

2016 City of Capitola First Flush: Annual Water Quality Report

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*Preserving and protecting
our coastal watersheds*

Introduction

First Flush is an annual citizen science monitoring event that studies water quality at storm drains and receiving waters during the first significant rainfall of the wet season. During the first seasonal rainfall, stormwater runoff washes pollutants that have been building up on urban surfaces like streets, driveways, vehicles, and buildings into nearby storm drains. This urban runoff, a cocktail of household chemicals, bacteria, fertilizers and more flows from the storm drains directly into creeks, rivers, and eventually the Monterey Bay.

The goal of the First Flush Event is twofold: first, to serve as a tool for education and outreach to the community regarding the impacts citizens have on local water quality through urban runoff; and secondly, to collect scientifically valid water quality data to support environmental management decision-making at the local and state levels.

As part of a regional water monitoring effort throughout the Monterey Bay, the Coastal Watershed Council (CWC) conducted the annual First Flush Program in the City of Capitola in the fall of 2016. As CWC's program partner, the Monterey Bay National Marine Sanctuary conducted similar activities in Monterey County. Since 2000 CWC's work has been funded by a contract with the City of Capitola. This report summarizes Capitola's 2016 results.

The 2016 First Flush Event covered seven monitoring sites within the City of Capitola. Because Soquel Creek is the principal receiving water for urban runoff discharges from the City of Capitola, the monitoring focused on urban runoff and in-stream (creek) sites within the Soquel Creek watershed. During the event, trained teams of volunteers recorded observations and measurements in the field and collected water samples for laboratory analysis.

The 2016 First Flush annual report is designed to facilitate public education and awareness and to engage residents in best management practices to reduce urban runoff pollution in our local watersheds. The First Flush Annual Report can also be viewed online at: <http://coastal-watershed.org/cwc-reports/>

Methods

Training

All CWC trainings for water quality monitoring focus on imparting knowledge and skills required to follow quality assurance protocols consistent with USEPA and State Water Resources Control Board procedures. CWC's trainings always stress the importance of volunteer safety above all other considerations.

Prior to the First Flush Event, volunteers received hands-on classroom training on September 7, 2016. They were trained by CWC staff on basic field water quality tests, including field measurements of water temperature, electrical conductivity, pH, and transparency. They were also taught how to properly collect and preserve water samples.

During a follow-up field training called the "Dry Run" on September 10, 2016, volunteers went to their sites, performed field measurements, and collected water samples at all sites with measurable flow. The Dry Run served to familiarize volunteers with their team members and provided an opportunity to visit their monitoring site(s) in daylight and during good weather. This is an important safety measure because the First Flush storm often comes during the night and the familiarity that volunteer teams gain during the Dry Run prepares them to visit their site(s) during the First Flush Event, when conditions are wet and possibly dark. In addition, Dry Run results offer a comparison between pollutant concentrations in dry weather flows and flows during the First Flush storm.

CWC trained 23 volunteers, who also participated in the Dry Run sample event; 18 volunteers participated in the actual first flush storm event monitoring that occurred on October 15, 2016.

Sites

Water quality monitoring was conducted in Capitola at four storm drain sites (Auto Plaza, Capitola Center, Creekside, and Capitola Pier), and three Soquel Creek sites (see Figure 1). CWC and staff from the Public Works Department at the City of Capitola chose the stream and outflow/storm drain sites based on drainage basin characteristics and safe access for volunteer monitoring teams. Sites were also chosen to represent the upper, middle, and lower reaches of Soquel Creek and its tributaries within the boundaries of the City of Capitola. Details on site characteristics are shown in Appendix A.

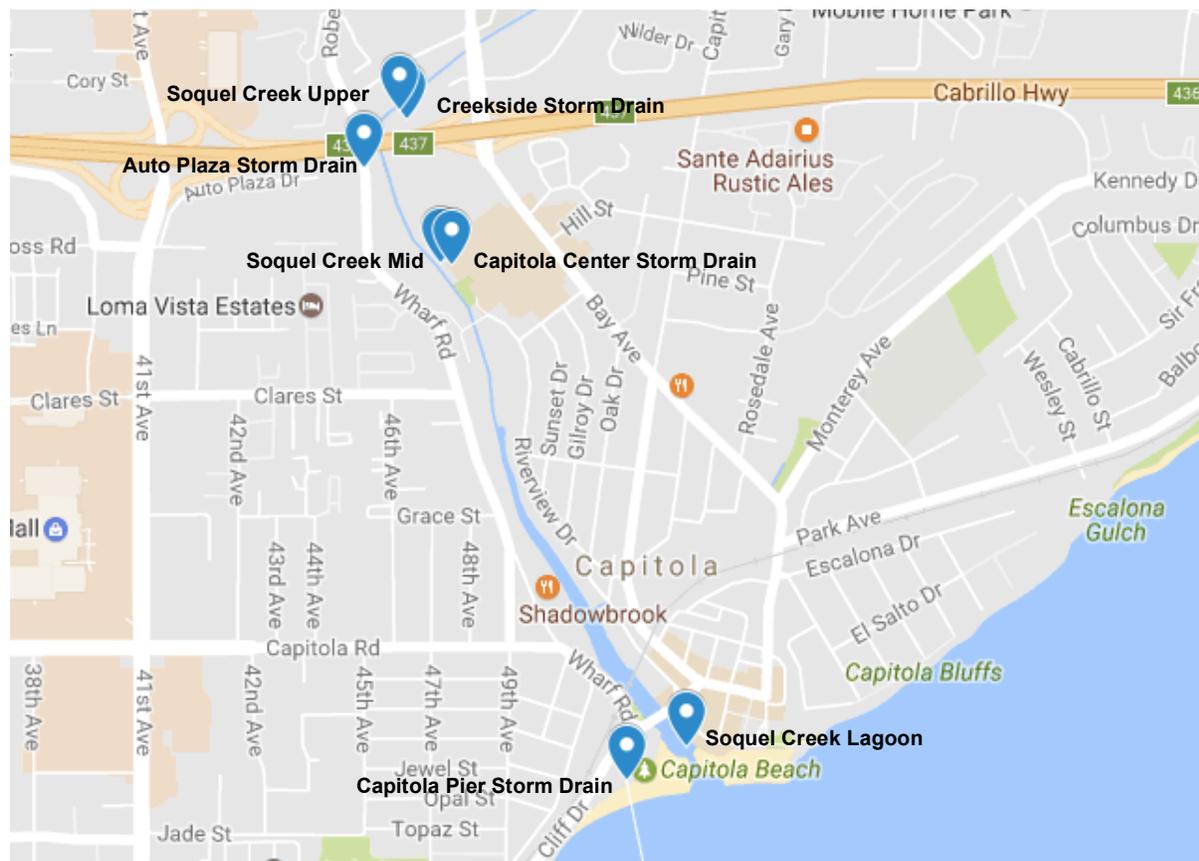


Figure 1: Map of 2016 Capitola First Flush Sites.

