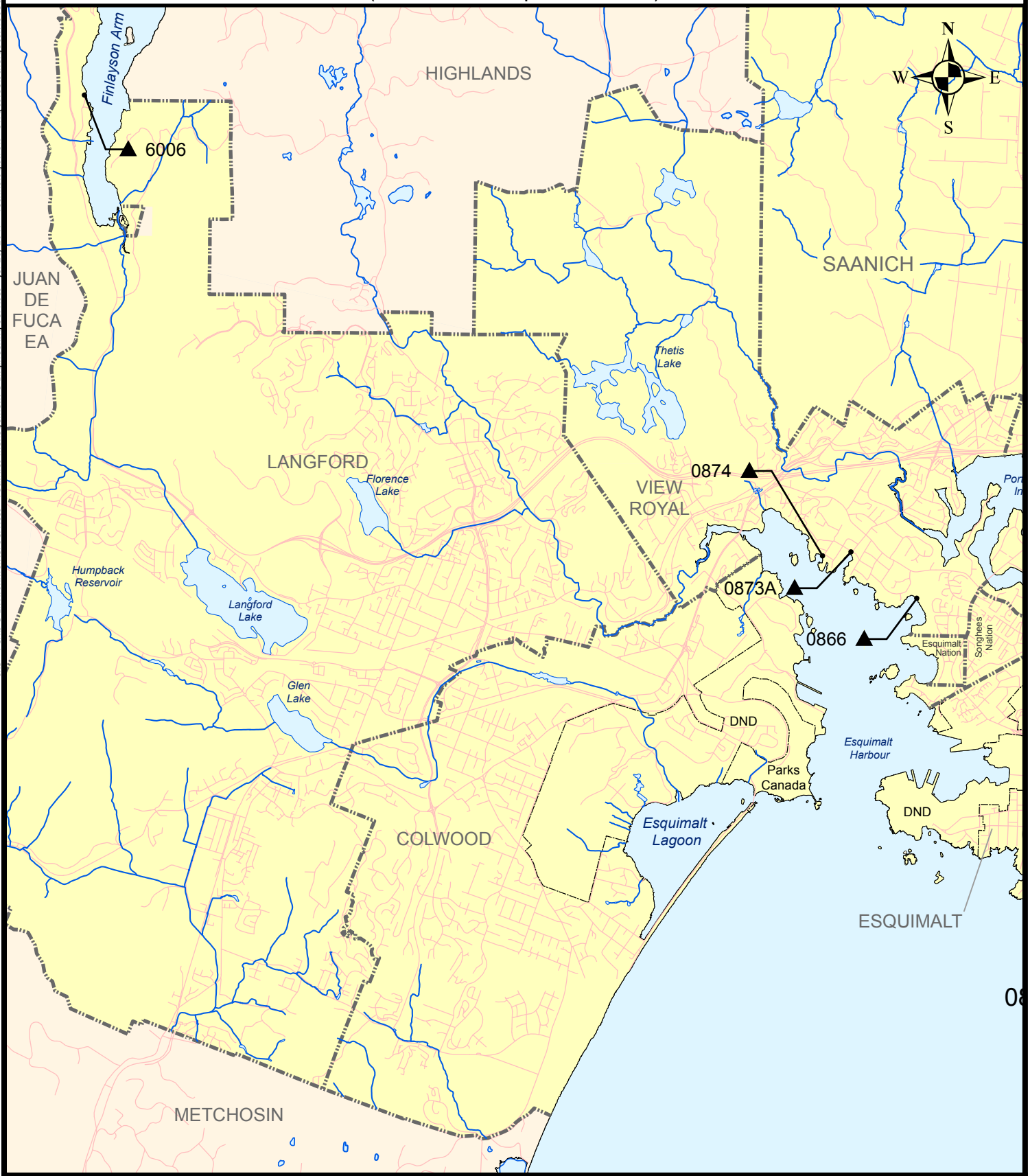
Table B. Discharges Rated High for Public Health Concern in 2016

Jurisdiction	CRD Discharge Number
City of Colwood	---
Township of Esquimalt	742, 744B, 780, 781, 805, 806
City of Langford	---
District of Oak Bay	245, 310A, 318, 320, 322, 323
District of Saanich	503, 505, 508, 559, 690E, 690D
City of Victoria	208/209, 214, 216, 222, 230, 610, 611, 613, 619, 641, 777A
City of Victoria – private[1]	645A, 649
Town of View Royal	---
Esquimalt First Nation	---
Songhees First Nation	---
DND	---

Notes:
[1] 2 high-rated discharges within City of Victoria drain private property do not fall under municipal jurisdiction (645A and 649).

