



**2005 Urban Watch-First Flush  
Storm Drain Monitoring Program  
City of Capitola  
Santa Cruz County, California**

**July 6– November 1, 2005**

**A Program Administered by the Coastal Watershed Council:**

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# Capitola Urban Watch Monitoring Program

## PROGRAM OVERVIEW

The Capitola Urban Watch-First Flush storm drain monitoring program was initiated by the Coastal Watershed Council (CWC) on behalf of the City of Capitola, NPDES Phase II Storm Water Management Program, and funded under the County's Proposition 13 - Coastal Non-Point Source Pollution Control Grant (Agreement: 03-184-553-0).

The Urban Watch Program started in 1997 as a joint effort between the Coastal Watershed Council, the City of Monterey, and the Monterey Bay National Marine Sanctuary. The "First Flush" event first took place in 2000, and the program has expanded regionally to include eight programs across the Monterey Bay in 2005. The goals of the Urban Watch-First Flush Program are twofold: First, to serve as a tool for education and outreach to the community regarding the impacts that the citizens have on local water quality thru urban run-off; and secondly, to collect important water quality data to support environmental management decisions at the local and state levels. These goals are achieved through the participation of trained volunteers who monitor dry-season storm drain discharges at selected outflow areas throughout the Capitola area. Urban Watch monitoring typically occurs twice weekly from June through approximately mid-November, ending with the first significant rain.

The Urban Watch-First Flush Program culminates with the "First Flush" monitoring event wherein volunteers monitor during the first significant rain of the wet season at the same Urban Watch program storm drains. This rain event washes the streets and 'flushes' the gutters and storm drains of collected materials and pollutants that have accumulated throughout the dry-season. Volunteers take in-field measurements and collect samples during the rain event. These samples are then sent to a professional lab where analysis for trace metals, nutrients, and pathogens are performed. Although the First Flush event will be mentioned in passing throughout this report, complete Annual First Flush event summary reports are produced by our program partner, the Monterey Bay Sanctuary Citizen Watershed Monitoring Network (Network), and reports from every year's event can be downloaded from their web site at: <http://www.mbnms.nos.noaa.gov/monitoringnetwork/events.html>

## PROGRAM DESIGN

### *Equipment & Parameters*

CWC's Urban Watch monitoring kit has been designed to provide a method for volunteers to monitor dry-season storm drain discharges and identify common urban pollutants and contaminants within the study area. The Urban Watch Program utilizes a stormdrain water quality monitoring kit manufactured by the LaMotte Company (SSDK 7446) and designed in association with the City of Ft. Worth, Texas. This kit was developed according to National Pollutant Discharge Elimination System (NPDES) Phase I dry weather monitoring requirements and is designed to detect illegal storm drain connections and discharges. To this pre-assembled kit CWC has added to the base kit equipment such as thermometers, two Oakton 'ECTestr' conductivity meters (1-high, 1-low range) and replaced the Oakton 'pHTestr' meter with pH strips for ease of use by volunteers, as well, two Hanna Instruments ion meters were added to the Capitola kit.

The parameters volunteers monitored include: detergent surfactants, ortho-phosphate, copper (total), chlorine (total), pH, conductivity, air and water temperature, sample water odor and color (Table 1). Volunteers also noted if there was oil sheen, sewage, trash, and surface scum, present on the water, or at the storm drain station. They also determined sample turbidity using a "Low-Medium-High" designation. As well, volunteers made other notable observations of changes to the station environment, including signs of recent 'pollution' activities or sources, and wildlife observations.