Data Collection

During both the Dry Run and the First Flush event, field measurements were performed for water temperature, electrical conductivity, pH, and transparency, and water samples were collected for laboratory analysis of nutrients (nitrate and orthophosphate), bacteria (*Escherichia coli*, enterococcus, and total coliform), metals (copper, lead, and zinc), total suspended solids, and hardness. Dry Run monitoring was conducted on September 10, 2016 (for sites where flow was present), and the First Flush event occurred on October 15, 2016. Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

CWC teams follow scientific protocols in the field to ensure that the data are reliable and can be compared to regulatory water quality objectives (“WQOs”; see discussion below). Samples were collected using protocols designed to avoid contamination during the sampling process. For lab samples, sample containers were filled with storm drain runoff or creek water, sealed, and placed on ice for preservation until delivery to the analytical laboratory. All samples were analyzed as individual grab samples rather than as a composite of samples. Laboratory sample

analysis was performed by Monterey Bay Analytical Services (MBAS), a professional laboratory accredited by the State of California.

Field equipment included a digital thermometer to measure water temperature, an Oakton EC Testr to measure electrical conductivity, Macherey-Nagel non-bleeding pH strips to measure pH, and 120 cm transparency tubes to measure transparency. pH and transparency were measured during the Dry Run but were not measured during the First Flush rain event as it occurred at night and both measurements require visual evaluation. Field measurements and physical observations such as presence of trash, scum, bubbles, odor, oil sheen, flow, and weather conditions were recorded on field data sheets.

The First Flush monitoring is organized into three “Time Series” data collection periods that include water sample collection for laboratory analysis and field measurements, as shown in Table 1. The intention is to sample urban runoff at the beginning of the flush to capture the heaviest pollutant load and highest concentrations of measured constituents, and subsequently measure constituent levels as rain and flow continues.

Table 1. Planned First Flush Field Measurements and Sample Collection

Time Series #	Timing	Storm Drains		Creek Sites	
		Field Measures	Lab Samples	Field Measures	Lab Samples
1	at Time "0"	✓	✓	✓	✓
2	30 minutes >Time 0	✓			
3	60 minutes >Time 0	✓	✓		

At the storm drain sites, field measurements and visual observations were performed at every time series, and water samples were collected for laboratory analysis during Time Series 1 and 3. The three Soquel Creek sites were monitored once; a set of Time Series 1 samples were collected at each site, along with field measurements and visual observations.

Beneficial Uses and Water Quality Objectives

WQOs are established to help ensure that ambient water quality is sufficient to support the “beneficial uses” of each ambient water body, as designated in the Regional Water Quality Control Plan (typically referred to as the “Basin Plan”).

When a WQO is exceeded in a receiving water body (such as Soquel Creek) on a recurring basis, it indicates that the water quality may not be protective of one or more of that water body’s designated beneficial uses. Following additional investigation by the regulatory authorities, the subject water body may then be designated as “impaired”.

When WQO exceedances are noted in the receiving water body, the receiving water data are compared to the storm drain (urban runoff) data to determine whether urban runoff discharges may be causing or contributing to the observed receiving water exceedances.

The designated beneficial uses of Soquel Creek, per Chapter II of the [Central Coast Basin Plan](#), are:

- MUN – Municipal and Domestic Supply
- AGR – Agricultural Supply
- IND – Industrial Service Supply
- GWR – Ground Water Recharge
- REC1 – Water Contact Recreation
- REC2 – Non-Contact Water Recreation
- WILD – Wildlife Habitat
- COLD – Cold Fresh Water Habitat

MIGR – Migration of Aquatic Organisms
SPWN – Spawning, Reproduction, and/or Early Development
BIOL – Preservation of Biological Habitats of Special Significance
FRESH – Freshwater Replenishment
COMM – Commercial and Sport Fishing

Data Analysis

Monitoring results for nitrate, copper, lead, zinc, and pH were compared to the WQOs in Chapter III of the [Central Coast Basin Plan](#). *E.coli* and *Enterococcus* results were compared to the [USEPA 2012 Recreational Water Quality Criteria](#). Orthophosphate results were compared to the former [Central Coast Ambient Monitoring Program \(CCAMP\)](#) Attention Level. There is no applicable WQO in the Central Coast Basin Plan for total coliform; for reporting purposes the WQO for total coliform in the neighboring San Francisco Bay Basin Plan is referenced. There are no applicable WQO's or attention levels for water temperature, electrical conductivity, transparency, urea, total suspended solids, or hardness (measured as the sum of calcium and magnesium). Details regarding the applicable WQOs and other applicable criteria are shown in Appendix B.

Exceedances of WQOs and other criteria are noted in the presentations of Dry Run field and lab results in Appendix C, and First Flush Event field and lab results in Appendix D.

It is important to note that WQOs apply only to receiving waters (such as named creeks, rivers, and the Bay), and not to urban runoff discharges. Yet comparisons of urban runoff monitoring results to WQOs provide a frame of reference by which results can be evaluated. In the absence of other objective standards to use as a comparison, these WQOs are the most appropriate values to compare to environmental results for both receiving waters and discharges. Where receiving water (Soquel Creek) WQO exceedances were observed, the storm drain data also are evaluated to determine whether urban runoff discharges may be causing or contributing to the receiving water WQO exceedances.