Figure A - Core Area 2016

Stormwater Discharges Requiring Action for Public Health and Environmental Concerns (Metchosin to Esquimalt Border)



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Projection: UTM ZONE 10N NAD 83

Discharges Requiring Action

- High Public Health Rating
- High Environmental Rating and/or Recommended for Action

- Municipal Boundaries
- DND Boundaries
- Streams and Rivers
- Major Roads
- Stormwater Monitoring Area

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CRD - Parks & Environmental Services - Facilities Management & Engineering Services - Jul 26, 2017 - Technologist: SR - SWQCoreDischargeColwoodConcern2017.mxd

Figure B - Core Area 2016

Stormwater Discharges Requiring Action for Public Health and Environmental Concerns
(Esquimalt to Central Saanich Border)

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Projection: UTM ZONE 10N NAD 83

Discharges Requiring Action

- High Public Health Rating
- High Environmental Rating and/or Recommended for Action

- Municipal Boundaries
- DND Boundaries
- Streams and Rivers
- Roads
- Stormwater Monitoring Area

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CRD - Facilities Management & Engineering Services - Sep 08, 2017 - Technologist: srulianrich - Map Document: SWQCoreDischargeVictoriaConcern2016.mxd

Table C. Discharges Recommended for Action Due to Elevated Chemical Contaminant Levels

Jurisdiction	Discharges Recommended for Corrective Action	Total
City of Colwood	-	0
Township of Esquimalt	737, 742, 749, 806	4
Township of Esquimalt– private[1]	-	0
City of Langford	6006	1
District of Oak Bay	250, 307, 310	3
District of Saanich	-	0
District of Saanich – private[1]	-	-
City of Victoria	216, 613A, 603, 620, 627, 629, 634, 636, 767	9
City of Victoria– private[1]	-	0
Town of View Royal	866, 873A, 874	3
DND	-	0
Total		**20**

Notes:

[1] Discharges that drain from private property do not fall under municipal jurisdiction.

2 Other discharges were assigned high ratings in 2016 (503; Hobb's Creek and 649; private discharge draining Gorge Road Hospital) but they aren't on the action list as contamination isn't confirmed.

2. Source Investigations

The program conducted source investigations in the catchment areas of 12 stormwater discharges for bacterial contaminant sampling and 3 discharges for chemical contaminant sampling.

Bacterial Investigations

In 2016, staff conducted source investigations in 12 stormwater discharge catchment areas. As a result, cross-connections were found and repaired in both Esquimalt and Oak Bay. Another source previously narrowed down (611), was confirmed. Investigations were inconclusive in 8 discharges due to presence of multiple sources, lower fecal coliform counts or lack of flows to sample. The investigation in 1 discharge (578) was ceased due to lower bacterial levels. The status of bacterial investigations completed by IWMP staff in 2016 is summarized in Table D.

Table D. 2016 Summary of Stormwater Fecal Coliform Source Investigations by IWMP staff

Discharge	Municipality	BST Results	Sampling Events	Status
216	Victoria	Human, dog, potential ruminant	1	Ongoing, multiple sources.
230	Victoria	Not tested	1	CRD narrowed down 1 source; others present.
603	Victoria	Human, dog, pig, general bacteriodes	1	Ongoing, CRD narrowed down 1 source, but needs confirmation, another exists.
310	Oak Bay	Not tested	1	Ongoing, multiple sources
320	Oak Bay	Human, ruminant animal in 2008	2	CRD and Oak Bay staff narrowed down a source and identified other infrastructure failures. Oak Bay **fixed a cross-connection**, **relined** and **replaced** some storm mains. 14 properties either **replaced** their laterals or **separated** combined systems.
505	Saanich	Human, ruminant animal, general bacteroides	1	Ongoing, counts lower; Saanich **repaired** a cross-connection (2015).
578	Saanich	General bacteroides	1	Ceased: counts lower, source appears to be birds, CRD will continue to monitor.
603	Victoria	Human, ruminant animal, pig, general bacteroides	1	Ongoing, CRD narrowed down 1 source, but needs confirmation, another exists.
611	Victoria	Human, dog and ruminant animal	1	CRD previously narrowed down a source, reassessed in 2016 and confirmed source still exists. Working with BC Legislature Building and City of Victoria.
629	Victoria	Ruminants and general bacteriodes	1	Ongoing, CRD narrowed down 1 source but needs confirmation.
636	Victoria	Human, ruminant animal, pig, gull general bacteroides	4	Ongoing, CRD narrowed down 2 sources flowing into manhole at Hillside Ave. and Bridge St., but needs confirmation.
736A	Esquimalt	Human and ruminant animal	3	CRD identified a cross-connection and it was **repaired**.

Notes:
BST = Bacterial Source Tracking; genetic analysis to determine the source of stormwater bacteria
General bacteroides are those for which a specific marker is not available, there is no marker for ducks
In 2015, sources were found and repaired in 505, 559 and 574 and 2 sources were narrowed down in 805.

Chemical Contaminant Investigations

In 2016, IWMP staff conducted chemical contaminant source investigations in sediment from 2 discharge catchment areas. Samples collected to confirm the source of contaminants from discharge 310 (Oak Bay) had lower levels of contaminants than previously identified indicating the source may be gone or that the concentrations are variable. More sampling will be done to confirm the results. Samples confirmed the presence of elevated mercury upstream of discharge 214. More sampling will be conducted in 2017 to narrow down the area of contamination.