**Table 1: Water Quality Parameters for the Urban Watch Monitoring Program.**

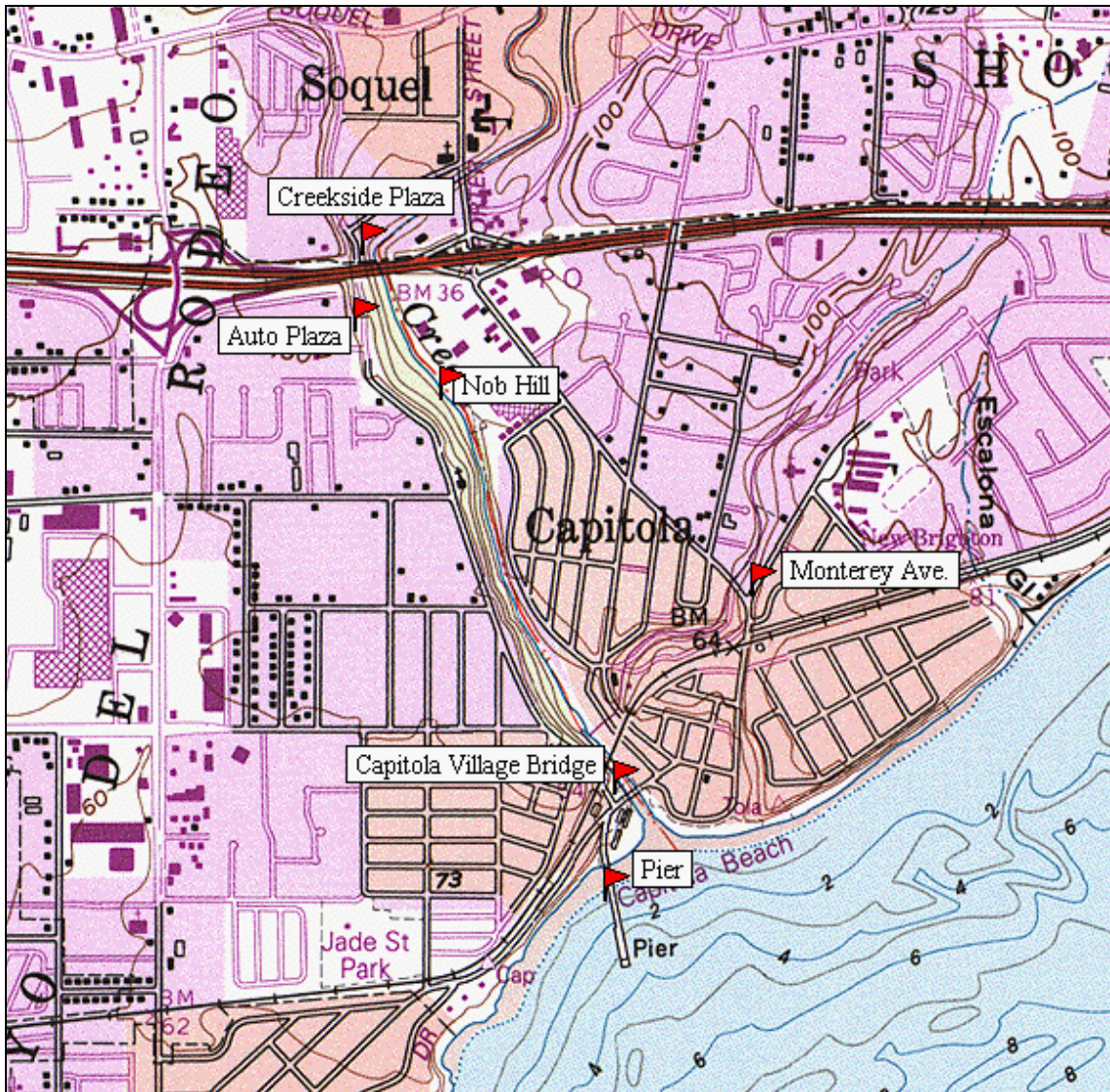
Parameter	Possible Sources	Associated Problems	Method/Accuracy
Temperature: Air & Water	Illegal discharges	Affects rates of chemical and biochemical reactions in water.	Method – Digital thermometer Accuracy ± 1% full scale Or Bulb Thermometer (Spirit) -5.0 – 55 oC
pH	Aerosols and dust in air, mineral substances, sewer overflows, animal wastes, pesticides & fertilizers, photosynthesis	Interferes with fish and other aquatic life	Method – MacHery-Nagel pH-Fix 4.5-10.0 color-fixed indicator strips Accuracy ± 0.25 units Min detection: 4.5
Detergent surfactants	Illegal or unintended discharges, car washing, cleaning of screens and grills, leaking sanitary sewers	Can be toxic to many aquatic insects, plants, and fish; can lower dissolved oxygen available to aquatic life	Method – solvent extraction/ bromphenal blue indicator Accuracy ± 0.1 ppm Min detection: >0.1 ppm
Phenols	Disinfectants, toothpaste, mouthwash from domestic water	Interferes with fish and other aquatic life	Method – Aminoantipyrine Octa-Slide Comparator against color standard. Accuracy ± 10% Min detection: 0.5 ppm
Copper	Illegal discharges into the storm drain system; also can occur naturally in surface waters.	Concentrations over 0.025 parts per million are toxic to most freshwater fish.	Method – Diethyldithiocarbamate Octa-Slide Comparator against color standard. Accuracy ± 10% Min detection: >0.0 ppm
Chlorine	Illegal or unintended connections to a Storm drain or draining of a swimming pool.	Toxic to aquatic life, can create a "sterile" environment.	Method – DPD Octa-Slide Comparator against color standard. Accuracy ± 10% Min detection: >0.2 ppm
Ammonia-Nitrogen	Illegal connections to storm drain systems, poorly functioning septic systems, wildlife.	At certain concentrations can be toxic to aquatic organisms.	LaMotte Code 5864 Method – Octa-Slide Comparator against color standard. Min detection: >0.1 ppm
Conductivity	Discharges high in salts and minerals or metals, water moving through local geology.	Possible agricultural, industrial or municipal wastewater runoff.	Method – Electrode probe module. Accuracy ±1% Min detection: 10 mS or 10 µS
Turbidity	Microorganisms, sediment, erosion.	Interferes with fish and other aquatic life.	Method – Visual Octa-Slide Viewer Compare to a 5 step “Low/Med/High” turbidity standard slide bar
Color	Dyes or chemicals	Interferes with aquatic Insects	Method – Visual Borger Color System
Odor	Illegal discharges or product of decomposition; "clean" drainage water should have no distinctive odor	Can indicate presence of contaminants.	Method – Scent
Oil sheen	Hydrocarbons such as oil, gasoline, and grease; leaking underground petroleum storage tanks	Toxic to aquatic organisms.	Method – Visual
Trash, sewage, scum	Illegal discharges or illegal dumping	Interferes with fish and other aquatic life.	Method - Visual

Units: ppm – parts per million; mg/L – milli grams per liter; mS – milli Siemens; µS – micro Siemens

*Monitoring Locations*

The Coastal Watershed Council and a representative of the City of Capitola chose six sampling sites based on drainage basin and safe access for volunteers (Figure 1 and Table 2). The monitoring sites established for this program are referred to as: (1) **Nob Hill**, left bank drain from parking lot and loading areas behind Nob Hill Market and Longs Drugs; (2) **Auto Plaza**, right bank outfall with dissipater draining Auto Plaza

Road; (3) **Stockton Bridge**, right bank drain at base of NW end of bridge at corner of East Cliff Dr. and Wharf Dr.; (4) **Creekside**, left bank drain behind Creekside plaza parking lot; (5) **Monterey Ave.**, drain from open channel along Monterey Avenue, to the right of the park; and (6) **Pier**, drain directly under the Capitola Pier.