Because higher water hardness mitigates the toxic effects of heavy metals such as copper and zinc, several Basin Plan metals WQOs are dependent on the hardness of the receiving water. When the hardness level is >100 mg/L, the Basin Plan WQO for copper is <30 µg/L and for zinc is <200 µg/L; when hardness levels are <100 mg/L, the Basin Plan WQO for copper is <10 µg/L and for zinc is <4 µg/L ([Basin Plan, Table 3-5](#)). Measured hardness levels at all three Soquel Creek sites were less than 100 mg/L during the Dry Run. During the First Flush event all Soquel Creek sites measured hardness levels greater than 100 mg/L.

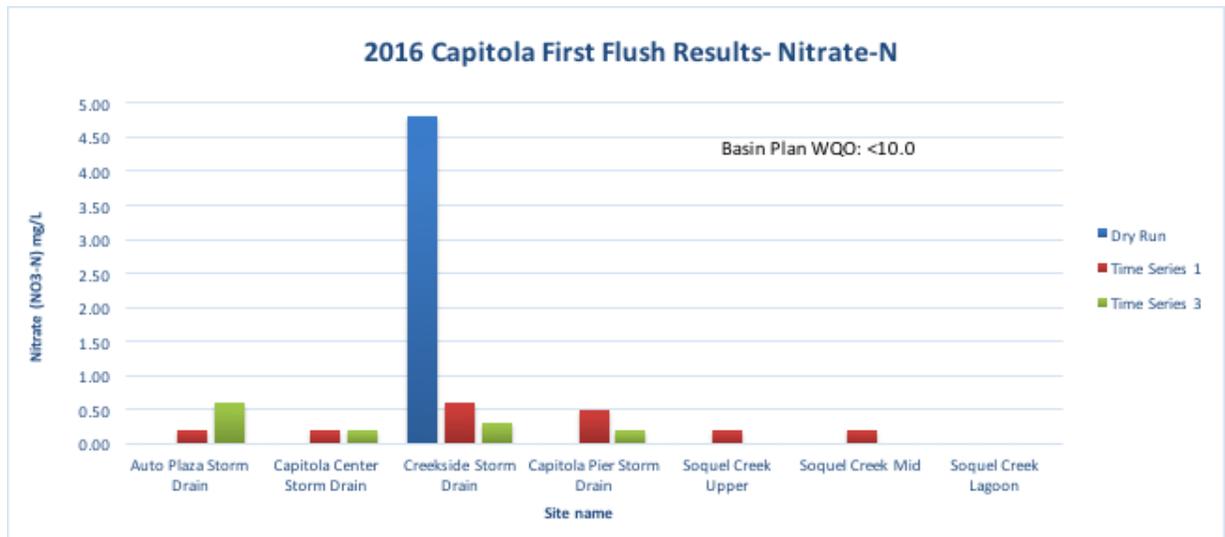
Results

The analytical results from the 2016 Dry Run and First Flush Event are provided in Appendix C and Appendix D, respectively. The data were evaluated and results are reflected in the following graphs and discussion.

Nitrate

Occurring naturally in the environment, nitrate is the primary source of nitrogen for plants. It promotes growth of aquatic vegetation and algae, but too much nitrate can cause overproduction, leading to algal blooms that deplete oxygen in water. Excessive nitrate contributes to the presence of harmful algal blooms (HABs) a rapidly growing problem in California. Sources of nitrate include runoff from lawns or fields containing fertilizers, animal waste, wash water, leaking sewer lines or failing septic systems, and excess dumping of vegetative material.

Nitrate met the Basin Plan WQO of <10.0 mg/L at all sites during the Dry Run and First Flush monitoring.



Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

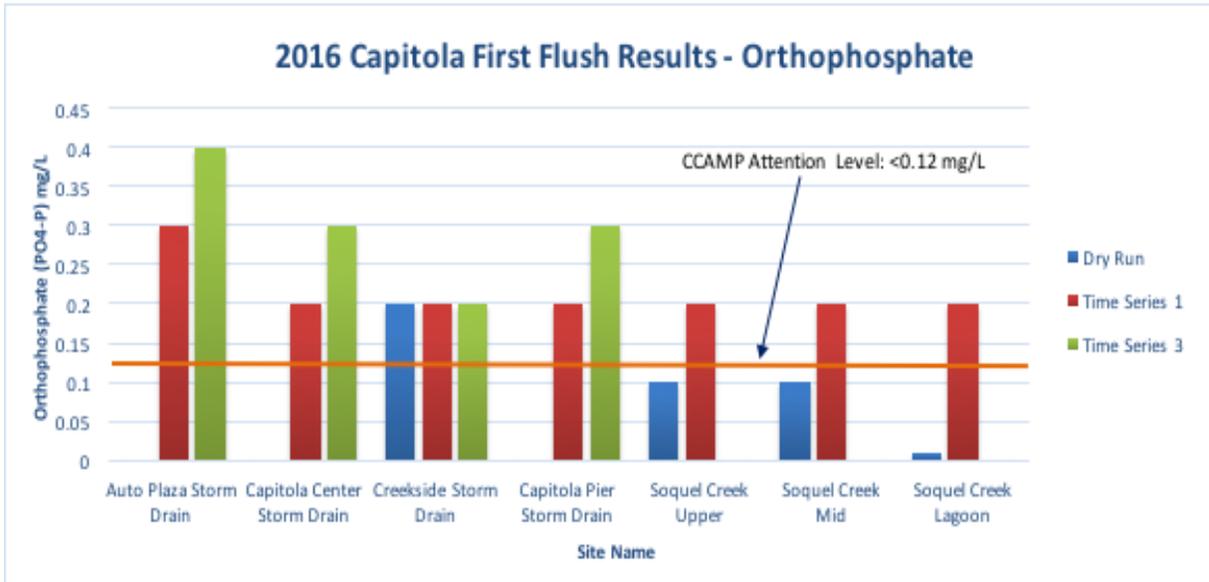
The 2016 First Flush outcomes follow the trend of fewer nitrate exceedances occurring in samples collected in Soquel Creek and Capitola storm drains. Over the past five years there have been no exceedances in nitrate at any Soquel Creek or Capitola storm drain sites.

Great job, Capitola residents! Please continue to do your part to maintain healthy levels of nitrate in our surface waters. Limit the use of chemical fertilizers on lawns, gardens, and landscapes. Where possible, redirect roof downspouts and use the lawn to spread runoff. Additionally, it helps if you can place cut or dead vegetation, a natural source of nitrate, into your yard waste bin can or compost it.

