JOLLY GIANT CREEK
MONITORING PLAN

February 2021, Updated June 2022
California Regional Water Quality Control Board
North Coast Region

Table of Contents

Revision 4
1. BACKGROUND 5
2. MONITORING DESIGN 8
2.1. Monitoring Plan Overview 9
2.2. Monitoring Parameters 10
3. JOLLY GIANT CREEK SAMPLING AND FIELD MONITORING PLAN 12
3.1. Sample Collection Timing 12
3.2. Prepare for a Sampling Trip 12
3.3. Sampling 13
3.4. Sampling Follow-up 15
4. DATA STORAGE 16
5. DATA ANALYSIS 17
5.1. Indicator Bacteria 17
5.2. Microbial Source Tracking 18
5.3. Field Parameters 18
6. QUALITY ASSURANCE 19

Figure 1. Jolly Giant Creek screening and monitoring locations 7

Table 1-1 Screening Analysis Results 6
Table 2-1. Monitoring design summary 8
Table 2-2. Monitoring Analytes and Methods 11
Table 3-1. 2021-2022 / 2022-2023 Monitoring Locations 13

Appendix A – Contact List 20
Appendix B – Field Checklist 22
Appendix C – Field Data Sheets 23
Appendix D – Field Measurements: Bacteria and Pathogens in Water Samples 24
Appendix E – Chain of Custody Forms 26
Appendix F – Monitoring Locations 28

Revision

Date: June, 2022

Reasons for Revisions: Change in project scope: The sampling plan initially included fecal coliform to assess impacts on Humboldt Bay due to a concern that Humboldt Bay is polluted. A review of data indicates that bacteria loads support beneficial uses, fecal coliform was removed from this monitoring plan.

The sampling plan initially addressed collecting “first flush” data. This was inaccurate and intended to reflect collecting runoff. First flush samples will not be collected since the goal of the monitoring effort is to determine systemic sources of fecal pollution, which will be best reflected in samples collected during routine wet weather monitoring rather than during a first flush event. Therefore, the language was updated to collecting wet weather samples when there is runoff along the hydrograph.

SWAMP Protocol: SWAMP protocol was updated to require a lab replicate rather than the previously required field replicate for every 10 samples.

Schedule: Monitoring was initially scheduled for fiscal year 2021-2022. Due to a lack of rain, the study will now extend into fiscal year 2022-2023.

Revision Summary: Fecal coliform was removed as an analyte, replicate protocol was updated, the schedule was expanded, and the report format was reorganized to highlight information for field staff.

1. BACKGROUND

Between 2016 and 2018, in collaboration with Humboldt Bay Keeper, Planning Staff collected dry weather and wet weather water quality data [fecal indicator bacteria (FIB) and microbial source tracking (MST)] for the Coastal Pathogens Project, to support analysis of water quality conditions for ocean beaches and freshwater streams listed on the 2012 303(d) list, and the associated suspected sources of fecal pollution. The overall analysis is still ongoing; however, initial analysis of existing data has identified consistent human-source fecal pollution near the terminus of Jolly Giant Creek exceeding state water quality objectives and other established thresholds for multiple parameters. However, no samples have been collected since January 2018, and the City of Arcata has implemented several sewer system infrastructure improvements since then. Therefore, Planning Staff, along with the staff members from the Environmental Services Department of the City of Arcata and the Humboldt Baykeeper non-profit, have developed a wet and dry weather sampling and monitoring plan, to be conducted in Fiscal Year (FY) 2021-2022, to determine the current status of fecal pollution in Jolly Giant Creek, identify the potential source(s) of pollution, and develop pollution control strategies if needed.

Table 2 lists the seven (7) initial screening locations where samples were collected on August 19, 2020, and September 16, 2020 and the five (5) final monitoring locations selected based on the results of the screening analysis described in section 2 and in collaboration with the staff members from the Environmental Services Department of the City of Arcata and the Humboldt Baykeeper non-profit. Figures 1 and 2 below illustrate the locations of the seven (7) initial screening locations and the final five (5) monitoring locations respectively.

Table 0-1 Screening Analysis Results

Sample Location[1]	**August 19, 2020 Dry Weather**		**September 16, 2020 Dry Weather**	
	Enterococci (MPN/100 mL)[2]	Fecal Coliform (MPN/100 mL)	Enterococci (MPN/100 mL)	Fecal Coliform (MPN/100 mL)
Jolly Giant Creek at Alliance Road near 17th Street	104.6	54.5	387.3	129.6
Jolly Giant Creek at Foster/Shay Park	248.9	86.0	344.8	290.9
Jolly Giant Creek at 14th Street near M Street	328.2	435.2	365.4	248.1
Jolly Giant Creek at 11th Street	> 2419.6	151.3	228.2	1732.9
Jolly Giant Creek at 9th and J Streets	1413.6	488.4	579.4	1413.6
Jolly Giant Creek at 7th and J Streets	866.4	579.4	1986.3	> 2419.6
Jolly Giant Creek at Samoa Boulevard	436.6	866.4	2419.6	> 2419.6

[1] The five (5) locations selected for monitoring, out of the seven locations screened, have been marked in bold.
[2] MPN – Most Probable Number

