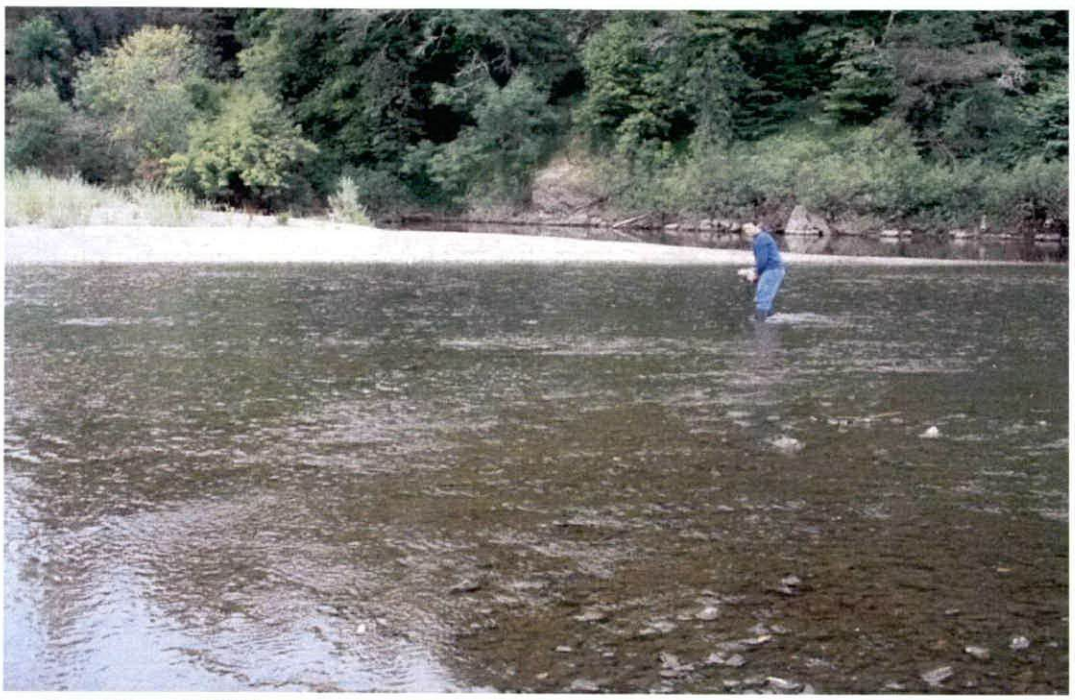
Water Quality Monitoring Plan
for the Russian River
Sonoma County Water Agency
2011 Temporary Urgency Change



Russian River 2009

Prepared by

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1.0 INTRODUCTION

The Sonoma County Water Agency (Water Agency) petitioned the State Water Resources Control Board (State Board) to reduce minimum instream flows in the Russian River as required by the National Marine Fisheries Service's (NMFS) *Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation District in the Russian River Watershed* (Russian River Biological Opinion, NMFS 2008). NMFS' Russian River Biological Opinion concluded that summer minimum instream flows required by Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile steelhead habitat. NMFS also determined that the conversion of the tidally-influenced Russian River estuary into a closed freshwater lagoon during the summer months would provide improved habitat for rearing juvenile steelhead. Prior to the State Board approving the petition to permanently change minimum instream flows, the Water Agency must undertake an environmental review, in accordance with the California Environmental Quality Act (CEQA), to assess potential impacts that could occur as a result of changed flows. As such, this monitoring plan will focus on water quality sampling and monitoring that would provide data to help analyze potential impacts under CEQA.

2.0 BACKGROUND

Under the federal Endangered Species Act (ESA), steelhead, coho salmon and Chinook salmon in the Russian River watershed are listed as threatened or endangered species. Coho salmon is also listed as endangered under the California Endangered Species Act (CESA). In September 2008, NMFS issued the Russian River Biological Opinion, a culmination of more than a decade of consultation under Section 7 of the ESA among Water Agency, U.S. Army Corps of Engineers (Corps), and NMFS regarding the impacts of Water Agency's and Corps' water supply and flood control operations in the Russian River watershed on the survival of these listed fish species. The California Department of Fish and Game (CDFG) issued a consistency determination on November 9, 2009, finding that the Russian River Biological Opinion was consistent with the requirements of the CESA and adopting the measures identified in the Biological Opinion.