**Figure 1.** Monitoring station locations for the City of Capitola-Soquel Creek Urban Watch Program, Santa Cruz County, California (TOPO! 1997).

**Table 2:** Drainage descriptions of the monitoring stations for the 2005 Urban Watch Program in the City of Capitola, Santa Cruz County.

Station Name	Station ID	Land use (Approximate)	Drainage Type (Collection point)	Discharges to:
Nob Hill	CSD-01	100% Commercial	Corrugated metal pipe	Creek
Auto Plaza	CSD-03	2% residential: 98% Commercial	Corrugated metal pipe outleting to a cement box culvert w/dissipater	Creek
Stockton Bridge	CSD-04	100% residential:	Corrugated metal pipe	Creek
Creekside	CSD-06	95% residential 5% Open Space	Corrugated metal pipe	Creek
Monterey Avenue	CSD-08	90% residential: 10% Open Space	Surface drainage	Creek
Pier	CSD-09	100% residential:	Cement culvert (metal 'flap' gate)	Ocean

Drainage area and land use information supplied by the County of Santa Cruz Public Works Department, 2006. All drains discharge to Soquel Creek, except Pier.

## **VOLUNTEER TRAINING**

### *Volunteer preparation*

All Urban Watch and First Flush Program volunteers attended one four-hour “classroom” training, and received a minimum of four hours “in-field” training. Volunteer training sessions cover pertinent topics including explanation of parameters to be monitored, monitoring protocols to be used, in-field and chemical safety, and a briefing on safe public encounters.

Tamara Doan of the Coastal Watershed Council (CWC) and Bridget Hoover of the Monterey Bay Sanctuary Citizen Monitoring Network (Network) provided a four-hour hands-on training for both the Urban Watch and First Flush programs. In each instance, volunteers are presented with program materials which included: detailing station locations, explanations of monitoring equipment and materials, procedural instructions and test protocols, as well as ancillary information on the subject of urban pollutants. Topics emphasized include monitoring concepts and clean sample collection procedures, test protocols, use of kits in the field, and safety procedures. In 2005 this included the NOAA Hazard Communication training (29 CFR 1910.1200). Training for the First Flush event was identical in format, and also included an in-field “dry run” training at each storm drain.

The trained Urban Watch volunteers were then scheduled into teams for monitoring over the duration of the program. A CWC staff person or trained “team leader” accompanied each Urban Watch volunteers in the field for each station visit. Volunteers conducted the Urban Watch monitoring at all stations twice a week throughout the monitoring period June to November 2005.

In the Capitola program 10 volunteers were trained and divided into four teams of between 3-5 members each, and each team was assigned one week per month to monitor. Field observations and sample collection were completed by each team twice during their assigned week, resulting in twice weekly monitoring for the program. Randomized sample collection was achieved by incorporating a flexible monitoring schedule with volunteers; where the week of the month was assigned to a team, but day of week and time of day was left up to the monitoring teams based on the volunteer availability. Volunteers were required to sample during daylight hours, and did so both on weekdays and weekends. A monitoring event for a team consisted of two field visits to all sits within the 7-day period Monday-Sunday. One data sheet was completed at each station for each of the two visits whether or not there was flow detected from the storm drain outfall on that occasion.

## **QUALITY ASSURANCE/QUALITY CONTROL PROGRAM**

In 2004 CWC and the Network jointly submitted at Quality Assurance Project Plan (QAPP) for the 'Monterey Bay Regional Urban Watch-First Flush Program'. This document was approved by the Quality Assurance Officer for the Central Coast Regional Water Quality Control Board (CCRWQCB) on October 8, 2004, and will continue to be in effect as long as the program is maintained by CWC and the Network (QAPP and monitoring protocols are available upon request). The purpose of the QAPP is to outline the technical aspects of the monitoring program relating to the quality of data assured by the implementation of the program as described in the document, including but not limited to; required training, sampling methods and procedures, analytical methods, equipment maintenance, documentation protocols, and various quality control requirements.

A sample of the Quality Assurance/Quality Control (QA/QC) program requirements included the QAPP:

### Training (staff and volunteers)

- Monitoring concepts, parameter information
- Sampling methods: Conducting a station visit; Water sample collection; Monitoring equipment & protocols
- Use of data sheets and chain of custody documents
- Safety; chemical, in-field, & public interaction

### Equipment maintenance & Programmatic QA/QC Procedures (staff)

- Regular inspection of monitoring equipment and program "kits"
- Periodic calibration of test equipment (calibration records are available)
- Monitoring of reagent stores, chemical expiration dates, and waste management.
- Completion of a Standard Operation Procedure for volunteers to use in the field while monitoring.
- Use of regulated monitoring regime (volunteer schedule)
- Continued supervision until the trainer was confident in the volunteers' sampling and analysis skills.

### Data Quality Management Procedures (staff)

- Training in CWC's Citizen Water Quality MS Access database, data entry
- Use of Instrument ID numbers to track equipment used by teams
- Use of Station ID numbers to track monitoring locations
- Maintaining records of equipment calibration
- Periodic review of data entry (field data sheets and lab reports) to assure consistent data entry.
- Processing and analysis of data for report

## **MONITORING RESULTS**

The parameters listed in the following sections were analyzed in the field using the Urban Watch monitoring kit as described above or in the Santa Cruz County Department of Environmental Health Water Quality Laboratory. The Nob Hill station was monitored from July 6, 2005 until September 9, 2005, for a total of 21 visits. This site was fenced off and discontinued due to construction in the Nob Hill shopping Plaza. Over the period of June 28, through November 1, 2005, monitoring took place at the five other designated stations 36 times for a total of 180 individual monitoring events. A total of 201 individual monitoring events occurred over the course of the program for all 6 stations. Water Samples were drawn once a month for four months, July through October (at stations with ‘flowing’ water at the time of the visit), and were taken to the County’s lab for bacteria and nutrient analysis.