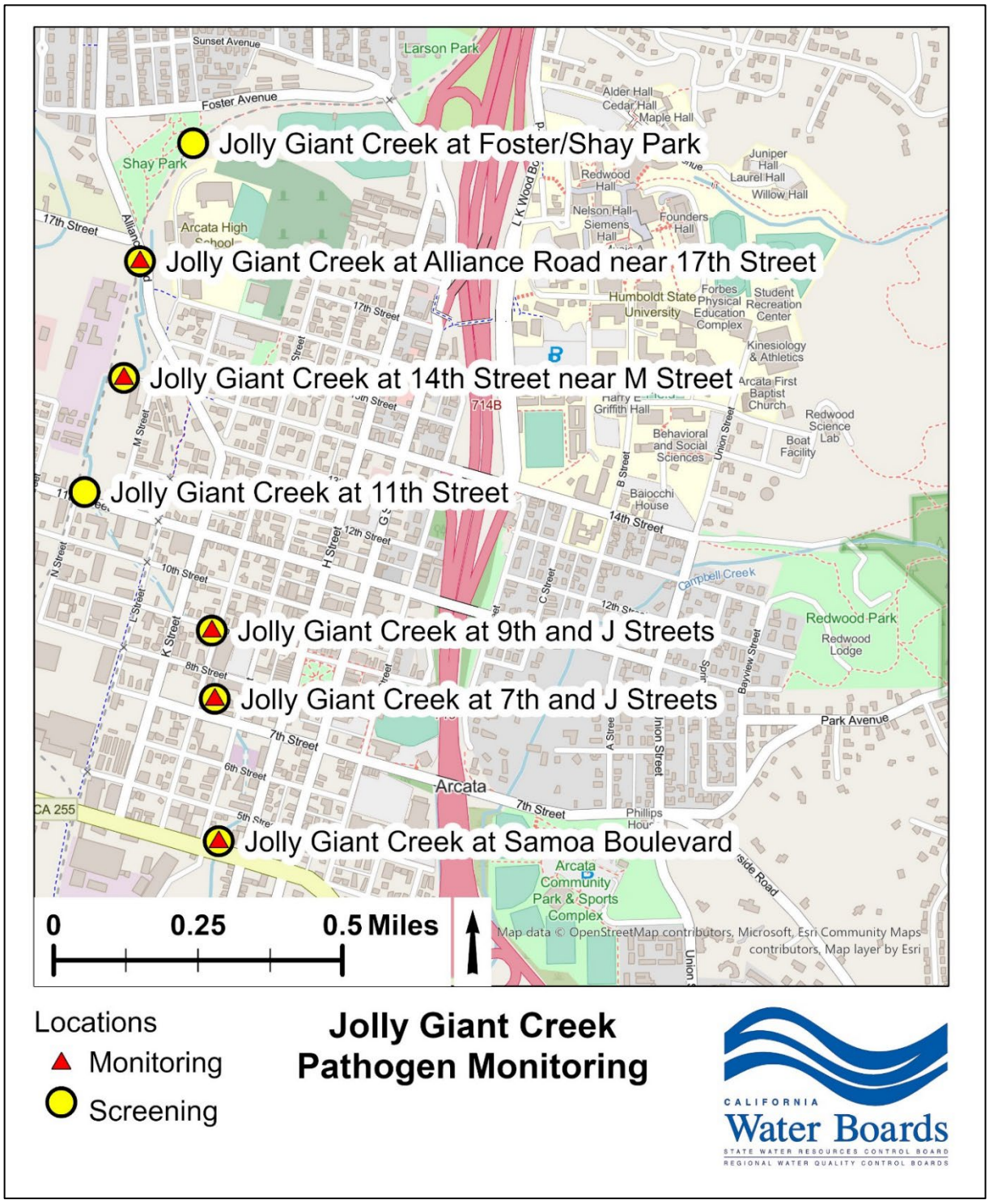

Figure 1. Jolly Giant Creek screening and monitoring locations

2. MONITORING DESIGN

Table 2 below provides a monitoring design summary.

Table 0-2. Monitoring design summary

Management Questions	1) Where, if any, do elevated concentrations of FIB exist in the in Jolly Giant Creek? 3) Can sources of elevated concentrations of FIB be identified using MST?
Number of Samples	Collect six (6) samples from five (5) monitoring sites • three (3) dry weather sampling events • three (3) wet weather sampling events
Selection of Sampling Sites	Sampling sites have been selected all along Jolly Giant Creek at locations where it is above ground and near suspected human fecal pollution sources (leaking sewage pipes, illegal sewage dumping and homeless population inputs)

Indicators	• Bacteria
	  ○ *Escherichia coli* (*E. coli*)
	  ○ Enterococci
	• Microbial Source Tracking (MST)
	  ○ human-specific Bacteroides marker
	  ○ ruminant-specific Bacteroides marker
	  ○ dog-specific Bacteroides marker
	  ○ gull-specific Catellicoccus marker
	• Field Parameters
	  ○ water temperature
	  ○ specific conductance
	  ○ salinity
	  ○ dissolved oxygen
	  ○ pH
	  ○ total dissolved solids

Timing	Sampling Periods • Dry Weather: The threshold for a dry weather sample is no precipitation resulting in runoff for the three previous days (72 hours). Dry Samples will be collected at least one month apart. • Wet Weather: The threshold for a wet weather sample is when there is runoff along the hydrograph. The USGS produces a hydrograph for the Mad River Near Arcata gauge (https://water.noaa.gov/gauges/arcc1)

The sampling site selection was determined using best professional judgement, in collaboration with staff members of the Environmental Services Department of the City of Arcata and the Humboldt Baykeeper non-profit.

The wet weather sampling period was determined to collect data when there was runoff that will characterize systemic sources of fecal pollution.

2.1. Monitoring Plan Overview

Analysis of fecal indicator and microbial source tracking data collected from Jolly Giant Creek by Planning staff between 2016 and 2018 illustrates a persistent high level of fecal pollution in Jolly Giant Creek and points to a human source. The fecal pollution loads were consistently high both in the dry and wet weather, indicating that there may be sources of fecal pollution in Jolly Giant Creek other than stormwater runoff. it is important to monitor various locations along Jolly Giant Creek, using a variety of monitoring parameters, to gather sufficient information to compare detected fecal indicator bacteria concentrations to water quality objectives, and to determine the source of fecal pollution and develop mitigation strategies.

An initial screening analysis was conducted at seven (7) locations along Jolly Giant Creek. Samples were collected by staff members from the Environmental Services Department of the City of Arcata, and volunteers from the non-profit Humboldt Baykeeper, on August 19, 2020 and September 16, 2020. Both were dry weather sampling events. These samples were analyzed by the City of Arcata Water/Wastewater Division Laboratory for the detection and enumeration of enterococci and fecal coliform using non-Environmental Laboratory Accreditation Program (ELAP) accredited methods. The results of the screening analysis, along with the locations of infrastructure improvements, sewer laterals, and locations of homeless encampments were used to determine the five (5) monitoring locations selected for the monitoring study. The selected sample locations were determined in collaboration with the staff members from the Environmental Services Department of the City of Arcata and the Humboldt Baykeeper non-profit. Samples will be collected from these five (5) locations in fiscal years 2021-2022 to 2022-2023 [three (3) sampling events during dry weather and three (3) sampling events during wet weather]. All samples will be analyzed for the detection and enumeration of fecal indicator bacteria and fecal pollution sources using microbial source tracking analysis. A temperature blank will be included with samples for every sampling trip and a lab replicate will be analyzed for every 10 samples. The *E. coli*, enterococci, and MST detection and enumeration will be conducted by the Humboldt County Public Health Laboratory in Eureka, California using ELAP accredited methods.

2.2. Monitoring Parameters

Two (2) main monitoring parameters will be used in this study to determine bacterial water quality – fecal indicator bacteria (FIB), and microbial source tracking (MST). Fecal indicator bacteria provide evidence of fecal pollution, and microbial source tracking helps identify the source of that fecal pollution. According to the 2016-2018 FIB and MST analysis of samples collected from Jolly Giant Creek and the enterococci data collected during the 2020 screening project along Jolly Giant Creek indicate exceedances of the statewide REC-1 fecal indicator objectives and federal recreational water quality thresholds, with evidence of human fecal waste as the potential source. For this monitoring effort, FIB and MST will again be used to determine whether there have been any changes in fecal indicator bacteria concentrations in Jolly Giant Creek since 2018 and, if detected, evidence of the fecal waste source(s). The results of this monitoring study will be used to develop a pollution control strategy for Jolly Giant Creek.

FIB monitoring will include the detection and enumeration of *E. coli* and enterococci. Fecal indicator bacteria live in the intestines of warm-blooded animals (including humans) and enter water bodies through fecal matter. These bacteria are often harmless to human beings themselves, but are used as, indicators of fecal pollution, and proxies for, harmful pathogens that may also exist in the intestines of animals along with fecal indicator bacteria. This type of surrogate or indicator method is used since it is impossible to measure all potentially harmful pathogens that may exist in the water body being investigated. The use of FIB in this manner is very common, scientifically accepted, and approved by the Environmental Protection Agency (EPA). Fecal indicator bacteria testing is performed in government-accredited labs using culture-based methods.

Microbial source tracking will include the detection and quantification of human-, ruminant- and dog-specific *Bacteroides* markers and a gull-specific *Catellicoccus* marker. Microbial source tracking is a tool used by scientists and approved for use by the EPA and by the United States Geological Survey (USGS), to identify the source of fecal contamination. The basis of this tool is that the microorganisms present in the feces of different types of animals (including humans) have unique characteristics that allow us to determine what specific animal the fecal matter being tested came from. In other words, the physiological differences in various hosts (animals whose feces is being analyzed) lead to differences in specific characteristics of microorganisms that are present in their intestines. Microbial source tracking is a culture-independent method which is also performed in government-accredited labs.

FIB and MST are complementary tools, when used together, allow scientists and regulators to determine, with confidence, not only the presence of fecal pollution, but also its source, which in turn helps with the development of appropriate solutions to address the source of fecal pollution and improve bacterial water quality.