Studies conducted during the consultation period that ultimately led to this Biological Opinion indicate that summer flows required by Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile salmonid habitat. NMFS also concluded in the Biological Opinion that the historical practice of breaching the sandbar that builds up and frequently closes the mouth of the Russian River during the summer and fall may adversely affect the listed species. NMFS concluded in the Biological Opinion that it might be better for juvenile steelhead and salmon if the sandbar is managed during these times, to allow for the formation of a seasonal freshwater lagoon in the Russian River estuary. Minimum instream flows required by Decision 1610 result in flows into the estuary that make it difficult to maintain a freshwater lagoon while preventing flooding of adjacent properties.

Without the requested modifications to the instream flow requirements, the high summer time flows required by Decision 1610 will continue to jeopardize the recovery of coho salmon and steelhead in the Russian River and its tributaries.

Changing minimum instream flows will assure the maintenance of a natural resource, i.e., the instream resources of the Russian River, by increasing available salmonid rearing habitat in the upper Russian River and Dry Creek, and providing a lower, closer to natural inflow to the estuary between late spring and early fall, thereby enhancing the potential for maintaining a seasonal freshwater lagoon that could support increased production of juvenile steelhead.

3.0 OBJECTIVES

Objective of this sampling and analysis plan: Supplement existing data to provide a more complete basis for analyzing spatial and temporal water quality trends due to Biological Opinion-stipulated changes in river flow and estuary management.

4.0 PURPOSE AND NEED

One of the conditions in the Order for the Temporary Urgency Change (TUC) petition states that Water Agency prepare this Water Quality Monitoring Plan (Monitoring Plan) for the Russian River in consultation with: (1) the North Coast Regional Water Quality Control Board (NCRWQCB); (2) the United States Geological Survey (USGS); (3) NMFS; and (4) the Division of Water Rights (DWR). The objectives of the Monitoring Plan are to provide information to evaluate potential changes to water quality and availability of habitat for aquatic resources resulting from the proposed permanent changes to Decision 1610 minimum instream flows that are mandated by the Biological Opinion. Furthermore, the Monitoring Plan will build upon previous water quality studies that have been conducted in the Russian River and the estuary as required by the Biological Opinion, and provide information to support the development of a CEQA document required for permanent changes to Decision 1610.

Monitoring will be conducted to track potential changes to water quality associated with reduced flows in the mainstem Russian River and extended closure of the estuary during the dry season to form a summer lagoon at the mouth of the river. Mainstem and estuary monitoring will include continuous hourly monitoring of temperature, dissolved oxygen, pH, and specific conductance at several stations stretching from Ukiah to Jenner. In addition, the estuary will be monitored hourly to observe salinity concentration and stratification in the water column; as well as up and downstream migration of the salt water layer associated with tidal exchange, periods of lower instream flows, and extended sandbar closures. Water samples (grab) will also be collected and analyzed for several constituents by Water Agency staff.

Regarding water quality monitoring to support the Water Agency's CEQA compliance for changes to Decision 1610 minimum instream flow requirements, the following preliminary questions help explain the objective of the monitoring plan:

- What are the background levels of nutrients and pathogens under the current minimum instream flow levels? How do these background levels respond to changes in instream flow, considering other contributing factors?
- Does water temperature and dissolved oxygen respond to changes in minimum instream flows?

- Are there secondary biological effects related to changes in water quality related to instream flow changes (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?
- What are the background levels of nutrients and pathogens in the Estuary? How do the levels respond to managing the estuary as a closed summer lagoon, considering other contributing factors?
- Do water temperature, dissolved oxygen, and salinity respond to managing the estuary as a closed summer lagoon?
- Are there secondary biological effects related to changes in water quality as a result of managing the estuary as a closed summer lagoon (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?