3. Marine Surface Water Monitoring

In 2015 and 2016, staff conducted winter monitoring of high-use beaches to assess marine bacterial levels. Data indicate a number of high-use public beaches in the Core Area (and Saanich Peninsula) have conditions that exceed Health Canada guidelines for recreational use during and after winter rainfall events. The sources of contamination include humans, ruminant animals and dogs. These findings led to the identification of 2 stormwater-sewer cross-connections and repairs to stormwater and sewer infrastructure.

In the harbours, staff continue to work with BC Ministry of Environment (MOE) staff to develop site-specific water quality objectives that will be used to monitor and manage Esquimalt Lagoon, Esquimalt and Victoria harbours, the Gorge and Portage Inlet.

4. Major Watercourse Monitoring

IWMP staff continued to assess the health of 12 watercourses in the core area in 2016. Each year, program staff measure the water quality of all the watercourses but conduct intensive watershed health assessment in 2 core area creeks with the goal to assess each creek in this manner every 5 or 6 years.

In 2016, staff measured water quality at the mouth of Bee, Bowker, Cecelia, Colquitz, Colwood, Craigflower, Douglas, Hospital, Noble and Selleck creeks, and Mill Stream in the dry and wet seasons. Parameters included: fecal coliforms, *E.coli*, dissolved oxygen, specific conductivity, pH, temperature, turbidity, nitrate and phosphorus.

Program staff completed more comprehensive assessments of creek health in Douglas Creek and Goldstream River that included additional water quality sampling and assessment of the health of invertebrate animals living in the sediment. The aforementioned water quality parameters were measured, as well as metals, hardness, suspended solids and nitrite.

Data show that the water quality parameters of most concern in core area creeks are bacteria, phosphorus, turbidity and metals. This is consistent with what is seen throughout the region wherever there is increased human presence. The fecal coliform shellfish harvesting guideline and draft Vancouver Island phosphorus objective were exceeded in all CRD creeks due to human and animal presence in these watersheds.

Douglas Creek water quality shows that aluminum, copper, iron, zinc, phosphorus, and suspended solids are at concentrations that could result in adverse effects on aquatic life. Bacteria are also elevated indicating sewage presence in the creek. Water quality was particularly poor when samples were taken while it was raining. Water quality in the Goldstream River was good in 2016.

Overall, creek water quality was similar to last year: poor in Bowker, Cecelia and Douglas creeks; moderate in Bee, Colquitz, Colwood, Hospital, Noble and Selleck creeks; and good in Craigflower Creek, Mill Stream and Goldstream River. Unusual exceedances that suggest a degradation in water quality were collected in Colwood, Bee, Colquitz and Hospital creeks. CRD staff will continue sampling to determine whether unusually high measurements were anomalous or an indication of permanent changes.

Water quality is important in these creeks, but hydrological changes and physical alteration are a concern as well; therefore, benthic invertebrate community data is also collected.

Benthic Invertebrate Community Data

Benthic invertebrates live in or on the bottom of streams and are good indicators of stream health. Their community composition reflects the overall condition of the aquatic environment and depends on water and sediment quality, as well as hydrology.

The data indicates that the benthic invertebrate communities in Colwood Creek and Mill Stream (at the discharge) are healthy based on their similarity to invertebrate communities in minimally-impacted Vancouver Island creeks. Benthic invertebrate community data from downstream locations in Bee, Bowker, Cecelia and Colquitz creeks, and at Treanor Road in Mill Stream, shows that these communities are not healthy and it is recommended that upstream activities impacting the watershed cease.

The Hilsenhoff Biotic Index indicates the amount of organic and nutrient pollution in a stream based on the benthic invertebrates present and their tolerance to such pollution. Mill Steam, Colwood and Craigflower creek were deemed "Good" with only some organic pollution probable. Douglas and Colquitz (downstream of Elk Lake) were deemed "Fair" with fairly substantial pollution likely, Bee, Cecelia and lower Colquitz were deemed "Fairly Poor" with substantial pollution likely and Bowker Creek was deemed "Poor" with very substantial pollution likely.

Special Projects and Other Activities

CRD staff are involved with a number of special projects and activities to improve stormwater quality in the region and promote healthy, livable watersheds and their receiving environments. Some initiatives carried out to reduce stormwater pollution and related activities are as follows:

- Implementing an Integrated Watershed Management Program to work in partnership with municipalities and the community to protect watersheds as regional assets rather than working at the individual scale.
- Coordinating a Community Integrated Watershed Management Group to allow CRD staff and other watershed stewards to communicate with each other about watershed activities, ideas, and research.
- Promoting stormwater source control through development of model bylaws, codes of practice, best management practices, educational outreach and technical assistance.
- Assisting MOE in the development of WQO in core area harbours and streams.
- Overseeing initiatives to improve and protect the environmental quality of core area watersheds and harbours, in cooperation with community and municipal groups through the Esquimalt Lagoon Stewardship Initiative, Gorge Waterway Initiative and Bowker Creek Initiative.
- Participating in community outreach events and hosting educational workshops.

2017 SAMPLING PROGRAM

The program will continue to work with municipal partners to achieve LWMP goals to identify stormwater discharges of public health and environmental concern and investigate the sources of contamination.

Staff will continue to collaborate with Island Health on public beach safety through sampling, communication and assistance in developing public notice messaging.