Orthophosphate

Orthophosphate is found naturally in living and decaying plants and animals and in rocks and sediment. Orthophosphate is a necessary nutrient for aquatic species growth, but like nitrate, excess amounts can stimulate rapid growth in aquatic ecosystems, resulting in algal blooms, oxygen depletion and eutrophication. Sources of orthophosphate include runoff from fertilized lawns, fields, or animal manure storage areas; leaking sewer lines, failing septic systems and commercial cleaning products.

Orthophosphate exceeded the former CCAMP attention level of <0.12 mg/L at all sites during First Flush monitoring and at one site, the Creekside Storm Drain, during Dry Run. This is the first time in First Flush monitoring that all orthophosphate levels have exceeded the attention level at all sites.



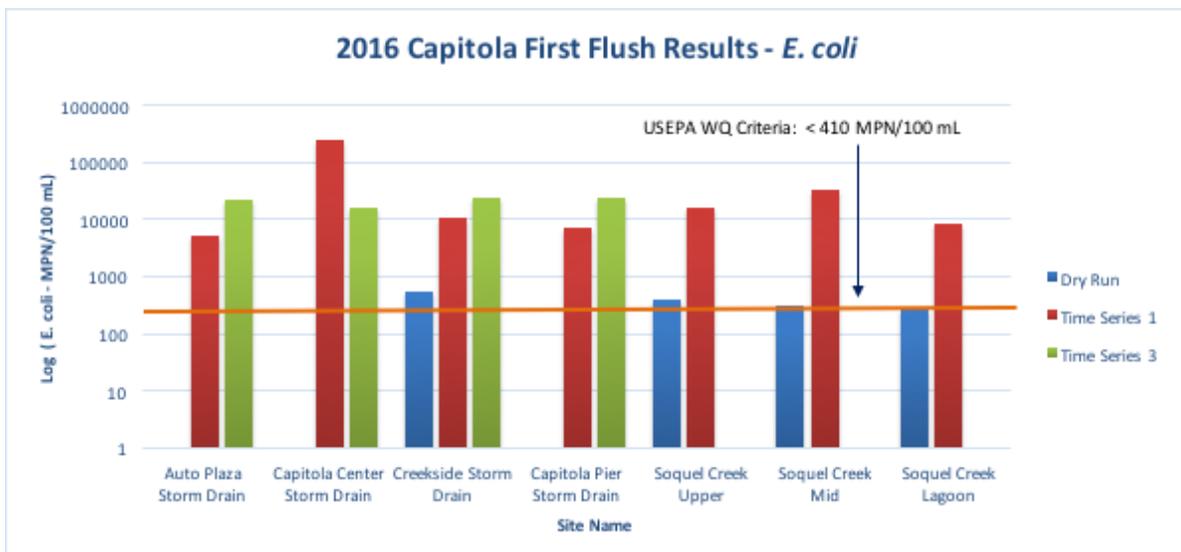
Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

You can reduce the input of orthophosphate into the watershed by maintaining or replacing septic systems, avoiding the outdoor use of phosphate-containing cleaners, and limiting the use of chemical fertilizers (especially before rain). Wash pets and vehicles where water won't run into a storm drain as incidental flows, or go to commercial pet or car washes that collect the wash water.

E. coli

E. coli is a common type of fecal bacteria originating in the intestines of warm blooded animals. In water quality it is used as an indicator of human waste in the form of sewage or animal waste contamination. High *E. coli* levels can be an indication of a septic tank failure or leaky sewer pipes. The bacteria can also be attributed to more diffuse sources such as wildlife, pets, and birds.

All samples collected during First Flush exceeded the USEPA WQ Criterion for *E. coli* of 410 MPN/100 mL. Two of the four Dry Run samples, collected at Creekside Storm Drain and Soquel Creek Upper sites, exceeded the criterion.

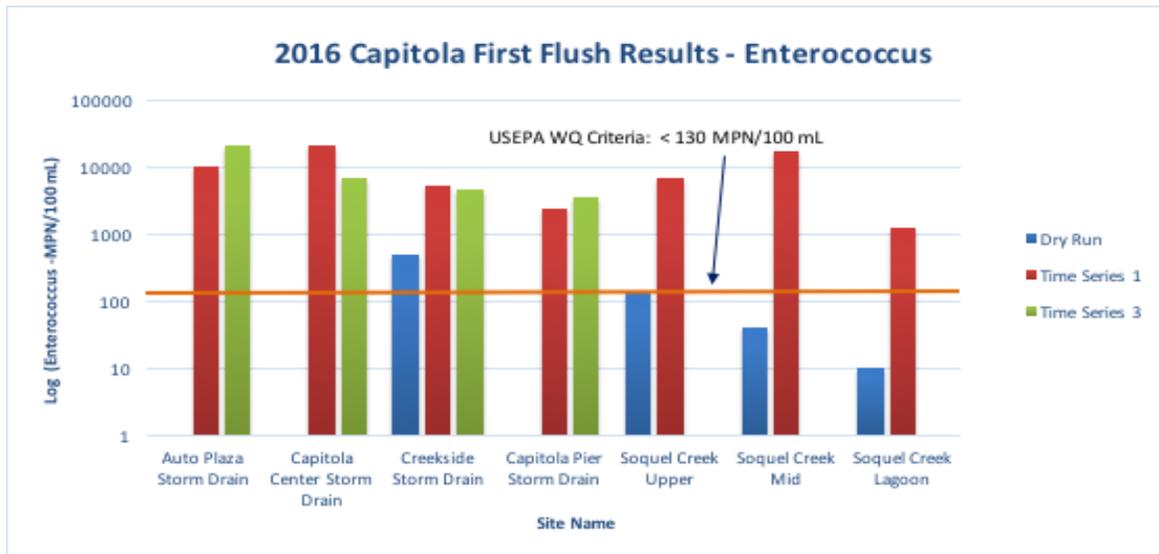


Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

Enterococcus

Enterococcus is an indicator of fecal pollution in water that may originate from animals or humans. Similar to *E. coli*, *Enterococcus* sources include leaky sewer pipes, failing septic systems, pets, and wildlife and particularly birds during dry weather.

All samples collected during the First Flush monitoring exceeded the USEPA WQ criterion of 130 MPN/100 mL for *Enterococcus*. During dry weather monitoring only the Creekside Storm Drain exceeded the WQ criterion.