5.0 SAMPLING AND ANALYSIS PLAN

5.1 Mainstem Russian River Study

5.1.1 Datasonde Deployment

In coordination with the United States Geological Survey (USGS) the Water Agency funds the maintenance and operation of five multi-parameter water quality sondes on the Russian River located at Hopland, Diggers Bend in Healdsburg, the Water Agency's river diversion facility (RDS) at Mirabel, Hacienda Bridge and Johnson's Beach (see Figure 1). These five sondes are referred to as "permanent" as the Water Agency maintains them as part of its early warning detection system. The sondes take real time readings of water pH, temperature, dissolved oxygen (DO), specific conductivity, and turbidity, every 15 minutes. The Hopland, Diggers Bend and Hacienda Beach data is provided in cooperation with the USGS on its "Real-time Data for California" website. The RDS and Johnson's Beach data is available via an "email subscription" available to the public via the Water Agency's website.

In addition to the permanent sondes, the Water Agency, in cooperation with the USGS, seasonally deploys sondes at various locations within the watershed. This year the Water Agency, in cooperation with the USGS will be installing seasonal sondes with real-time telemetry at the USGS river gage station north of Cloverdale at Commisky Station Road and at the Alexander Valley Road Bridge (USGS Jimtown river gage). The sonde at the Cloverdale gage collects DO and temperature and the sonde at the Jimtown gage collects pH, temperature, DO, specific conductivity and turbidity; both locations will transmit the data and be available on the USGS real-time website.

5.1.2 Nutrient/Bacterial/Algal Sampling

Water samples will be collected from nine (9) surface-water sites in the mainstem of the Russian River (Figure 1). All samples will be analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (total coliforms, *e. coli*, and enterococci), total and dissolved organic carbon, total dissolved solids, and turbidity (See Table 1). Sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols and procedures established by the contract laboratory and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency. As identified in Table 1, Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)".

Beginning May 19, 2011, grab samples will be collected every two weeks (Thursdays) when flows are above D1610 normal year levels (125 cfs – measured at USGS gauging station 11467000, near Hacienda), and will be collected weekly when flows drop below D1610 normal year levels (125 cfs). See Figure 1 for a map of surface-water sampling locations. Measurements of water temperature and pH, will be collected using either a Orion 4 star or Orion 250A+, pH calibrated using 3 buffers prior to use each day. The temperature feature is checked against an NIST thermometer and recorded.

Russian River mainstem sites from upper to lower (Figure 1) include:

- Russian River @ Diggers Bend (USGS gage 11463980)
- Russian River @ Camp Rose (historic sampling site)
- Russian River @ Memorial Beach (historic sampling site)
- Russian River @ below Memorial Beach and above Dry Creek confluence
- Russian River @ ~1,500 feet below Dry Creek confluence
- Russian River @ Riverfront Park (USGS gage 11465390)
- Russian River @ ~150 feet below RDS and above Mark West Creek confluence
- Russian River @ ~1,300 feet below Mark West Creek confluence
- Russian River @ Steelhead Beach (historic sampling site)

The mainstem sampling sites have varied over the last several years based upon discussions with the coordinating agencies. However, while some historical sampling sites remain in this year's monitoring program several of the sites listed above are new sampling sites. In addition, the Camp Rose, Memorial Beach and Steelhead Beach sample sites are sites that the NCRWQCB is collecting bacteria samples from and therefore the results from both monitoring programs should be able to be used for further analysis. Duplicate field samples are being collected at the Steelhead Beach sample site.

These analyses will further the effort to establish a water-quality baseline for the mainstem of the Russian River. The baseline established with these analyses will help the Water Agency and other agencies to assess the influence of reduced flows in the mainstem of the Russian River during summer flow conditions.