FIB concentrations determined during this analysis will be compared to the water quality objectives (WQO) listed in the Water Quality Control Plan for the North Coast Region (Region 1 Basin Plan) (the statewide water contact recreation (REC-1) beneficial use WQO as per as per the Bacteria Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries (ISWEBE Plan) to natural background levels). In addition, the fecal indicator bacteria data will also be compared to the EPA Recreational Water Quality

Criteria. When assessing water quality for REC-1 beneficial use, the water quality objective selected for comparison is based on the salinity of the water body being analyzed for both statewide and federal water quality objectives. During the 2016-2018 study salinity measurements were not conducted. Therefore, salinity was determined post-hoc using the elevation of the sampling locations analyzed. Using this method, the Jolly Giant Creek sampling location analyzed during the 2016-2018 study was determined to be saline and therefore, the enterococci concentrations collected from this site were used for comparison with both statewide and federal water quality objectives. Since Jolly Giant Creek is still being considered to be a saline water body, for this monitoring effort, enterococci concentrations measured will again be compared to the statewide REC-1 water quality objectives and the federal recreational water quality criteria. In addition, *E. coli* concentrations measured will be used to provide additional lines of evidence of fecal pollution.

In addition to monitoring parameters explicitly associated with bacterial water quality, other parameters will also be measured including, but not limited to, geographic coordinates, 24-hour rainfall, estimated stream flow, water temperature, turbidity, electrical conductivity, pH, and visual observations of habitat and the environment surrounding the sampling site.

The following abbreviations and acronyms are used in the table below.

REC-1 = Water Contact Recreation
ISWEBE = Inland Surface Waters, Enclosed Bays, and Estuaries of California
GM = Geometric Mean
STV = Statistical Threshold Value
cfu = colony forming units

Table 0-3. Monitoring Analytes and Methods

Analyte	**Water Quality Objective**	**Analysis Method**
Escherichia coli	REC-1 (ISWEBE) GM: 100 cfu/100 mL STV: 320 cfu/100 mL	U.S. EPA Method 1603 or equivalent
Enterococci	REC-1 (ISWEBE) GM: 30 cfu/100 mL STV: 110 cfu/100 mL	U.S. EPA Method 1600 or equivalent

3. JOLLY GIANT CREEK SAMPLING AND FIELD MONITORING PLAN

3.1. Sample Collection Timing

One (1) sample will be collected from each of the five (5) sampling locations, described above, at six (6) sampling events conducted in Fiscal Year (FY) 2021-2022. Specifically, three (3) samples will be collected in dry weather and three (3) samples will be collected in the wet weather. Three (3) QA/QC lab replicate samples will also be included in the analysis, consisting of one lab replicate per 10 samples.

- Dry Weather: The threshold for a dry weather sample is no precipitation resulting in runoff for the three previous days (72 hours). Dry Samples will be collected at least one month apart.

- Wet Weather: The threshold for a wet weather sample is when there is runoff along the hydrograph. The USGS produces a hydrograph for the Mad River Near Arcata gauge (https://water.noaa.gov/gauges/arcc1). First flush samples will not be collected since the goal of the monitoring effort is to determine systemic sources of fecal pollution, which will be best reflected in samples collected during routine wet weather monitoring rather than during a first flush event.

3.2. Prepare for a Sampling Trip

3.2.1. Sample Collection Containers

Sample collection containers are provided by Humboldt County Public Health Laboratory.

Per trip

- Bacteria Samples: 7 quantity 120 mL unpreserved sample bottles for bacteria analysis
  - 1 bottle for each of the 5 locations
  - 1 bottle for a temperature blank (as requested by lab)
  - 1 spare bottle

- Microbial Source Tracking Samples: 6 quantity 110 mL (4 ½ oz) specimen containers
  - 1 container for each of the 5 sampling locations
  - 1 spare container

3.2.2. Coordinate with City of Arcata

Contact Scott Sinnott at the City of Arcata staff to coordinate sampling event.

3.2.3. Notify Lab

Email the general email address for Humboldt County Public Health Laboratory with as many days as possible for an upcoming sampling trip, but no fewer than 24 hours before sample drop-off.

3.2.4. Field Equipment and Supplies

Multimeter – A multimeter sonde will be provided by the City of Arcata, who will calibrate and clean the equipment.

Sampling Containers – Ensure adequate sampling containers are available or coordinate with Humboldt County Public Health Department to collect empty containers.

Chain of Custody Forms: Blank chain of custody forms are stored electronically. See SWAMP Coordinator for copies.

Field Monitoring Form: Blank field monitoring forms are stored electronically. See SWAMP Coordinator for copies.

Field Checklist -- Please see Appendix B for Field Checklist

3.3. Sampling

3.3.1. Sampling Locations

Additional monitoring station information is in Appendix F – Monitoring Locations.

Table 0-4. 2021-2022 / 2022-2023 Monitoring Locations

Sampling Order	Sample Location Name	Sampling Latitude	Sampling Longitude	Datum
1	Jolly Giant Creek at Samoa Boulevard	40.8657	-124.089	WGS84
2	Jolly Giant Creek at 7th and J Streets	40.86829	-124.089161	WGS84
3	Jolly Giant Creek at 9th and J Streets	40.869450	-124.089076	WGS84
4	Jolly Giant Creek at 14th Street near M Street	40.874237	-124.091276	WGS84
5	Jolly Giant Creek at Alliance Road near 17th Street	40.876445	-124.090873	WGS84

3.3.2. Sample Collection

Follow sample collection specifications in Appendix D to collect the following water quality samples at each of the five sampling locations:

- 1 qty bacteria 120 mL sample bottle
- 1 qty microbial source tracking 110 mL specimen containers

- Temperature blank in 120 mL bacteria sample bottle

3.3.3. Field Observations & Measurements

Record field measurements on the field sheet form obtained from the Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Project Plan (QAPP). An example of the field sheet is in Appendix C.

- Field Observations:
    - See Appendix C – Field Sheet for field observation fields

- Sonde Field Measurements:
    - Water Temperature (°C)
    - Specific Conductance (uS/cm)
    - Salinity (ppt)
    - Dissolved Oxygen (%)
    - Dissolved Oxygen (mg/L)
    - pH
    - pH (mV)
    - Total Dissolved Solids (g/L)

- Metadata: On the field sheet for the first site, record if it is a dry or wet weather sample.

3.3.4. Chain of Custody

Humboldt County Public Health Laboratory

- Take picture or ask for copy of completed chain of custody form.

Babcock Laboratories

- HCPHL is a subcontracted lab. Complete the Babcock, the primary contract, for their billing purposes.

- Bacteria (with dilution): 120 mL sample vessels
    - Enterolert (Enterococcus)
    - Colilert (*E. coli*)

- MST 110 mL specimen containers
    - HF183 PCR (human)
    - DogBact PCR (dog)
    - LeeSeagull PCR (gull)
    - Rum2Bac PCR (ruminant)

3.3.5. Health

The purpose of monitoring is to measure the magnitude of indicator bacteria for human health. After handling each sample and removing gloves, disinfect hands with at least a 70% ethyl alcohol solution, such as hand sanitizer.

3.3.6. Laboratory Analysis

Drop off samples at Humboldt County Public Health Laboratory by 12:00 pm.

3.4. Sampling Follow-up

3.4.1. Field Paperwork

Chain-of-Custody Forms, Field Sheets, and Field Photos

- Scan and email electronic copies to Project Lead and SWAMP Coordinator
- Paper copies to SWAMP Coordinator

3.4.2. Field Gear Cleaning

Invasive species have been identified in Jolly Giant Creek. Thoroughly scrub gear with a stiff-bristled brush to remove all organisms. After gear is completely dry, keep dry for at least 48 hours so any remaining organisms may desiccate. If drying for 48 hours is not possible, place in a 32º F freezer for at least 8 hours.