Volunteer availability and other technical factors (such as equipment availability or breakage and weather conditions) were taken into account throughout the program resulting in not every parameter being tested/observed for every station visit. “Frequency” of detection is therefore the relationship of the number of times the parameter was recorded as other than normal or non-detect, out of the total number of times a measurement or observation for that parameter was completed throughout the program. Please see the Appendix for Summary Tables 1-7: Tables 1-4 provide monitoring result of the parameters monitored, showing averages, minimum-maximum values, and frequency of detection; Table 5 presents the lab analysis results; Table 6 presents a consolidated record of the data collected in the field in tabular form by station; Table 7 presents a consolidated record of the lab data in tabular form by station.

The Water Quality Objectives (WQO) are listed for each parameter that has an approved ‘criteria’ or range; we have noted the origin of each determination. These criteria originate from accepted sources such as the United States Environmental Protection Agency (US EPA), the State Water Resources Control Board’s (SWRCB) “California Ocean Plan”, the Central Coast Regional Water Quality Control Board’s (CCRWQCB) “Basin Plan”, and the California Department of Fish and Game’s (CDFG) “Salmonid Recovery Plan” (used predominantly where discharges flow directly to a salmonid stream).

The Monterey Bay Regional Urban Watch-First Flush Program operates in the ‘Central Coast Region’ and we therefore also recognize the CCRWQCB’s ‘Ambient Monitoring Program’ which has also set criteria for many parameters based on region specific conditions or concerns in the form of “Attention levels”. These attention levels are non-regulatory in nature, and are frequently lower than the regulatory criteria. Detections of pollutants or conditions at the “Attention level” are indicators of levels of a constituent where both human and wildlife health may be compromised and usually warrant further investigation. CWC refers to both the regulator and non-regulatory values in this report. For the purposes of this program; a ‘detection’ is any value greater than the lowest identified WQO criteria. In the case of parameters without criteria, such as Detergent surfactants or Phenols (man made chemical substances), then it is the minimum detection level of the test kit or tool. As well, pH values out of the normal range (6.5-8.0), or water temperatures above 26°C are also identified as a ‘detection’ of unsatisfactory water quality conditions.

Of the six stations monitored throughout the duration of the program, three stations consistently exhibited no flow conditions. Therefore, the following results reflect only measurements taken at these three sampling stations. Flows were detected regularly at Creekside, Monterey Avenue and the Pier.

## **I. Quantitative Parameters**

*(In-field chemical kit/meter analysis)*

### **Detergent Surfactants**

*WQO: None.*

There were 97 samples tested for detergent from the three sampling sites with flowing water. Of those, 3 tested positive for detergent, or 3% of all samples tested. Detergent surfactants were detected at the Pier 2 of 33 times (6%) and at Creekside in 1 of 32 samples (3%) during the course of the monitoring program. The Pier detected the highest concentration of 0.4 ppm on September 9, 2005. The range of detection for Detergent surfactants for all three stations was between 0.1 pm and 0.4 ppm. Monterey Avenue did not detect detergents during the monitoring period (0%).

### **Copper**

*WQO: CCRWQCB Basin Plan > 0.03 mg/L - Cold and Warm Water Fish Habitat.*

There were 101 samples tested for copper; however no copper was detected on volunteer site visits during the monitoring period.

### **Chlorine**

*WQO: None (tap water is typically 2 mg/L).*

There were 100 samples tested for chlorine; however no chlorine was detected on volunteer site visits during the monitoring period.

## **II. Measured Values**

*(In-field measurement)*

The following parameters were measured in the field during the 201 individual monitoring events. Please see the Appendix for Summary Tables 1-7: Tables 1-5 provide monitoring results of the parameters monitored, showing averages, minimum-maximum values, and frequency of detection; Table 6 presents a consolidated record of the data collected in the field in tabular form by station; Table 7 presents the lab analysis results.

### **Flow**

*WQO: None.*

For the six storm drains sampled, presence of flow was observed during 108 of the 201 (53%) station visits. Flow was present at only three stations; Creekside, Monterey and the Pier, where flow was observed in 100% of all volunteer site visits. No flow was observed at any of the other three stations over the course of the program.

### **Air Temperature**

*WQO: None.*

Air temperature was taken at 196 station visits. Due to a broken thermometer, air temperature was not taken on 7/23/05 at 3 stations. Air temperature ranges fell between: 11.0-20.0°C at Creekside; 11.5-19.0°C at Monterey Avenue and between 12.0-19.0°C at the Pier. The lowest recorded temperature was 11.0°C at Creekside on 8/26/05 (8:06 am) and 10/28/05 (8:41 am). The highest recorded temperature was 20.0°C at Auto Plaza on 8/29/05 (11:20 am) and 9/29/05 (10:21 am); at Stockton Bridge on 8/29/05 (10:45 am) and 11/1/05 (12:23 pm) and at Creekside on 8/29/05 (11:20 am) and 9/29/05 (10:15 am).

### **Water Temperature**

*WQO: CCRWQCB Basin Plan > 26°C - Cold Water Fish Habitat.*

Water temperature was taken at 108 station visits. Water temperatures ranged between 11.0 – 21.0°C at all 3 stations exhibiting flow. Water temperature ranges fell between: 12.0-16.5°C at Creekside; 11.0-16.5°C at Monterey Avenue and 16.5-21.0°C at the Pier. The lowest recorded water temperature was 11.0°C at the Monterey Avenue station on 10/31/05 (9:46 am) and the highest recorded temperature was 21.0°C at the Pier on 8/31/05 (9:30 am). No water temperatures were collected for Nob Hill, Auto Plaza and Stockton Bridge stations due to lack of flow.