5.1.3 Reporting

A report describing the results of the Water Agency 2011 mainstem Russian River water quality monitoring and sampling effort will be prepared as described in the TUC Order. The report will provide summaries of data observations recorded for each constituent sampled or monitored. The report may also provide recommendations for changes to monitoring and sampling efforts to be conducted in subsequent years. The information from this report will be used in a subsequent report being prepared by the Water Agency for the Biological Opinion that incorporates other studies and discusses trends and observations relating to the proposed permanent changes to minimum instream flows during the summer months. The report shall be submitted by March 31, 2012.

5.2 Russian River Estuary Study

5.2.1 Datasonde Deployment

Water quality monitoring will occur at ten (10) stations in the lower, middle, and upper reaches of the Russian River estuary, including tributaries and areas upstream from the estuary that become inundated during closed lagoon conditions (maximum backwater area). Eight stations will be located in the mainstem between the mouth of the river at Jenner and Monte Rio and two stations will be located in Willow and Austin Creeks, in areas that are subject to tidal and/or closed lagoon inundation. Refer to Figure 2 for a map of estuary water quality station locations.

Water Agency staff will use several Yellow Springs Incorporated (YSI) 6600 series multi-parameter datasondes (sondes) equipped with a YSI 6560 combination conductivity/temperature sensor, a YSI 6561 or YSI 6589Fr pH sensor, and either a YSI 6562 dissolved oxygen sensor or YSI 6150 optical dissolved oxygen sensor to collect water quality parameters at all sites. Sondes will be programmed to record hourly measurements of water temperature (Celsius), dissolved oxygen (milligrams per liter, mg/L), specific conductance (microsiemens), salinity (parts per thousand, ppt), and hydrogen ion (pH). Monitoring sites will be accessed by boat or by foot.

All sondes will be recalibrated following the manufacturer's 6-Series User Manual and data downloaded every two weeks by Water Agency staff. The YSI temperature sensor utilizes a thermistor that does not require calibration or maintenance. However, thermistor accuracy will be checked against a National Institute of Standards and Technology (NIST) thermometer during initial deployment to ensure the sensor is functioning properly. The YSI 6560 conductivity sensor will be calibrated using a 10,000 microsiemen (µS/cm) standard. The YSI 6561 pH sensor will be calibrated to two points using buffer solutions of pH 4, 7, and/or 10. The YSI 6562 dissolved oxygen sensor will be calibrated using the dissolved-oxygen-calibration chamber-in-air method where the calibration chamber is set-up with water and allowed to reach 100-percent saturation prior to calibration. The YSI 6150 optical dissolved oxygen sensor will be calibrated using a one-point dissolved-oxygen-

calibration chamber-in-air method where the calibration chamber is set-up with water and allowed to reach 100-percent saturation prior to calibration.

Field calibration and data collection will be conducted using the YSI 650 Multiparameter Display System (MDS) datalogger designed to work with the 6-Series datasondes. Data will be downloaded onto the YSI 650 MDS and then transferred to a PC, where data will undergo analysis by Water Agency staff.

Monitoring sites (Figure 2) include:

- Russian River @ Mouth at Goat Rock State Beach (2 YSI 6600 Datasondes)
- Russian River @ Patty's Rock upstream from Penny Island (2 YSI 6600 Datasondes)
- Willow Creek at the 1st Bridge (1 YSI 6600 Datasonde)Russian River @ Sheephouse Creek downstream of Sheephouse Creek (2 YSI 6600 Datasondes)
- Russian River @ Heron Rookery halfway between Sheephouse and Freezeout creeks (2 YSI 6600 Datasondes)
- Russian River @ Freezeout Creek downstream of Freezeout Creek (2 YSI 6600 Datasondes)
- Russian River @ Brown's Pool downstream of Austin Creek (1 YSI 6600 Datasonde)
- Austin Creek downstream of first Steel Bridge (1 YSI 6600 Datasonde)
- Russian River @ Villa Grande (1 YSI 6600 Datasonde)
- Russian River @ Monte Rio downstream of Dutch Bill Creek (1 YSI 6600 Datasonde)