California Department of Fish and Wildlife Aquatic Invasive Species Decontamination Protocol (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43333)

4. DATA STORAGE

Regional Board staff will enter field sonde and lab analysis raw data into the SWAMP database, which will be transferred to CEDEN.

Electronic copies of scanned documents will be stored in the shared TMDL folder, Coastal Pathogen Project subfolder.

Paper copies will be stored in the SWAMP Resource cubicle.

5. DATA ANALYSIS

5.1. Indicator Bacteria

A bacteria geometric mean requires a minimum of five samples during a six-week period. Samples will not be collected to satisfy this threshold and so geometric means will not be calculated.

5.1.1. E. coli

Statistical Threshold Values (STV) will be assessed per calendar month using the statewide Water Quality Objective (WQO) (https://www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf.). Any month where more than 10% of the *E. coli* samples exceed the STV WQO of 320 cfu/100 mL will be considered an exceedance.

Exceedance thresholds will be assessed in accordance with the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy) (https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf).

For the REC-1 beneficial use, data will be evaluated for three periods.

- A ten percent exceedance percentage will be applied to year-round calendar months, from November 1 through October 31, wet/winter period (November 1 through March 31), and dry/summer period (April 1 through October 31). A four percent exceedance percentage will not be used for dry/summer calendar months because although MST data indicates the presence of human fecal matter there is no indication of substantial human contact in the water body.

If any of the periods have exceedances greater than the exceedance percentage threshold, that monitoring station will be identified as the pollutant Indicator Bacteria does not supporting the REC-1 beneficial use.

5.1.2. Enterococci:

Statistical Threshold Value (STV): STVs will be assessed per calendar month using the statewide Water Quality Objective (WQO) ((https://www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf.). Any month where more than 10% of the Enterococci samples exceed the STV WQO of 110 cfu/100 mL will be considered an exceedance.

Exceedance thresholds will be assessed in accordance with the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy) ((https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf).

For the REC-1 beneficial use, data will be evaluated for three periods.

- A ten percent exceedance percentage will be applied to year-round calendar months, from November 1 through October 31, wet/winter period (November 1 through March

31), and dry/summer period (April 1 through October 31). A four percent exceedance percentage will not be used for dry/summer calendar months because although MST data indicates the presence of human fecal matter there is no indication of substantial human contact in the water body.

If any of the periods have exceedances greater than the exceedance percentage threshold, that monitoring station will be identified as the pollutant Indicator Bacteria does not supporting the REC-1 beneficial use.

5.2. Microbial Source Tracking

Each MST analyte will be assessed by the binary yes/no frequency of detection at each monitoring location rather than comparing magnitudes of MST signal detections.

5.3. Field Parameters

Field data will be used as ancillary data.

6. QUALITY ASSURANCE

The following sources are used to establish quality assurance and quality control standards and procedures to this monitoring project to produce data that are scientifically valid and defensible, and of known documented quality.

- The Coastal Watershed Pathogen Indicator Study Quality Assurance Project Plan was developed for pollutant verification of waterbodies placed on the 303(d) list as impaired by pathogens. Jolly Giant Creek was included in the study and this is further sampling to identify the extent and sources of the impairment.
- The Surface Water Ambient Monitoring Program Quality Assurance Program Plan is a statewide plan that establishes the requirements for collecting data. The plan addresses program administration, project management and coordination, quality assurance and data management, and field, laboratory, and technical services.
- Humboldt County Public Health Laboratory is accredited by the Environmental Laboratory Accreditation Program to analyze the analytes in this study.
- Field staff are trained in the field sampling procedures.

Appendix A – Contact List

Coastal Pathogens Project Leads

Prachi Kulkarni
Title: Water Resources Control Engineer
Email: Prachi.Kulkarni@waterboards.ca.gov
Phone: 707-576-2650
Address: 5550 Skylane Blvd, Santa Rosa, CA 95403

Mary Bartholomew
Title: Environmental Scientist
Email: Mary.Bartholomew@waterboards.ca.gov
Phone: 707-576-2662
Address: 5550 Skylane Blvd, Santa Rosa, CA 95403

Jolly Giant Creek Monitoring Lead

Mary Bartholomew
Role: Organize monitoring events
Title: Environmental Scientist
Email: Mary.Bartholomew@waterboards.ca.gov
Phone: 707-576-2662
Address: 5550 Skylane Blvd, Santa Rosa, CA 95403

SWAMP Coordinator

Rich Fadness
Role: Lab contract manager
Title: Engineering Geologist
Email: Rich.Fadness@waterboards.ca.gov
Phone: 707-576-6718
Address: 5550 Skylane Blvd, Santa Rosa, CA 95403

City of Arcata

Scott Sinnott
Role: Partners with Regional Board staff during sampling trips
Title: Environmental Compliance Technician
Email: ssinnott@cityofarcata.org
Phone: 707-825-2140
Address: City of Arcata, 736 F Street, Arcata, CA 9552

Humboldt County Public Health Laboratories

HCPHL General Email Address: hcphl@co.humboldt.ca.us

Pepper Stockton
Title: Public Health Laboratory Director
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Jessica Reynolds
Title: Laboratory Assistant II
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Phone: 707-268-2179
Address: 529 I Street, Eureka, CA 95501

Babcock Laboratories: contact through SWAMP Coordinator

Appendix B – Field Checklist

Trip Planning

- ❑ Notify Humboldt County Public Health Laboratory of upcoming sampling
- ❑ Exchange contact information with field team
- ❑ Reserve room for lodging for night prior to sampling day
- ❑ Complete Trip Plan and submit to supervisor
- ❑ Monitoring Plan with sampling locations

Personal Gear

- ❑ Waders or knee-high rain boots
- ❑ Hand sanitizer
- ❑ Drinking water
- ❑ Rain jacket and/or rain pants, if applicable
- ❑ Snacks, optional
- ❑ Sunscreen, optional
- ❑ Hat, optional

Field Sheet

- ❑ 5 qty Field Sheets (1 field sheet per sampling location)
- ❑ clipboard
- ❑ Ballpoint pen
- ❑ Rite-in-Rain pen or pencil (for writing in rain)
- ❑ Multiparameter sonde
- ❑ camera

Sample Collection

- ❑ 7 qty 120 mL bacteria sample bottles
- ❑ 6 qty 110 mL MST specimen containers
- ❑ Sample container labels, if not pre-affixed to containers
- ❑ Babcock Laboratories Chain-of-Custody (COC) form
- ❑ Humboldt County Public Health Laboratory: Bacteria and MST COCs
- ❑ 10+ nitrile gloves (1 pair for each of 5 sampling location per person)
- ❑ Nitrile glove trash bag
- ❑ Ultra-fine point permanent marker (for sample container labels)
- ❑ Ballpoint pen for Chain-of-Custody forms
- ❑ 1 qty ice chest (approximately 8 to 10 quarts)
- ❑ Ice (to be purchased just prior to sampling)

Appendix C – Field Data Sheets

The field sheet below is an example of a field sheet and was obtained from the Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Project Plan (QAPP) and can be accessed here https://www.waterboards.ca.gov/water_issues/programs/swamp/qapp/swamp_QAPrP_2017_Final.pdf).