## **Conductivity**

*WQO: None.*

Conductivity measurements were taken with the Oakton ECTester low range meter (0-1990  $\mu\text{S}$ ) or with the Oakton ECTester high range meter (0-19,900  $\mu\text{S}$ ; 0-19,900  $\mu\text{S}$ ) to ensure no readings would be out of range. Conductivity was measured in 108 station visits where water was flowing (108 of 201 total station visits, 53%). The range of conductivity measurements were between 350  $\mu\text{S}$  (Monterey Avenue) to 1060  $\mu\text{S}$  (Pier). No conductivity measurements were collected for Nob Hill, Auto Plaza and Stockton Bridge stations due to lack of flow.

The average conductivity in discharging waters at each site is helpful in determining the influx of fresh rain water during the "First Flush" event. Conductivity averages (median values) were calculated as follows: 649 (650)  $\mu\text{S}$  at Creekside; 709 (720)  $\mu\text{S}$  at Monterey Avenue; and 576 (560)  $\mu\text{S}$  at the Pier.

## **pH**

*WQO: <6.5 or >8 pH units.*

pH was measured in 108 station visits where water was flowing (53%). pH values throughout the entire program ranged from 6.5 to 9.0 for stations. The highest pH measured was 9.0 (Pier on 9/7/05) and the lowest was 6.5 (Creekside on 7/14/05).

Of the 108 measurements, 4 were at the threshold or in exceedence of the WQO (3%): 1 measurement was at the lower 6.5 limit (Creekside, 7/14/05 at 8:15 am), and 3 were at the 8.0 higher limit of safe water quality conditions (Creekside, 8/24/05 at 8:08 am; and Monterey Avenue, 8/20/05 at 8:07 am and 8/21/05 at 8:08 am). Additionally, 1 of these 4 measurements was 9.0 (Pier, 9/7/05 at 3:30 pm), above the higher pH threshold of 8.0.

## **III. Qualitative Parameters**

*(Visual observations)*

Volunteers were asked to make 'presence or absence' observations of the following parameters. More detailed descriptions were noted on the data sheet, and can be provided upon request. These observations were recorded even when water was not detected and samples were not collected. "Frequency" therefore is the relationship of the number of times the parameter was recorded as other than normal, out of the number of times an observation for that parameter was recorded throughout the program. Over the period of July 6, 2005 through November 1, 2005, monitoring took place at five designated sites 36 times and a total of 180 individual monitoring events. The Nob Hill site was monitored from July 6<sup>th</sup> until September 9<sup>th</sup> for a total of 21 visits. Therefore, the total number of individual monitoring events was 201. Please see the Appendix for Summary Tables 1-7: Tables 1-4 provide monitoring result of the parameters monitored, showing averages, minimum-maximum values, and frequency of detection; Table 5 presents the lab analysis results; Table 6 presents a consolidated record of the data collected in the field in tabular form by station. Table 7 presents a consolidated record of the lab data in tabular form by station.

### **Odors**

The observation of "Odor" is taken from the sample water collected, and 'measured' away from the storm drain location; volunteers are instructed to determine if the water itself carries an odor, not the general location. No odors were noted in the water collected at any stations during the monitoring period.

### **Color**

Early in the program, volunteers matched water samples to a Borger Color System (BCS) booklet used to identify colors in nature. Generally, all samples were found to be colorless, pale yellow or pale tan. However, the chart was lost during the course of the program and was unable to be replaced.

### **Oil sheen**

There were 108 observations made for ‘oil sheen’; however, no ‘oil sheen’ was observed on volunteer site visits during the monitoring period at the 3 stations with flowing water.

### **Sewage**

The observation of ‘sewage sighted’ or ‘sewage smell’ was found 35 times of the 108 station visits (32%) for the 3 stations with flowing water. Monterey Avenue reported observation of ‘sewage sighted or smelled’ in 31 of 36 visits (86%); in all instances, a ‘musty’ odor was noted. This can be due to the fact that there is petroleum coating on the inside of the storm drain culvert. The Pier reported observation of ‘sewage sighted’ or ‘sewage smell’ in 3 of 36 site visits (8%); noting bird feces sighted near the outfall. Creekside did not observe ‘sewage sightings’ or ‘sewage smell’ during the course of the program. There were no sewage observations for the Nob Hill, Auto Plaza and Stockton Bridge stations due to lack of flow.

### **Surface scum**

The observation ‘surface scum’ sighted indicates some type of ‘froth’ on the water’s surface in or near the drain outfall; this ‘scum’ may be originate from any number of biological or human induced causes, and no specific information is gathered. The lowest frequency of surface scum was observed in 9 of 36 site visits at Creekside (25%). Monterey Avenue observed surface scum at 12 of 36 visits (33%), noting an ‘orange biological function’. These observations are typical of a common iron oxidizing bacteria/fungus which forms an oily or foamy ‘rust’ colored area at the water’s margin (usually indicating that the stream is being recharged from a groundwater source, and these features are most commonly seen at seeps or springs<sup>1</sup>). The highest frequency of surface scum observed was 20 of 36 times (56%) at the Pier; the most common observations at that station were algae growth, bubbles and foam.

### **Trash**

Trash was found at all stations except Auto Plaza, Stockton Bridge and Creekside during the monitoring season. The highest frequency was recorded at the Pier, where trash was detected 27 of 36 (75%). At Nob Hill and Monterey Avenue, trash was recorded in 4 of 36 site visits (11%). The most common observations included paper (food wrappers and packaging), plastics, Styrofoam and cigarette butts, and recyclables such as aluminum cans and glass bottles.