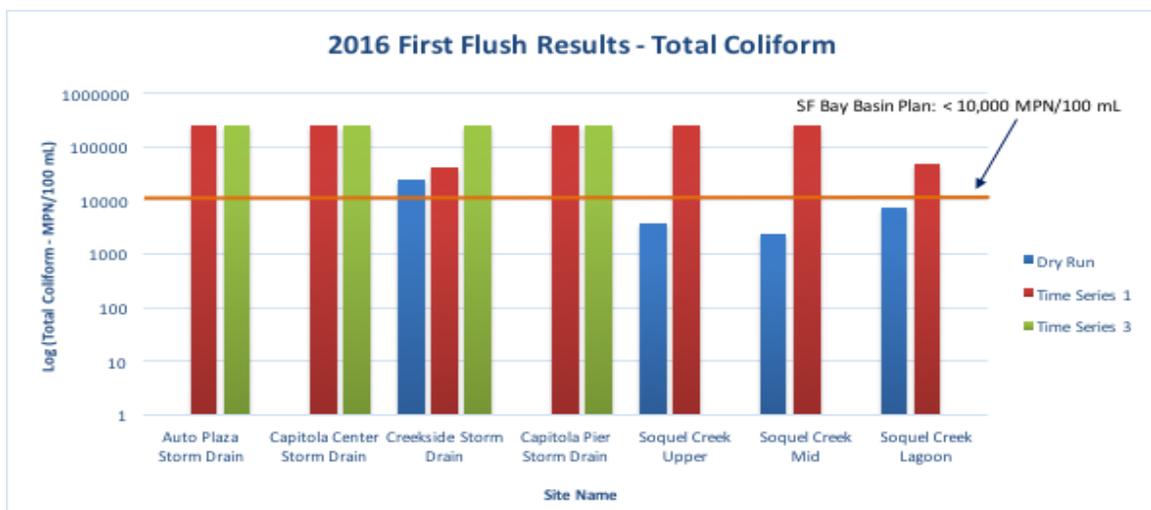


Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

Total coliform

Total coliform is a general group of bacteria that includes naturally occurring bacteria and also harmful fecal coliform bacteria. Total coliform results can suggest the possible presence of harmful bacteria, like the aforementioned *E. Coli.*, and potential fecal pollution in water, originating from animals or humans. While coliforms occur naturally they can also be sourced from leaky sewer pipes, failing septic systems, pets and wildlife (esp. birds).

All samples collected during First Flush monitoring exceeded the SF Bay Basin Plan WQO of 10,000 MPN/100 mL. Only the sample collected at the Creekside Storm Drain exceeded the WQO during Dry Run.



Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

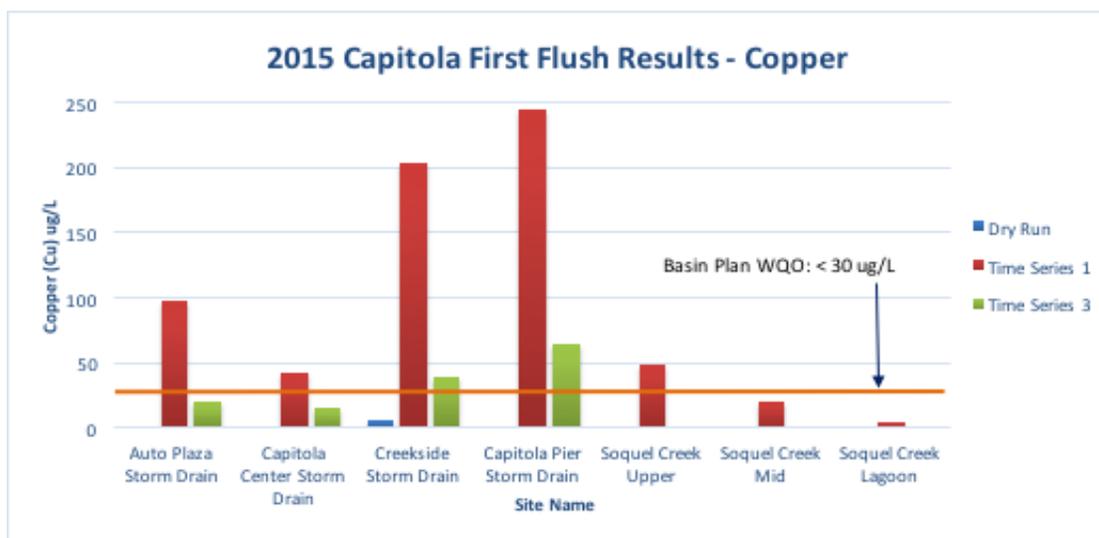
Exceedances in *E. coli*, *Enterococcus* and total coliform are common during First Flush events. Over the past five years, all First Flush samples analyzed for bacteria exceeded water quality objectives. However high bacteria loads can be reduced by addressing common sources with individual actions during dry weather. Ongoing inspection and maintenance of sewer laterals and septic systems can prevent leaching or runoff of polluted effluent.

You can clean up after pets in public spaces and your yard, help clean up trash that may attract birds, and report leaking sewer lines.

Copper

Copper is a mineral element that occurs naturally. It also has many industrial applications and it used in items we use daily like brake pads and tires in our cars. Surface runoff and stormwater flows can pick up copper that is deposited on roadways or mobilized while you are washing your car. Concentrations over 0.025 mg/L (25 µg/L) are toxic to freshwater fish.

During the First Flush event all Soquel Creek sites measured hardness levels greater than 100 mg/L resulting in an applicable copper WQO of <30 µg/L. Copper exceeded the WQO at all four storm drain sites and the Upper Soquel Creek site during First Flush Time Series 1, and at two storm drain sites during Time Series 3. None of the four sites monitored during Dry Run exceeded the lower hardness WQO of <10 µg/L for copper (copper was not detected in any of the Dry Run Soquel Creek samples).



Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

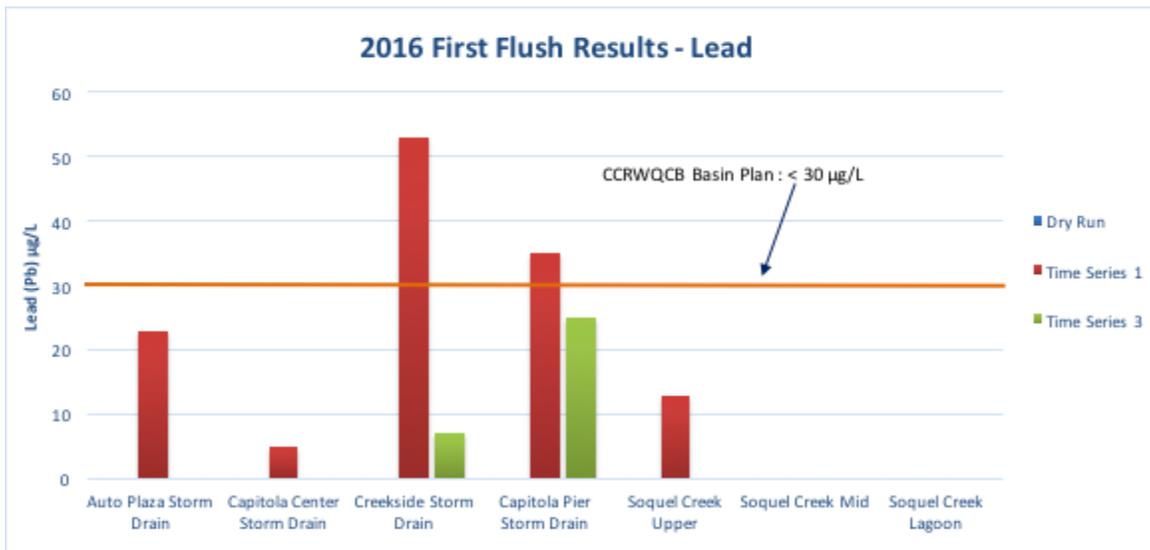
Auto Plaza, Capitola Center, Creekside and Capitola Pier storm drain sites all exceeded the applicable WQO of the receiving waters during Time Series 1. During Time Series 3 copper exceeded the receiving waters WQO at the Creekside Storm Drain and Capitola Pier Storm Drain.

Lead

Lead is toxic to fish, macro invertebrates and other aquatic organisms. While lead does occur naturally in the environment most lead comes from humans. Lead particles can be deposited onto the roadway from the exhaust pipes of cars and then carried with runoff and stormwater flows to the storm drain and creeks.

During the First Flush event Creekside Storm Drain and Capitola Pier Storm Drain both exceeded the Basin Plan WQO of <30 µg/L during Time Series 1, at 53 µg/L Pb and 35 µg/L

Pb, respectively. There were no exceedances of the lead WQO at any sites during the Dry Run (lead was not detected at any sites during the Dry Run analysis.) High lead levels are atypical when compared to past First Flush monitoring. In the previous five years of First Flush monitoring, there had been no lead exceedances in Soquel Creek or Capitola storm drains.

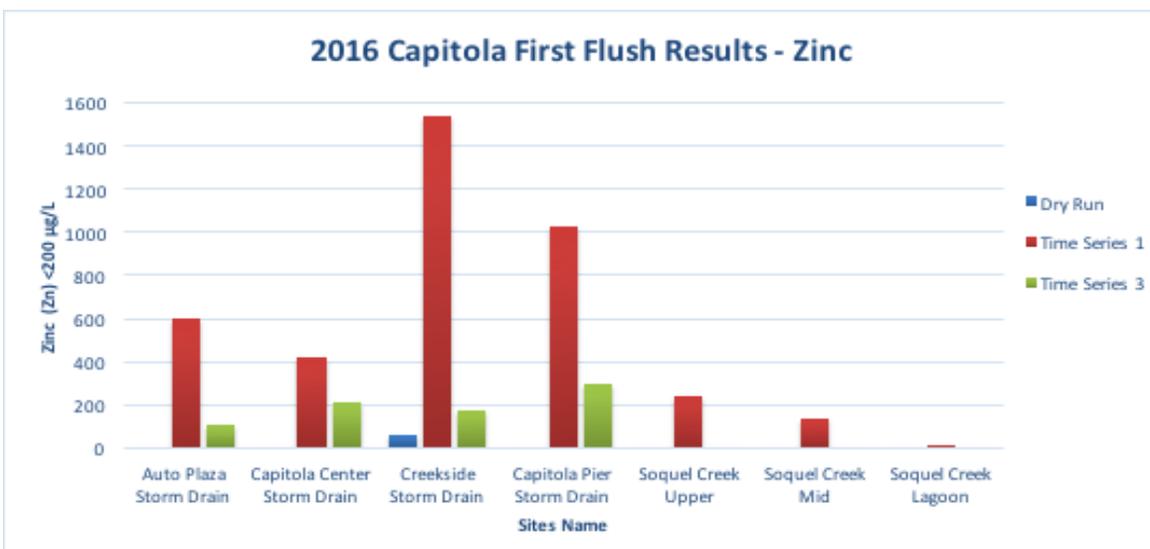


Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

Zinc

Zinc occurs naturally at low levels, but too much can be harmful to fish and other aquatic organisms. Common sources are vehicle brake and tire wear, vehicle wash-water, and building materials.

Five of the seven sites monitored during First Flush Time Series 1 exceeded the Zinc Basin Plan WQO of 200 ug/L, including all four storm drain sites and the Upper Soquel Creek site. During Time Series 3 only the Capitola Pier Storm Drain continued to exceed the zinc WQO. During the Dry Run, only the Creekside Storm Drain exceeded the lower hardness WQO of 4 µg/L for zinc (zinc was not detected in any of the Dry Run Soquel Creek samples).



Dry Run samples were not collected at Auto Plaza, Capitola Center, or Capitola Pier Storm Drains, due to lack of flow.

To reduce copper, lead and zinc in your watershed you can get your car washed at a car wash that collects their waste water and avoid using copper-containing pesticides.

Discussion/Conclusions

This report summarizes results for the 2016 Dry Run and First Flush Event conducted in the City of Capitola. Exceedances of WQOs or attention levels were documented for orthophosphate, bacteria (*Escherichia coli*, enterococcus, and total coliform), and metals (copper, lead and zinc).

Field-measured Habitat Results

Trash was observed during the First Flush event at three sites: Creekside Storm Drain, Capitola Pier Storm Drain and the Soquel Creek Upper.