SWAMP Field Data Sheet (Water Chemistry & Discrete Probe) - EventType = **WQ**													Protocol: **MPSL-DFG_Field_v1.1**	Agency: **RWB1**	Project Code :	
Sta Code:					Date (mm/dd/yyyy):						Funding:				Entered in d-base (initial/date)	
Sta Name:					SampleTime:						Personnel:					
Habitat (Method = Habitat_Generic)			Purpose:	WaterChem	Habitat	FieldMeasure	Algae	WaterTox	SedChem	SedTox	TimeSeries					
BEAUFORT SCALE: (see back)		WIND DIRECTION (from):	N W E S	WADEABILITY: Y N Unk	LOCATION:	Bank	Thalweg	Midchannel	DGPS	Lat (dd.dddddd)		Long (ddd.dddddd)				
					GPS Device:	**72H**	S/N:		Target:							
					Accuracy (ft)		Datum:	**WGS84**	*Actual:			-				
COLOR WATER	Colorless	Green	Gray	Brown	Yellow	Red	Black	Mixed								
DOM. SUBSTRATE:	Bedrock	Concrete	Cobble	Gravel	Sand	Mud	Unknown	Other	OCCUPATION METHOD:	**Walk In**						
EVIDENCE OF FIRES:	No	<1 year	<5 years						STARTING BANK: (facing downstream)	LB	RB	NA				
OBSERVED FLOW:	NA	Dry Waterbody Bed	No Obs Flow	Isolated Pool	Trickle (<0.1cfs)	0.1-1cfs	1-5cfs	5-20cfs	20-50cfs	50-200cfs	>200cfs					
ODOR Habitat :	None	Sulfides	Sewage	Petroleum	Smoke	Other	HYDROMODIFICATION:	None	Bridge	Pipes	Concrete	Channel	GradeControl	Culvert	Dam	Other
ODOR Water:	None	Sulfides	Sewage	Petroleum	Smoke	Other	HYDROMOD LOCATION:	US	DS	WI	NA		**PHOTOS - YES / NO**			
OTHER PRESENCE:	None	Vascular	Nonvascular	OilySheen	Foam	Trash	Other	STREAM WIDTH (m):				(RB)	(LB)	(US)	(DS)	
24 hr OVERLAND RUNOFF:	None	Light Precip	Moderate/Heavy	Unknown								**Duplicate?**	**DupID:**	**% ALGAL COVER**		
PRECIPITATION:	None	Fog	Drizzle	Rain	Snow			DISTANCE FROM BANK (m):				**YES NO**	**FIELDQA**	**ALL**	**Cyano**	
24 hr PRECIPITATION:	None	Unknown	<1"	>1"												
SKY CODE:	Clear	Partly Cloudy	Overcast	Fog	Smoky	Hazy		WATER DEPTH (m):				SAMPLE TYPE: **GRAB**				
WATER CLARITY:	Clear (see bottom)	Cloudy (>4" vis)	Murky (<4" vis)									COLLECTION DEVICE:				
Lab (Method = Water_Grab)												**Individual bottle by hand**				

Depth: **0.1m**	Position in Column									YSI DataSonde:	**600XL 6920**
										S/N:	
Replicate 1	**subsurface**									YSI DataSonde:	**600 OMS**
Replicate 2	**subsurface**									S/N:	
Replicate 3	**subsurface**									Calibration Date:	
Field Results (Method = Field)										Calibration Sheet #:	

Depth: **0.1 m**	Position in Column	Velocity Observed (fps)	Water Temp (°C)	Sp. Cond (uS/cm)	Salinity (ppt)	O2 (%)	O2 (mg/L)	O2 (Charge)	pH	pH (mV)	Turbid (NTU)	TDS (g/L)
Replicate 1	**subsurface**											
Replicate 1	**subsurface**											
Replicate 2	**subsurface**											

COMMENTS:	Turbidimeter: **2100N**	Calibration Date:	Barometric Pressure	Calibrated Pressure
	Turbid (NTU)			
		Analysis Date/Time:		
Rev. 01/22/2021			**IF Diff. is >13 Recalibrate D.O.**	
	Secchi Depth		Rev. 08/26/2017	

Appendix D – Field Measurements: Bacteria and Pathogens in Water Samples

The Coastal Watershed Pathogen Indicator Study states that samples will be collected in accordance with Surface Water Ambient Monitoring Program (SWAMP) guidelines. The following information about field measurements was obtained from the following guide Conducting Field Measurement and Field Collections of Water and Bed Sediment Samples with Associated Field Measurement and Physical Habitat in California Version 1.1-MPSL-CDFW (March 2014). (https://sites.google.com/view/swamp-iq-wiki/swamp-standard-operating-procedures-sops).

A. Screw cap containers
   - Make sure the containers are sterilized; either factory-sealed or labeled.
   - Label the bottle.
   - Remove the plastic seal from the bottle's cap just before sampling. Avoid touching the inside of the bottle or cap. If you accidentally touch the inside, use another bottle.
   - If wading into the stream, try to disturb as little bottom sediment as possible. Be careful not to collect water that has sediment from bottom disturbance. Stand facing upstream. Collect the water sample on your upstream side, in front of you.
   - Hold the bottle near its base while wearing nitrile or polyethylene gloves and submerge the bottle in the water with the cap on. Open the bottle collecting the water sample approximately four (4) inches beneath the surface. When the bottle is filled to the desired level recap the bottle and remove from water. You can only use this method if the sample bottles do not contain sodium thiosulfate.
   - Alternative sampling method: In case the sample bottle contains preservatives/chlorine removers (i.e. Sodium-Thiosulfate), it cannot be plunged opening down. In this case hold the bottle upright under the surface while it is still capped. Open the lid carefully just a little to let water run in. Fill the bottle to the fill mark and screw the lid tight while the bottle is still underneath the surface.
   - Leave an air space so that the sample can be shaken just before analysis. Recap the bottle carefully, remembering not to touch the inside of the lid.
   - If the samples are to be analyzed in the lab, place them in a cooler with ice or cold packs for transport to the lab. Samples should be placed immediately on ice to maintain temperature at 6º C

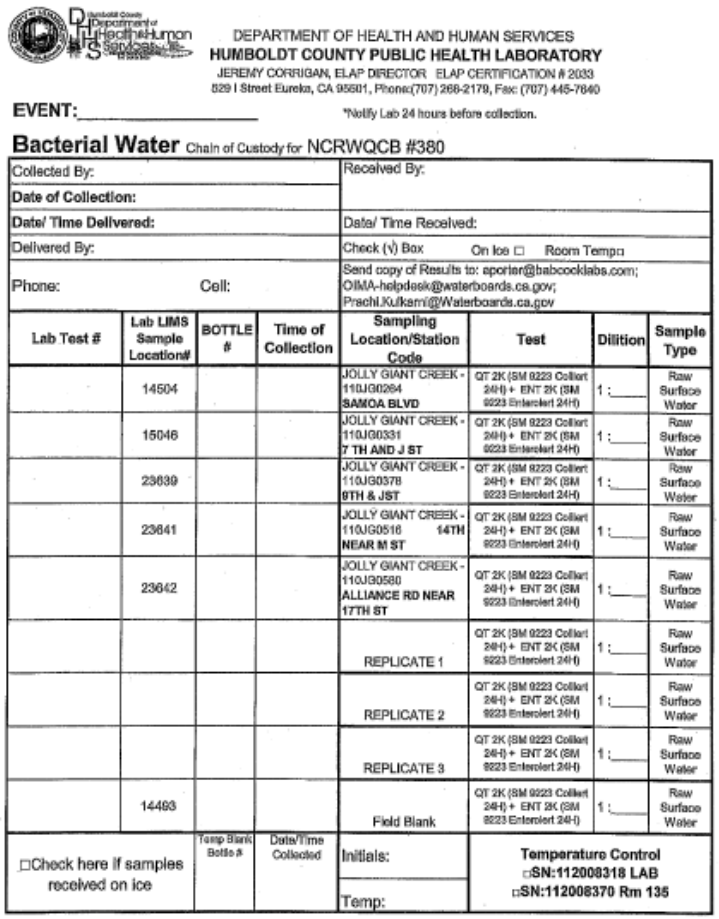
B. Pouring from another clean bottle
   - Make sure the containers are sterilized; either factory-sealed or labeled.
   - Due to different sampling conditions (high turbidity, rough water etc.) it is sometimes easy to pour water from another clean bottle into the bacteria bottle. This helps to make sure that the sample water is only being filled to the desired line and no overfilling occurs.