### **Turbidity**

Turbidity was compared to a visual scale and was recorded consistently as “low” for the Creekside, Monterey Avenue and Pier sites during the monitoring period. No turbidity readings were taken for the Nob Hill, Auto Plaza and Stockton Bridge stations due to lack of flow.

### **Day of Week/Time of Day**

A total of 201 volunteer monitoring events occurred on Mondays (16), Tuesdays (23), Wednesdays (45), Thursdays (28), Fridays (55), Saturdays (17) and Sundays (17). The monitoring times varied; however, they were more frequently in the morning hours for the monitoring events.

## **IV. Additional Data**

*(Laboratory Analysis)*

### **Laboratory Analysis**

Water samples were collected once per month from Creekside, Monterey Avenue and Pier stations during the four ‘dry’ months of the program.

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<sup>1</sup> “Fairfax County Stormwater Planning Division – Perennial Streams Field Identification Protocol”, Fairfax County Public Works and Environmental Services Department  
[http://www.cblad.virginia.gov/docs/guidance/Perennial\\_Stream\\_Doc\\_Fairfax\\_NC/FairfaxMethod\\_May\\_03.pdf](http://www.cblad.virginia.gov/docs/guidance/Perennial_Stream_Doc_Fairfax_NC/FairfaxMethod_May_03.pdf)

These samples were collected where water was found discharging at the time of the station visit:

Station:	Code*	7/27/05	8/29/05	9/29/05	10/26/05
Nob Hill	CSD-01	Dry	Dry	Dry	Dry
Auto Plaza	CSD-03	Dry	Dry	Dry	Dry
Stockton Bridge	CSD-04	Dry	Dry	Dry	Dry
Creekside	CSD-06	X	X	X	X
Monterey Ave.	CSD-08	X	X	X	X
Pier	CSD-09	X	X	X	X

Once the samples were collected, they were iced and delivered to Santa Cruz County Department of Environmental Health Services Water Quality Laboratory to be tested for bacteria (*E.coli*, total coliform), and nutrients (nitrate, orthophosphate, and ammonium nitrogen. (Please see Appendix Table 5 for all lab results).

## Bacteria

### *E. Coli* & Total Coliform

*CCRWQCB Basin Plan;*

*E. coli - WQO: No single sample shall exceed 400 MPN - Water Body Contact Recreation*

*Total coliform – WQO: No single sample shall exceed 10,000 MPN –Marine Water Contact Recreation*

Total coliform bacteria are a collection of relatively harmless microorganisms that live in large numbers in the intestines of man and warm- and cold-blooded animals. They aid in the digestion of food. A specific subgroup of this collection is the fecal coliform bacteria, the most common member being *Escherichia coli* (*E. coli*). These organisms may be separated from the total coliform group by their ability to grow at elevated temperatures and are a specific kind of fecal coliform bacteria that live in the intestines of warm blooded vertebrates.

Although these bacteria which naturally exist in human intestines are harmless and helpful in digestion, ingesting water tainted with *E. coli* can cause severe food poisoning or even death in humans. The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of man or other animals. At the time this occurred, the source water may have also been contaminated by pathogens or disease producing bacteria or viruses which can also exist in fecal material. The test for total coliform is a measure all forms of coliform bacteria present in human and other mammal waste while the analysis for *E.coli* is to determine the presence of the more specific fecal coliforms.

Results from the laboratory analysis indicated the presence of *E.coli* to be under the water quality objectives in 8 of the 12 water samples analyzed during the program (67%) and in 5 of 12 water samples for total coliform (42%). Creekside was the only station which never had a measurable value of *E.coli* higher than the appropriate WQO. The presence of bacteria in water is expressed in the unit “Most Probable Number” of bacteria colonies in 100 milli-liter of water; MPN/mL.

Measurable values for *E.coli* ranged from 5 MPN/100ml (Creekside, 7/27/05) to 4884 MPN/100ml (Monterey Avenue, 10/26/05). The values for total coliform ranged from 1178 MPN/100ml (Creekside, 9/29/05) to 24192 MPN/100ml (Monterey Avenue, 8/29/05 and Pier, 7/27/05 and 8/29/05). Monterey Avenue had the highest frequency of bacteria ‘detections’ overall with values which exceeded the WQO of 400 MPN/ml for *E.coli* (in 3 of 4 samples tested) and over 10,000 MPN/ml for total coliform (in 3 of 4 samples tested).

Four of 12 samples (33%) analyzed in the Capitola program exceeded the water quality objective of  $\leq 400$  MPN/100ml for *E.coli*: Monterey Avenue, 8/29/05 – 3873, 9/29/05 – 598, and 10/26/05 – 4884 MPN/100ml; and Pier, 10/26/05 – 448 MPN/100ml.

Seven of the 12 samples (58%) analyzed in the Capitola program exceeded the water quality objective of  $\leq 10,000$  MPN/100ml for total coliform: Creekside, 8/29/05 – 10462 MPN/100ml; Monterey Avenue, 7/27/05 – 11199, 8/29/05 – 24192 and 10/26/05 – 14136 MPN/100ml; and Pier, 7/27/05 – 24192, 8/29/05 – 24192, and 10/26/05 – 19863 MPN/100ml.

## **Nutrients**

### **Nitrate-nitrogen, Orthophosphate & Ammonia-Nitrogen**

WQO: CCRWQCB CCAMP;

Nitrate nitrogen - Attention Level  $> 2.25$  mg/L-  $\text{NO}_3\text{-N}$  (10 mg/L-N in CCRWQCB Basin Plan)

Orthophosphate - Attention level  $> 0.37$  mg/L- $\text{PO}_4$  as  $\text{PO}_4$

WQO: US EPA;

Ammonia Nitrogen  $> 0.025$  mg/L- $\text{NH}_3$

Also tested in the lab were the nutrients nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ), orthophosphate ( $\text{PO}_4\text{-PO}_4$ ), and ammonia-nitrogen ( $\text{NH}_3\text{-N}$ ).