Sewage was smelled during the First Flush event at Capitola Center Storm Drain and the Soquel Creek Lagoon.

No oil sheen was reported at any site during the First Flush Event.

Scum was reported at one site, Soquel Creek Mid, during the Dry Run. During the First Flush Event, four of seven sites in Capitola reported scum: Auto Plaza Storm Drain, Creekside Storm Drain, Capitola Pier Storm Drain and Soquel Creek Mid.

Receiving Water vs. Urban Runoff Results

The 2016 First Flush data can be evaluated with respect to the following management questions:

- 1) Did measured water quality at the Soquel Creek receiving water sites meet established WQOs during the First Flush event?
- 2) For constituents exhibiting WQO exceedances in the receiving water, do urban runoff discharges appear to cause or contribute to the observed receiving water exceedances?

During First Flush, the Time Series 1 orthophosphate levels were detected at quite similar levels at Soquel Creek receiving water sites and storm drain sites, and the results were above the WQO at all sites. Orthophosphate tended to rise to even higher levels at the storm drain sites during Time Series 3. The data therefore indicate that urban runoff may be causing or contributing to the in-stream receiving water exceedances for orthophosphate during wet weather conditions. During dry weather, the Creekside Storm Drain site exceeded the WQO, but the creek sites did not.

During First Flush all sites - storm drain and creek sites - exceeded WQO's for *E. Coli*, *Enterococcus* and Total Coliform during Time Series 1, and the storm drain sites continued to exceed those WQOs during Time Series 3. Bacteria levels were similar at storm drain and creek sites, demonstrating that urban runoff discharges may contribute substantially to the bacteria exceedances found in Soquel Creek during rainfall. During the Dry Run the situation is more ambiguous, as in the creek, only the Upper Soquel Creek site exceeded bacteria WQOs (for two of the three bacteria tests), while the Creekside Storm Drain site exceeded the WQOs for all three tests.

During First Flush, copper and zinc both exceeded their respective WQOs at all four storm drain sites during Time Series 1, with the greatest magnitudes at the Creekside and the Capitola Pier* storm drain sites. In the creek, only the Soquel Creek Upper site also exhibited copper and zinc WQO exceedances, indicating the likely impact of urban runoff on the receiving water exceedances for copper and zinc at that location. Notably, the downstream Soquel Creek Mid and Soquel Creek Lagoon sites did not exceed copper or zinc WQOs. [*Flow from the Capitola Pier Storm drain runs directly into the Monterey Bay at Capitola Beach.]

Among all sites monitored, the Creekside Storm Drain had the highest frequency of exceedances. Notably Soquel Creek Upper had the highest frequency of exceedances of any receiving water site.

Program Summary

The volunteers who participate in the First Flush monitoring and collect this valuable information play a key role as stewards of our watersheds. The information they provide is used by resource agencies, local governments, and community groups to protect and improve the health of our local streams.

The results from First Flush studies and from other monitoring programs can be used to facilitate pollution prevention efforts by identifying which constituents are of greatest concern, and evaluating trends in water quality for key constituents over time. Environmental data, by their very nature, are extremely variable, and conclusions are often difficult to make based on limited data points. Nonetheless, these results are of use in shaping regional programs to inform the public about environmental stewardship.

CWC's mission is to preserve and protect coastal watersheds through community stewardship, education, and monitoring. The First Flush program and the partnership between CWC and the City of Capitola represent a collaboration that supports the goals of each organization and benefits the overall community.

More information about local water quality data is available at <http://coastal-watershed.org> or by contacting Alev Bilginsoy at (831) 464-9200 or abilginsoy@coastal-watershed.org.

Appendix A – Monitoring Site Locations

SiteName	Site Code	Latitude	Longitude
Auto Plaza Storm Drain	304-CSD-03	36.982519	-121.959825
Capitola Center Storm Drain	304-CSD-05	36.9806	-121.95780
Creekside Storm Drain	304-CSD-06	36.983419	-121.958828
Capitola Pier Storm Drain	304-CSD-09	36.971283	-121.953783
Soquel Creek-Upstream	304-SOQUE-26	36.9835	-121.9590
Soquel Creek-Mid	304-SOQUE-28	36.9804	-121.95780
Soquel Creek Lagoon/Outlet	304-SOQUE-22	36.971897	-121.952406

Appendix B – Water Quality Objectives and Other Criteria

Applicable WQOs and attention levels are as follows:

Analyte	WQO or Attention Level	Units	Source of WQO/AL
Field:			
Water Temperature	Not Evaluated	°C	CCRWQCB Basin Plan Objective for Cold Water Habitat
Electrical Conductivity	NA		NA
pH	>7.0 and <8.5	pH units	CCRWQCB Basin Plan Objective for Cold Water Habitat
Transparency	NA		NA
Laboratory:			
<i>E.coli</i>	<410	MPN/100 mL	USEPA 2012 Recreational WQ Criteria
Total Coliform*	<10,000	MPN/100 mL	SF Bay Region Basin Plan for Water Contact Recreation
Enterococcus	<130	MPN/100 mL	USEPA 2012 Recreational WQ Criteria
Nitrate (NO ₃ -N)	<10.0	mg/L	CCRWQCB Basin Plan
Orthophosphate (PO ₄ -P)**	<0.12	mg/L	Former CCAMP Attention Level
Copper (Cu) ***	<30	µg/L	CCRWQCB Basin Plan
Lead (Pb)	<30	µg/L	CCRWQCB Basin Plan
Zinc (Zn)***	<200		CCRWQCB Basin Plan
Total suspended solids (TSS)	NA		NA
* Total coliform: there is no applicable WQO in the CCRWQCB Basin Plan; for report purposes the neighboring SF Bay Basin Plan is referenced.			
** Orthophosphate: there is no applicable WQO in the Basin Plan; for report purposes the former CCAMP Attention Level is referenced.			
*** Copper and Zinc receiving water WQO is Hardness dependent.			
+ (Urea, Conductivity, Magnesium, Calcium, and Calcium Carbonate (CaCO ₃) do not have a specific receiving water WQO or Attention Level).			