Summary of Sample Container, Volume, Initial Preservation, and Holding Time Recommendations for Water Samples

Parameters for Analysis in Water Samples	Recommended Containers (all containers pre-cleaned)	Sample Volume (mL)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Bacteria *E. coli* Enterococci	125 mL sterile plastic (high density polyethylene or polypropylene) container	Collect 125 mL of sample water. A single 100 mL volume sample sufficient the three analyses.	Sodium thiosulfate may be pre-added to the containers in the laboratory (chlorine elimination) but is not required for creek samples. Cool to ≤ 10°C; dark.	STAT: 8 hrs. at ≤ 10°C; dark for regulatory purposes; otherwise, 24 hrs. at ≤ 10°C, dark if non-regulatory purpose
Microbial Source Tracking (MST) Human Dog Gull Ruminant	125 mL sterile plastic (high density polyethylene or polypropylene) container	Collect 125 mL of sample water. 100 mL volume sufficient for MST analysis.	Sodium thiosulfate may be pre-added to the containers in the laboratory (chlorine elimination) but is not required for creek samples. Cool to ≤ 10°C; dark	STAT: 8 hrs at ≤ 10°C; dark for regulatory purposes; otherwise, 24 hrs at ≤ 10°C, dark if non-regulatory purpose

Appendix E – Chain of Custody Forms

Example of Humboldt County Public Health Department BACTERIAL WATER and MST Chain-of-Custody Forms

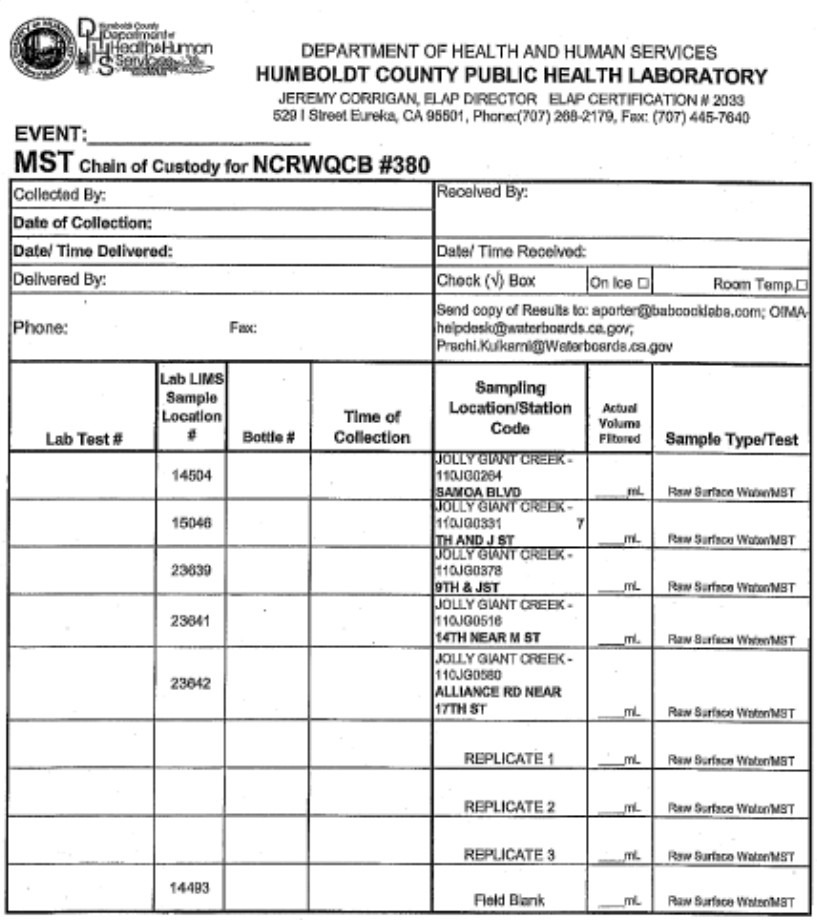


DEPARTMENT OF HEALTH AND HUMAN SERVICES
HUMBOLDT COUNTY PUBLIC HEALTH LABORATORY
JEREMY CORRIGAN, ELAP DIRECTOR ELAP CERTIFICATION # 2033
529 I Street Eureka, CA 95501, Phone:(707) 268-2179, Fax: (707) 445-7640

EVENT:_____ *Notify Lab 24 hours before collection.

Bacterial Water Chain of Custody for NCRWQCB #380

Collected By:				Received By:			
Date of Collection:							
Date/ Time Delivered:				Date/ Time Received:			
Delivered By:				Check (√) Box On Ice □ Room Temp□			
Phone: Cell:				Send copy of Results to: aporter@babcocklabs.com; OIMA-helpdesk@waterboards.ca.gov; Prachi.Kulkarni@Waterboards.ca.gov			
Lab Test #	**Lab LIMS Sample Location#**	**BOTTLE #**	**Time of Collection**	**Sampling Location/Station Code**	**Test**	**Dilition**	**Sample Type**
	14504			JOLLY GIANT CREEK - 110JG0264 **SAMOA BLVD**	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
	15046			JOLLY GIANT CREEK - 110JG0331 **7 TH AND J ST**	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
	23639			JOLLY GIANT CREEK - 110JG0378 **9TH & JST**	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
	23641			JOLLY GIANT CREEK - 110JG0516 **14TH NEAR M ST**	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
	23642			JOLLY GIANT CREEK - 110JG0580 **ALLIANCE RD NEAR 17TH ST**	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
				REPLICATE 1	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
				REPLICATE 2	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
				REPLICATE 3	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
	14493			Field Blank	QT 2K (SM 9223 Colilert 24H) + ENT 2K (SM 9223 Enterolert 24H)	1 :____	Raw Surface Water
□Check here if samples received on ice		Temp Blank Bottle #	Date/Time Collected	Initials:	**Temperature Control** □**SN:112008318 LAB** □**SN:112008370 Rm 135**		
				Temp:			



DEPARTMENT OF HEALTH AND HUMAN SERVICES
HUMBOLDT COUNTY PUBLIC HEALTH LABORATORY
JEREMY CORRIGAN, ELAP DIRECTOR ELAP CERTIFICATION # 2033
529 I Street Eureka, CA 95501, Phone:(707) 268-2179, Fax: (707) 445-7640