The five mainstem stations located in the lower, middle, and upper reaches of the estuary between the Mouth and Freezeout Creek will have a vertical array of two datasondes. Monitoring stations will be comprised of a concrete anchor attached to a steel cable suspended from the surface by a large buoy with sondes attached at varying depths along the cable. The rationale for choosing these sites was to locate the deepest pools at various points throughout the Estuary to obtain the fullest vertical profiles possible and to monitor anoxic events and temperature or salinity stratification. The three stations in the lower and middle estuary that are predominantly saline will have sondes placed at the surface (approximately 1-meter depth) and mid-depth portions of the water column. The two stations in the upper estuary, where water is predominantly fresh, will be located at the mid-depth and bottom of the water column.

Three additional mainstem stations will be established in the maximum backwater area, upstream from the estuary in freshwater habitat that becomes inundated during sandbar closure events. The stations at Brown's Pool and Laurel Dell have not been previously monitored and will have one datasonde each placed at the bottom of the pool or thalweg, which is the deepest part of the water column. They will be placed in this manner to track the potential migration of saline water upstream of Freezeout Creek during estuary closure. The Monte Rio station has not previously been observed to become saline and will have one sonde suspended at approximately mid-depth (during open conditions) in the thalweg, or deepest part of the water column. The two tributary stations in Willow and Austin creeks will each have one sonde that will be suspended at approximately mid-depth (during open conditions) in their respective thalwegs near the confluences with the Russian River.

Sondes will be located in this manner to track changes to water quality in the water column, vertically and longitudinally, within the estuary during reduced instream flows, tidal fluctuation and closure events. The placement of sondes in this manner will also allow Water Agency staff to track changes to water quality that may be associated with the migration and stratification of the salt water layer within the estuary, as well as the enhancement of habitat conditions for juvenile salmonids.

5.2.2 Nutrient/Bacterial/Algal Sampling

Water samples will be collected from 5 surface-water sites in the Russian River estuary (Figure 2). All samples will be analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (total coliforms, *e. coli*, and enterococci), total and dissolved organic carbon, total dissolved solids, and turbidity (See Table 1). Sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A in conjunction with protocols and procedures established by the contract laboratory and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency. As identified in Table 1, Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)".

Beginning May 17, 2011, grab Samples will be collected every two weeks (Tuesdays) when flows are above D1610 normal year levels (125 cfs - measured at USGS gauging station 11467000, near Hacienda), and will be collected weekly when flows drop below D1610 normal year levels (125 cfs). See Figure 2 for a map of surface-water sampling locations. Measurements of water temperature and pH, will be collected using a YSI 6600 datasonde and YSI 650MDS datalogger during water sample collection.

Russian River Estuary sites (Figure 2) include:

- Russian River @ Jenner Boat Ramp
- Russian River @ Bridgehaven below Willow Creek
- Russian River @ Duncans Mills above Freezeout Creek
- Russian River @ Casini Ranch below Austin Creek
- Russian River @ Monte Rio below Dutch Bill Creek

Additional focused sampling will also occur under certain conditions and following specific river management and operational events, noted below, at the sites listed above. Duplicate field samples are being collected at the Monte Rio sampling site.

- Removal of Johnson's Beach and/or Vacation Beach Dam - 3 samples within 10 days after dam removal

- Sandbar Closure - 3 samples within 10 days (or weekly)
- Sandbar Breach - 3 samples within 10 days after breach
- Lagoon Outlet Channel implementation - 3 samples within 10 days after implementation.

At the conclusion of any focused sampling event, regular sampling will resume following the schedule based on flows, as described above.

These analyses will continue the Water Agency effort to establish a water-quality baseline for the Russian River estuary (including the maximum backwater area) from Monte Rio to the river mouth at Jenner. The baseline established with these analyses will enable Water Agency to assess the influence of reduced flows in the lower mainstem, a closed lagoon in the Russian River estuary, and the operation of a lagoon outlet channel across the river mouth sandbar, during summer flow.