Eight of 12 samples for nitrate-nitrogen were found to be under their water quality objective of  $\leq 2.25$  mg/L. Nitrate-Nitrogen values at Creekside exceeded the water quality objective in all four samples taken during the monitoring period: 7/27/05 – 7.696, 8/29/05 – 5.35, 9/29/05 – 7.564, and 10/26/05 7.36 mg/L. None of the nitrate-nitrogen values at the Monterey Avenue and Pier stations exceeded the water quality objective. None of the nitrate-nitrogen values measured for the program exceeded the Central Coast Basin Plan WQO of  $\leq 10.0$  mg/L  $\text{NO}_3\text{-N}$ .

There were no exceedences of the US EPA water quality objective of  $> 0.37$  mg/L -  $\text{PO}_4$  as  $\text{PO}_4$  for Orthophosphate in the 12 water samples taken during the monitoring period.

Ammonia nitrogen concentrations were found to be above the water quality objective of  $\leq 0.025$  mg/L in 4 of 12 samples tested (33%). All detectable ammonia nitrogen values ranged from 'non-detect' to 0.208 mg/L. All samples from the Pier station were found to be 'non detect'. The samples with detectable values found to exceed this WQO were: 2 of 4 at Creekside (7/27/05, 0.131 mg/L and 10/26/05, 0.042 mg/L); and 2 of 4 from Monterey Avenue (7/27/05, 0.208 mg/L; and 9/29/05, 0.025 mg/L).

## **V. First Flush Event**

The First Flush monitoring event occurred on Tuesday, November 8, 2005 at approximately 3:30 am in Santa Cruz County and closer to 4:30 am in Monterey County. The event was held in the cities of Monterey, Pacific Grove, Capitola, Live Oak and Santa Cruz. The cities of Scotts Valley and Seaside mobilized one day later on Wednesday, November 9, 2005 at approximately 4:40 pm. For the 2005 Capitola First Flush event, six trained volunteers and two staff members participated in the collection of samples in Capitola.

Storm drain outfalls were monitored for conductivity, water temperature, pH, transparency, and field samples were collected for analysis of nitrate, orthophosphates, zinc, copper, lead, total coliform, *E. coli.*, total dissolved solids, and total suspended solids. A separate report will be written for the 2005 First Flush monitoring event which will be available to the public and sent to local area governments and agencies. The results of First Flush event are available by contacting Bridget Hoover, Coordinator of the Monterey Bay Sanctuary Citizen Watershed Monitoring Network at (831-883-9303). Previous First Flush reports can be downloaded from the Internet at: <http://www.mbnms.nos.noaa.gov/monitoringnetwork/events.html>

## DISCUSSION

The following section summarizes the results from monitoring discharge waters during the monitoring station visits, and breaks the program results into the two main qualitative groups for review; 'by parameter', and 'by station.' Please refer to the Appendix Tables 1-5 for a detailed presentation of the program data.

### *Discharge at Monitoring Stations*

Of the six stations visited during the 2005 Urban Watch monitoring period, only three exhibited enough flow to measure water quality conditions during the course of the program. Flows were detected at the Creekside, Monterey Avenue and Pier stations during every station visit, possibly indicating that these three stations either expressed perennial 'stream' flows or received consistent discharges from some unknown source.

### *Parameter Detections*

- **Detergent** surfactants were detected in 3% of all 97 samples tested, and ranged between 0.2 and 0.4 ppm. The Pier and Creeksdie stations had detergent detections; Monterey Avenue did not. The Pier station had the highest frequency of detections with 2 of 33 samples testing positive (6%). The highest recorded detection was 0.4 ppm at Pier on September 30, 2005.
- **Nitrate nitrogen** (NO<sub>3</sub>-N) Monthly samples of stormdrain discharge waters were collected and delivered to the laboratory for analysis of **nitrate nitrogen** (NO<sub>3</sub>-N). Lab analysis of nitrate nitrogen averaged 2.962 mg/L (n=12, range 0.529-7.696, 1.0585 median). The detection results for these visits were that only 4 samples in 12 (33%) had a detection of nitrate nitrogen in exceedence of the WQO; Creekside on 7/27/05 – 7.696, 8/29/05 – 5.35, 9/29/05 – 7.564, and 10/26/05 7.36 mg/L NO<sub>3</sub>-N.
- **Ammonia nitrogen** (NH<sub>3</sub>-N) Monthly samples of stormdrain discharge waters were collected and delivered to the laboratory for analysis of **ammonia** (NH<sub>3</sub>). Lab analysis of ammonia averaged 0.0727 mg/L (n=6, range 0.013-0.208, 0.034 median). The results for these visits were that 6 samples in 12 (50%) were identified at a detectable level of ammonia, and 4 of the 6 were in exceedence of the WQO (67%): Creekside on 7/27/05 (0.131 mg/L) and 10/26/05 (0.042 mg/L); and Monterey Avenue on 7/27/05 (0.208 mg/L) and 9/29/05 (0.025 mg/L).
- **Orthophosphate** (PO<sub>4</sub>) Monthly samples of stormdrain discharge waters were collected and delivered to the laboratory for analysis of **orthophosphate** (PO<sub>4</sub>). There were no exceedences at any of the 3 stations during the monitoring period. Values of orthophosphate ranged between 'non detect' to 0.014 mg/L.

Lab analysis of orthophosphate averaged 0.0417 mg/L (n=8, range 0.01-0.09, 0.0335 median). The results for these visits were that 8 samples in 12 (66%) were identified at a detectable level of orthophosphate, and 0 were in exceedence of the WQO.