EVENT:_____

MST Chain of Custody for NCRWQCB #380

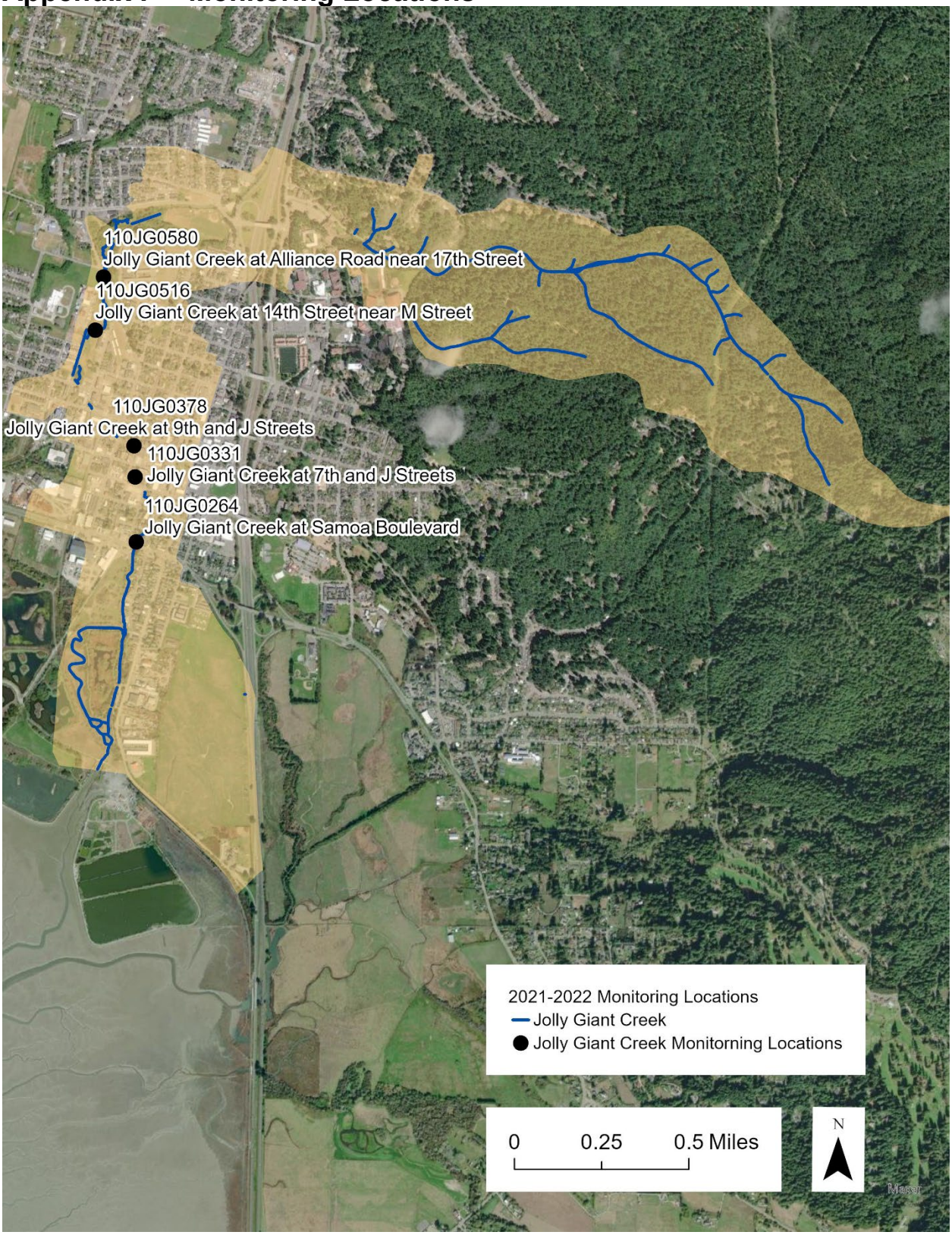
Collected By:				Received By:		
Date of Collection:						
Date/ Time Delivered:				Date/ Time Received:		
Delivered By:				Check (√) Box	On Ice □	Room Temp.□
Phone: Fax:				Send copy of Results to: aporter@babcocklabs.com; OIMA-helpdesk@waterboards.ca.gov; Prachi.Kulkarni@Waterboards.ca.gov		
Lab Test #	**Lab LIMS Sample Location #**	**Bottle #**	**Time of Collection**	**Sampling Location/Station Code**	**Actual Volume Filtered**	**Sample Type/Test**
	14504			JOLLY GIANT CREEK - 110JG0264 **SAMOA BLVD**	___mL	Raw Surface Water/MST
	15046			JOLLY GIANT CREEK - 110JG0331 **7TH AND J ST**	___mL	Raw Surface Water/MST
	23639			JOLLY GIANT CREEK - 110JG0378 **9TH & JST**	___mL	Raw Surface Water/MST
	23641			JOLLY GIANT CREEK - 110JG0516 **14TH NEAR M ST**	___mL	Raw Surface Water/MST
	23642			JOLLY GIANT CREEK - 110JG0580 **ALLIANCE RD NEAR 17TH ST**	___mL	Raw Surface Water/MST
				REPLICATE 1	___mL	Raw Surface Water/MST
				REPLICATE 2	___mL	Raw Surface Water/MST
				REPLICATE 3	___mL	Raw Surface Water/MST
	14493			Field Blank	___mL	Raw Surface Water/MST

Lab Test #: Sticker added by lab at drop-off
BOTTLE #: Sticker on sample collection bottle

Example of Babcock Laboratories Chain-of-Custody Form

EventCode WQ	Project Code	RWB1_Coastal Pathogen	Agreement No.								Analysis Request: (Type/write in single analysis vertically (e.g.TOC) or analyte group with all analytes named (e.g. metals = Ni,Cu,Fe, Pb,Cr,Se)									
Fiscal Year 21/22	Project Name	Region 1 Coastal Pathogen TMDL	Results to	SWAMP/CEDEN Database	OIMA-helpdesk@waterboards.ca.gov							BACTEROIDES								
Agency Code RWQCB1			Field Lead	Prachi Kulkarni Prachi.Kulkarni@waterboards.ca.gov																
OR ->																				
	Agency	Water Boards	Project Lead	Prachi Kulkarni Prachi.Kulkarni@waterboards.ca.gov Rich Fadness Rich.Fadness@waterboards.ca.gov																
Note: Standard field preservation codes to choose ->		Field Acidified, Field Filtered, FieldFrozen																		
To obtain appropriate "codes", consult the SWAMP Database Look-up-lists -----> https://swamp.waterboards.ca.gov/swamp_checker/LookUpLists.aspx OR contact OIMA-helpdesk@waterboards.ca.gov			Protocol Code (i.e., sample collection)	MPSL-DFG_Field_v1.1																
SampleID	Station Code/ Station Name	SITE CODE 2	Collection Date	Sample Time	Collection Method Code	Location Code	Sample Type Code	Collection Depth (m)	Field Preservation	REPLICATE	# of samples	E-Coli (Quantitray)	HUMAN	GULL	DOG	RUMINANT				
	110JG0264				Water_Grab	Midchannel	Grab	0.1	Stored < 4*C	1	2	X	X	X	X	X				
	110JG0331				Water_Grab	Midchannel	Grab	0.1	Stored < 4*C	1	2	X	X	X	X	X				
	110JG0378				Water_Grab	Midchannel	Grab	0.1	Stored < 4*C	1	2	X	X	X	X	X				
	110JG0516				Water_Grab	Midchannel	Grab	0.1	Stored < 4*C	1	2	X	X	X	X	X				
	110JG0580				Water_Grab	Midchannel	Grab	0.1	Stored < 4*C	1	2	X	X	X	X	X				
Request Details *: Turnaround Time (CIRCLE) :	Rush	24 hours	48 hours	72 hours	Regular (6 days +)	* Do not use this COC for tissue														
Sample Types (i.e. matrix on this form : (CIRCLE)	Ambient/ receiving water	Sediment	Oil + Gas	Effluent e.g.stormwater, groundwater	Other _____															
Samples Relinquished by:				Date & Time	Samples Received by:						Date & Time						Distribution of COC form: Original accompanies shipment, Electronic copy emailed			
Name (Print)					Name (Print)															
Signature					Signature												Cooler return shipping (circle):			
Agency					Agency															