5.2.3 Reporting (Water Agency)

A report describing the results of the Water Agency 2011 Russian River estuary water quality monitoring and sampling effort will be prepared as described in the Russian River Biological Opinion. The report will provide summaries of data observations recorded for each constituent sampled or monitored. The report may also provide recommendations for changes to monitoring and sampling efforts to be conducted in subsequent years. The information from this report will be used in a synthesis report being prepared by Water Agency for the Biological Opinion that incorporates other estuary studies and discusses trends and observations relating to the proposed permanent changes to minimum instream flows and estuary management during the summer months. The report shall be submitted by March 31, 2012.

5.3 Quality Assurance Program

As previously identified sampling methodology and quality assurance protocols including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols and procedures established by Alpha Analytical Laboratories (the Water Agency's contract laboratory) and the Laboratory/Industrial Waste Services section in the Operations Division of the Water Agency.

Table 1. List of bacterial indicators and nutrients to be analyzed in water samples collected from the Russian River Mainstem and Estuary.

Compound	Test Method	Method Detection Limit (MDL)	Laboratory Reporting Limit (LRL/PQL[1])	Units
Nitrogen, Total	SM4500-N	0.2[5]	0.5	mg/L
Nitrogen, Total Organic	SM4500-N	0.2	0.2	mg/L
Nitrogen, ammonia as N	SM4500NH3C	0.1	0.2	mg/L
Ammonia Unionized	SFBRWQCP	0.00010	0.00050	mg/L
Nitrogen, Total Kjeldahl	SM4500-N_{org} B	0.10	0.20	mg/L
Nitrogen, nitrate as N	EPA300.0	0.050	0.20	mg/L
Nitrogen, nitrite as N	EPA300.0	0.010	0.20	mg/L
Organic carbon, dissolved	SM5310C	0.0400	0.300	mg/L
Organic carbon, total	SM5310C	0.0400	0.300	mg/L
Phosphorus, orthophosphate	SM4500-P E	0.020	0.020	mg/L
Phosphorus, total	SM4500-P E	0.020	0.10	mg/L
Total Dissolved Solids	SM2540C	4.2	5.0	mg/L
Chlorophyll (a)	SM10200H	0.000050	0.010	mg/L
Coliform, total	SM9223B (MTF)[2]	2.0	2.0	MPN[3]
Coliform, fecal	SM9221E (MTF)	2.0	2.0	MPN
Enterococci	SM9230 (MTF)	2.0	2.0	MPN
Coliform, total	SM9223 (clert)[4]	2.0	2.0	MPN
e-coli	SM9223 (clert)	2.0	2.0	MPN
Turbidity	EPA180.1	0.020	0.10	NTU

Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)".