Appendix C – Dry Run Analytical Results

Appendix C provides the field and laboratory results for the City of Capitola Dry Run. Results that exceed the applicable WQO or attention level are shaded. Not all tests were performed during the Dry Run at every monitoring site (no flow was present at the Auto Plaza, Capitola Center, Creekside, and Capitola Pier Storm Drains during the Dry Run); these instances are listed as “NA” when the test was not performed or “NR” if the datum was not recorded. One set of samples was collected for each site with flow.

	CSD-03	CSD-05	CSD-06	CSD-09	SOQUE-26	SOQUE-28	SOQUE-22
Parameter	Auto Plaza Storm Drain	Capitola Center Storm Drain	Creekside Storm Drain	Capitola Pier Storm Drain	Soquel Creek Upper	Soquel Creek Mid	Soquel Creek Lagoon
Nitrate-N (NO ₃ -N)	NA	NA	4.8	NA	ND	ND	ND
Orthophosphate-P (PO ₄ -P)	NA	NA	0.20	NA	0.1	0.1	ND
Urea-N	NA	NA	NA	NA	NA	NA	NA
<i>E.coli</i>	NA	NA	556	NA	410	305	262
Total Coliform	NA	NA	>24196	NA	3654	2359	7270
Enterococcus	NA	NA	504	NA	146	41	10
Copper (Cu)	NA	NA	6	NA	ND	ND	ND
Lead (Pb)	NA	NA	ND	NA	ND	ND	ND
Zinc (Zn)	NA	NA	58	NA	ND	ND	ND
Total Suspended Solids (TSS)	NA	NA	8	NA	ND	ND	ND
Hardness (as CaCO ₃)	NA	NA	160	NA	308	313	301
Calcium	NA	NA	36	NA	82	84	76
Magnesium	NA	NA	17	NA	25	25	27
Water Temperature	NA	NA	15.6	NA	15.9	16.2	18.9
pH	NA	NA	7.5	NA	7.5	7.5	7.5
Electrical Conductivity	NA	NA	680	NA	860	860	960
Transparency	NA	NA	100	NA	>120	>120	>120

Visual Field Observations:

Trash	NA	NA	NA	NA	N	N	N
Sewage (sited or smelled)	NA	NA	NA	NA	N	N	N
Oil Sheen	NA	NA	NA	NA	N	N	N
Scum	NA	NA	NA	NA	N	Y	N

Shaded values indicate discharge value exceeds receiving water WQO or Attention Level

ND = Non-detect result

NA = No data available/test not performed

NA* = Capitola Center Time Series 1: sample cap loose, sample leaked out

NR = Not recorded

Y/N = Yes/No

Appendix D – First Flush Analytical Results

Appendix D provides the field and laboratory results for the City of Capitola First Flush Event. Results that exceed the applicable WQO or attention level are shaded. Not all tests were performed during the First Flush monitoring event (no samples were collected from Storm Drain sites for Time Series 2 lab analyses, and only Time Series 1 samples were collected for Creek sites); these instances are listed as “NA” when the test was not performed or “NR” if the datum was not recorded.

	Auto Plaza Storm Drain	Auto Plaza Storm Drain	Auto Plaza Storm Drain	Capitola Center Storm Drain	Capitola Center Storm Drain	Capitola Center Storm Drain	Creekside Storm Drain	Creekside Storm Drain	Creekside Storm Drain	Capitola Pier Storm Drain	Capitola Pier Storm Drain	Capitola Pier Storm Drain	Soquel Creek Upper	Soquel Creek Mid	Soquel Creek Lagoon
	CSD-03	CSD-03	CSD-03	CSD-05	CSD-05	CSD-05	CSD-06	CSD-06	CSD-06	CSD-09	CSD-09	CSD-09	SOQUE-26	SOQUE-28	SOQUE-22
Parameter	Time Series 1	Time Series 2	Time Series 3	Time Series 1	Time Series 2	Time Series 3	Time Series 1	Time Series 2	Time Series 3	Time Series 1	Time Series 2	Time Series 3	Time Series 1	Time Series 1	Time Series 1
Nitrate-N (NO ₃ -N)	0.2	NA	0.6	0.2	NA	0.2	0.6	NA	0.3	0.5	NA	0.2	0.2	0.2	ND
Orthophosphate-P (PO ₄ -P)	0.3	NA	0.4	0.2	NA	0.3	0.2	NA	0.2	0.2	NA	0.3	0.2	0.2	0.2
Urea-N	388	NA	NA	251	NA	NA	155	NA	NA	802	NA	NA	47	82	16
<i>E. coli</i>	5371	NA	21426	241957	NA	15648	10460	NA	23593	7328	NA	23326	15648	32554	8703
Total Coliform	>241960	NA	>241960	>241960	NA	>241960	>241960	NA	>241960	>241960	NA	>241960	>241960	>241960	>48392
Enterococci	10460	NA	21872	20635	NA	7083	5448	NA	4798	2462	NA	3592	15648	32554	8703
Copper (Cu)	97	NA	20	42	NA	16	203	NA	39	245	NA	64	48	20	4
Lead (Pb)	23	NA	ND	5	NA	ND	53	NA	7	35	NA	25	13	ND	ND
Zinc (Zn)	602	NA	112	416	NA	211	1539	NA	176	1028	NA	299	241	138	16
Total Suspended Solids (TSS)	28	NA	200	68	NA	27	290	NA	47	353	NA	200	101	52	3
Hardness (as CaCO ₃)	101	NA	33	42	NA	14	95	NA	26	138	NA	50	226	128	284
Calcium	29	NA	10	12	NA	4	25	NA	7	34	NA	10	59	33	74
Magnesium	7	NA	2	3	NA	1	8	NA	2	13	NA	6	19	11	24
Water Temperature	18	17.9	17.9	18.7	18	17.8	18	17.9	17.8	17.7	17.1	16.9	16.6	17.2	16.1
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Electrical Conductivity	200	140	120	NA	NA	NA	240	110	110	490	260	220	700	450	800
Transparency	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Visual Field Observations:

Trash	N	N	N	N	N	N	Y	Y	N	Y	N	N	Y	N	N
Sewage (sited or smelled)	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y
Oil Sheen	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Bubbles/Scum	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	N	Y	N

Shaded values indicate discharge value exceeds receiving water WQO or Attention Level

ND = Non-detect result

NA = No data available/test not performed

Y/N = Yes/No