Appendix F – Monitoring Locations

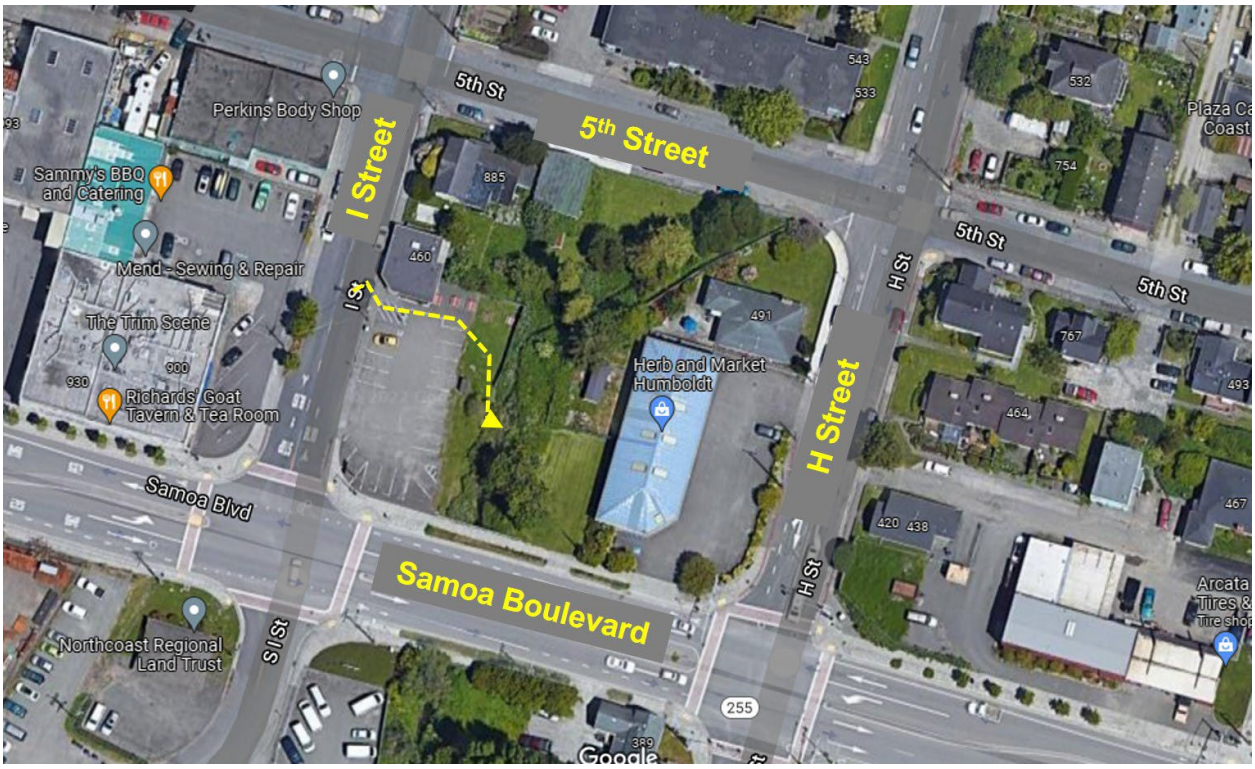


Sampling Location 1

Station Code: **110JG0264**
Station Name: **Jolly Giant Creek at Samoa Boulevard**

Sample Location Description: At approximately 50 feet upstream from the north side of Samoa Boulevard and between I Street and H Street

Sample Location Coordinates: 40.865558, -124.088857



Note:

- There is a waist-high fence to cross over to access the sampling location.

Sampling Location 2

Station Code: **110JG0331**
Station Name: **Jolly Giant Creek at 7th and I Streets**

Sample Location Description: Behind commercial building at 960 7th Street in Arcata, California. Building occupant will unlock gate for access.

Sample Location Coordinates: 40.868157, -124.089002

Note:

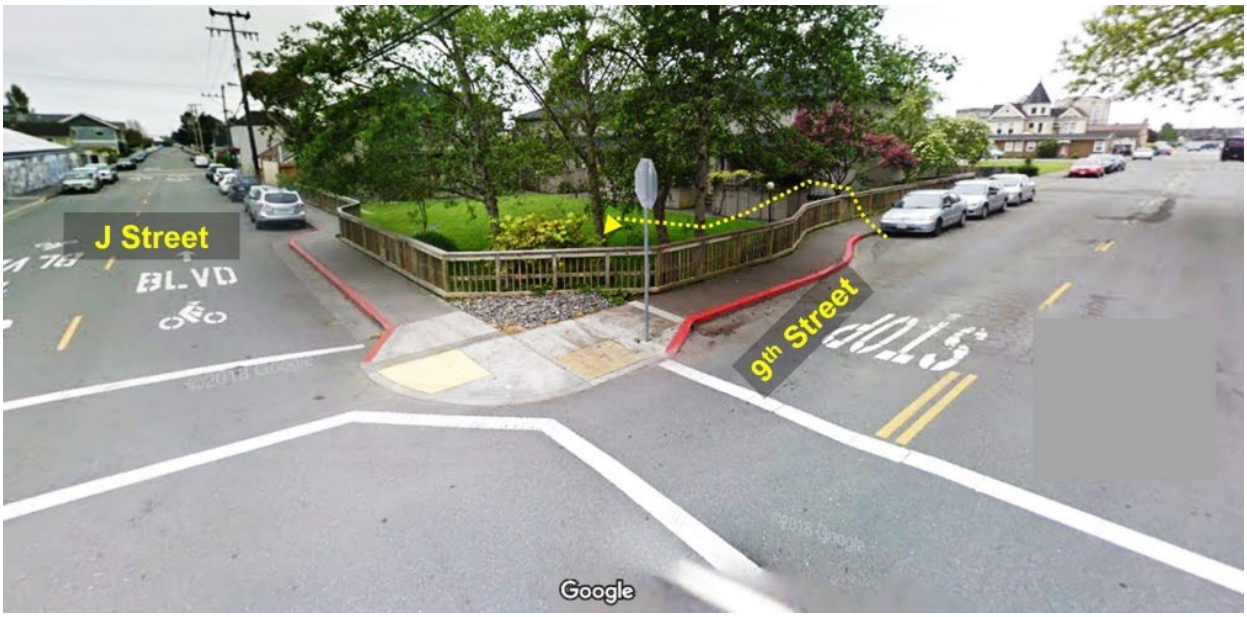
- There is a gate that needs to be unlocked for access. City of Arcata staff will contact the property operator, who will unlock the gate.

Sampling Location 3

Station Code: **110JG0378**
Station Name: **Jolly Giant Creek at 9th and J Streets**

Sample Location Description: At 9th Street and I Street, approximately five feet downstream of the culvert at the southwest corner of the intersection

Sample Location Coordinates: 40.869450, -124.089076



Note:

- The fence has an unlocked gate accessed from 9th Street.

Sampling Location 4

Station Code: **110JG0516**
Station Name: **Jolly Giant Creek at 14th near M Street**

Sample Location Description: At the south side of an access road in line with 14th street to the east, approximately 180 feet west of M Street

Sample Location Coordinates: 40.874237, -124.091276

Sampling Location 5

Station Code:	**110JG0580**
Station Name:	**Jolly Giant Creek at Alliance near 17th Street**
Sample Location Description:	At the west side of Alliance Road approximately 140 feet south of 17th Street
Sample Location Coordinates:	40.876445, -124.090873

Note:

- Access through thorny berry bramble.