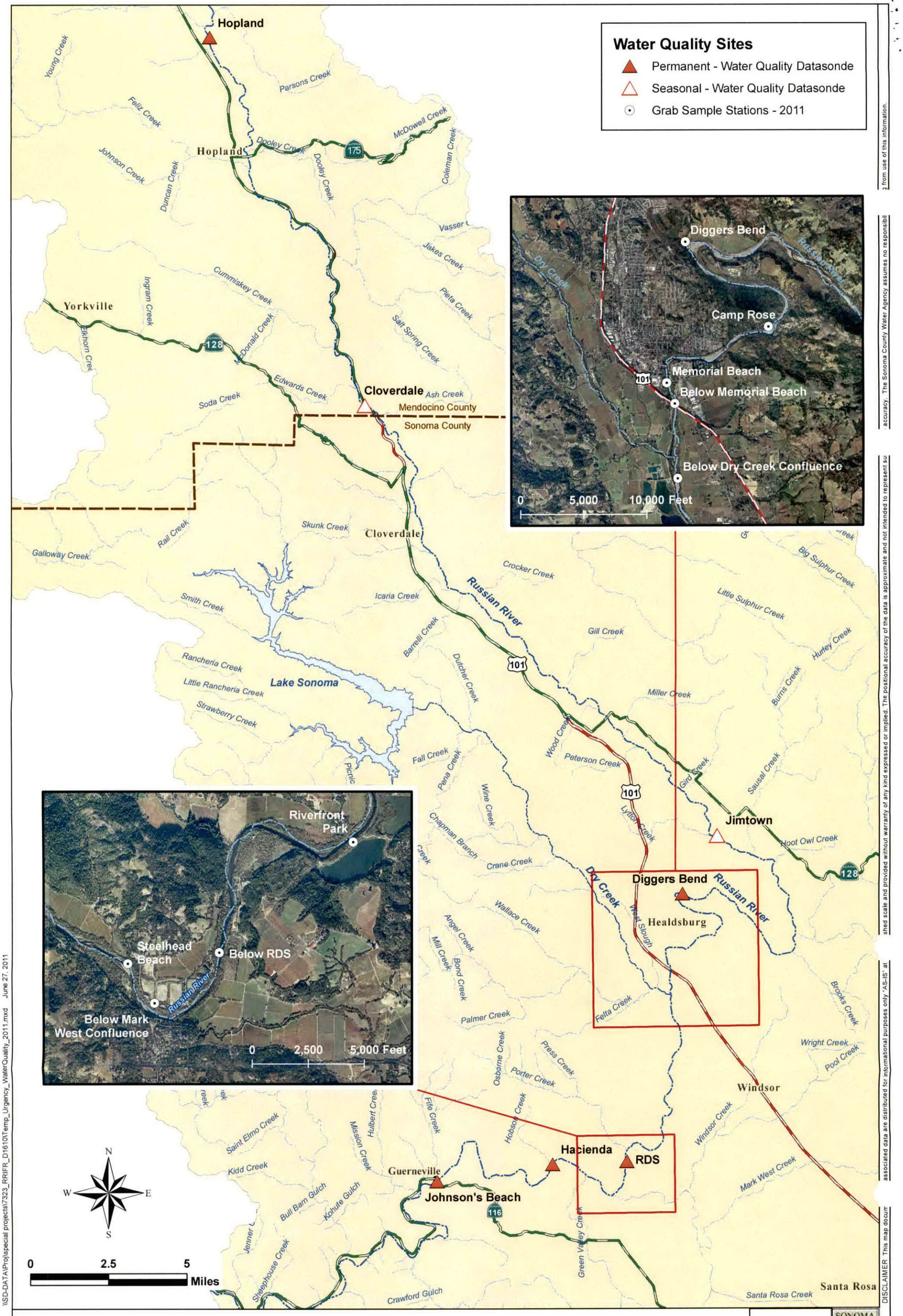
[1] PQL – Practical Quantitation Limit

[2] MTF – multiple tube fermentation

[3] MPN – most probable number

[4] clert – Colilert Method

[5] Total Nitrogen is calculated from TKN, N as Nitrate, N as Nitrite



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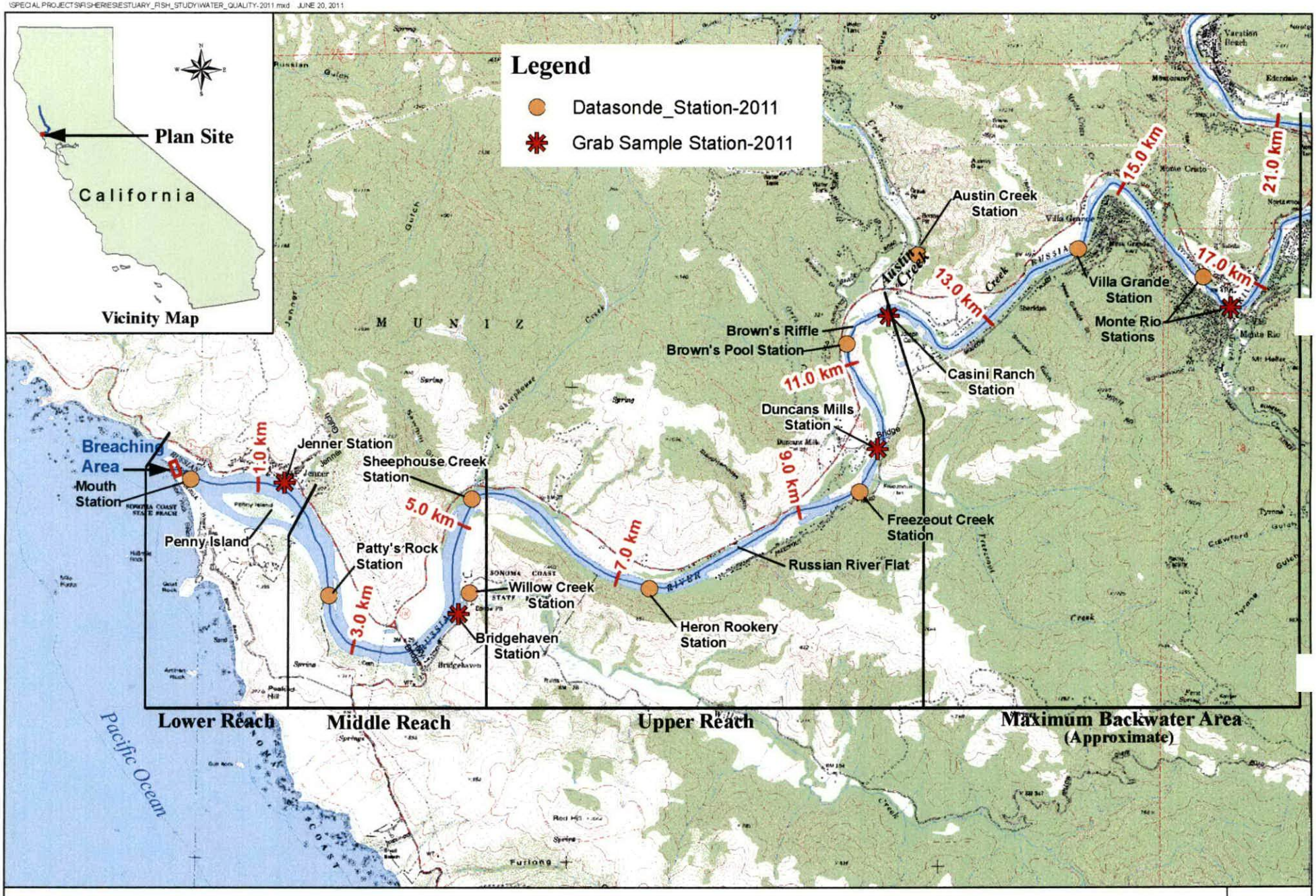
Russian River Mainstem
Water Quality Monitoring Stations - 2011

Figure 1

SONOMA COUNTY WATER AGENCY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Legend
Datasonde_Station-2011
Grab Sample Station-2011
Plan Site
California
Vicinity Map
Austin Creek Station
Villa Grande Station
Monte Rio Stations
Brown's Riffle
Brown's Pool Station
Casini Ranch Station
Duncans Mills Station
Freezeout Creek Station
Russian River Flat
Heron Rookery Station
Willow Creek Station
Bridgehaven Station
Patty's Rock Station
Sheephouse Creek Station
Jenner Station
Penny Island
Mouth Station
Breaching Area
1.0 km
3.0 km
5.0 km
7.0 km
9.0 km
11.0 km
13.0 km
15.0 km
17.0 km
21.0 km
Lower Reach
Middle Reach
Upper Reach
Maximum Backwater Area (Approximate)
Pacific Ocean
0 0.45 0.9 1.8 Kilometers
0 0.375 0.75 1.5 Miles
Russian River Estuary
Water Quality Monitoring Stations - 2011
This Map is for general reference only.

Figure 2