- There were no detections of **copper** or **chlorine** above the detection range of the equipment used (0.3 ppm for copper and 0.2 ppm for chlorine) in the samples collected from the three stations, and the 'visual' observation of **turbidity** (Hi/Med/Low) was consistently 'Low' for all measurable stations during the 2005 program.
- From the **qualitative observations**, no distinct odor, intense color or oil sheen was detected in all station visits. Volunteers reported 41 findings of the presence of surface scum (38%) in 108 site visits, however most were associated with areas of high algae and an 'orange biological function' typical of a common iron oxidizing bacteria/fungus which forms an oily or foamy 'rust' colored area at the water's margin: volunteers were instructed to look for the characteristics of naturally occurring 'sheen' and 'scum', and those used in this report were the instances where this was not indicated on the datasheet. 'Sewage sighted' or 'sewage smell' was recorded in 35 of 108 site visits (32%). Most occurances were at the Monterey Avenue stations where volunteers noted a 'musty' smell. Trash was observed at 3 of 6

monitoring stations, in 17% of station visits (a decrease from 37% in 2004), and consisted mostly of food wrappers, paper and plastic packaging, drink containers, and cigarette butts. The Pier exhibited the highest frequency of trash of all 6 stations.

- Monthly samples of stormdrain discharge waters were collected and delivered to the laboratory for analysis of the **total coliform** bacteria. There is no field analysis which can be done for this parameter. Lab analysis of total coliform ranged between 1178 MPN to 24,192 MPN (the upper limit of detection in this method of analysis).

The results for this analysis was that 7 samples of 12 (58%) were identified in exceedence of the WQO (<10,000 MPN in any one sample): Creekside on 8/29/05 (10,462 MPN); Monterey Avenue on 7/27/05 (11,199 MPN), 8/29/05 (24,192 MPN) and 10/26/05 (14,136 MPN); and Pier on both 7/27 and 8/29/05 (24,192 MPN) and 10/26/05 (19,863 MPN).

- Monthly samples of stormdrain discharge waters were collected and delivered to the laboratory for analysis of the ***E.coli*** bacteria. There is no field analysis which can be done for this parameter. Lab analysis of *E.coli* ranged between 5 MPN to 4,884 MPN.

The results for this analysis was that 4 samples of 12 (33%) were identified in exceedence of the *E.coli* WQO (<400 MPN in any one sample): Monterey Avenue on 8/29/05 (3,873 MPN), 9/29/05 (598 MPN) and 10/26/05 (4,884 MPN); and Pier on 10/26/05 (448 MPN).

On four occasions the total and *E.coli* and total coliform bacteria were both in exceedence of their WQO: Monterey Avenue on 8/29, 9/29/05 and 10/26/05; and at Pier on 10/26/05.

## **CONCLUSIONS AND RECOMMENDATIONS**

The 2005 Urban Watch season for the City of Capitola had a total of 201 individual monitoring events (an increase from 30 monitoring events in 2004). Results from the data collected showed that bacteria, nitrates, detergents, and trash are the most common contaminants entering storm drains within the study area. Additionally, sewage smells and surface sum were noted but it should be taken into consideration that the sewage smells were from petroleum from the culvert at the Monterey Ave. site and the surface scum mostly consisted of algae growth.

Trash proved to be a consistent pollutant along the stream banks and in the water. Trash was found in 17% of all visits to all sites (a decrease from 37% in 2004), and occurring in 75% of the site visits to the Pier site. During the 2004 monitoring season, trash was sited at Creekside in 83% of visits, this year the frequency of trash sited was 0%. Trash proved to be an obvious ‘public’ pollutant in the study area. Encouragement of frequent community ‘Stream Clean-Up’ days, or targeted notices posted to point out the problem could be beneficial in trash abatement. As is true in most urban environments, the presence or absence of trash receptacles directly affects the amount of trash pollution in a given area. Locating and maintaining the presence of trash cans in the areas where community use is obvious, as well as making sure they are emptied, is an important component in reducing trash as a pollutant in our waterways and to the ocean. Other ideas may include working with local newspapers to publish weekly monitoring results from the Urban Watch program, and working with the Chamber of Commerce or other business associations to promote clean water practices. Development of a Public Service Announcement for the local cable channel detailing information about storm water and urban runoff pollution is another possible avenue for outreach to a wider audience.

The 2000 City of Capitola Urban Watch Monitoring Program joined the ongoing efforts of the cities of Pacific Grove and Monterey in looking at non-point source pollutants entering the waterways of the Monterey Bay. The LaMotte Urban Watch kit, which was used by volunteers to monitor dry-weather storm drain flow, is easy to use and provides consistent data for cities and interested parties. It provides a

vehicle for community involvement in data collection, which contributes critical data not otherwise collected by other programs in the City of Capitola. The data results continue to show the need for continued public outreach for urban runoff control within the city limits as well as in the neighborhoods that feed these drains. The continuation of this program in 2006 will supplement the data presented in this report and provide further information regarding the state of water health in Soquel Creek.

The First Flush event proved a useful event for data collection and showed a great need to do further monitoring in the systems now looked at with the Urban Watch monitoring. This program also is a great tool for volunteers to see what the storm drain system is meant to do.

In conclusion, the City of Capitola is commended for continuing the Urban Watch monitoring program for a sixth season in 2006 to augment the data presented here. Recommendations for the 2006 program include: 1) assess upstream sources of illicit discharges and pollutant sources; 2) support the investigation of additional parameters for study; and 3) continue outreach programs targeting local businesses, schools and residents to further reduce detergent concentrations and other sources of pollution from entering the Monterey Bay National Marine Sanctuary.

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