Policy for Maintaining Instream Flows in Northern California Coastal Streams

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

CDF	California Department of Forestry
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFII	Cumulative Flow Impairment Index
DA	Drainage Area
DFG	California Department of Fish and Game
Division	Division of Water Rights
DWR	California Department of Water Resources
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
MBF	Minimum Bypass Flow
MCD	Maximum Cumulative Diversion
NMFS	National Marine Fisheries Service
POD	Point of Diversion
POI	Point of Interest
QA/QC	Quality Assurance/Quality Control
Q	Flow
Q_m	Unimpaired Mean Annual Flow
Q_{MBF}	Minimum Bypass Flow
R2	R2 Resource Consultants
SED	Substitute Environmental Document
State Water Board	State Water Resources Control Board
Stetson	Stetson Engineers
USGS	US Geological Survey

POLICY FOR MAINTAINING INSTREAM FLOWS IN NORTHERN CALIFORNIA COASTAL STREAMS

1.0 INTRODUCTION

The State Water Resources Control Board (State Water Board or Board) adopted this state policy for water quality control on _____, 2008. This policy is also known as the North Coast Instream Flow Policy. It applies to applications to appropriate water, small domestic use and livestock stockpond registrations, and water right petitions.

Water Code section 1259.4, which was added by Assembly Bill 2121 (Stats. 2004, ch. 943, § 3), requires the State Water Board to adopt principles and guidelines for maintaining instream flows in northern California coastal streams as part of state policy for water quality control, for the purposes of water right administration. This policy implements Water Code section 1259.4. The geographic scope of this policy, referred to as the policy area, encompasses coastal streams from the Mattole River to San Francisco and coastal streams entering northern San Pablo Bay, and extends to five counties -- Marin, Sonoma, and portions of Napa, Mendocino, and Humboldt counties.

This policy focuses on measures that protect native fish populations, with a particular focus on anadromous salmonids and their habitat. Beginning in 1996, the National Marine Fisheries Services (NMFS) and the California Department of Fish and Game (DFG) listed steelhead trout, coho salmon, and chinook salmon as "threatened" under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), respectively. In 2005, the coho salmon's status was upgraded from threatened to "endangered" on both the ESA and the CESA lists.

A number of factors have led to the decline of anadromous salmonid populations in the policy area. Climatic variation, disease, predation, loss of genetic diversity, fish harvesting, and land and water use are all considered to pose an ongoing threat to salmonids. Degradation and loss of freshwater habitat is considered to be one of the leading causes for the decline of salmonids in California (DFG, 2004). Historical and continuing urban, agricultural, and timber harvest land use practices affect fish habitat by increasing pollutant loading and causing sedimentation of spawning gravels. Land use practices also have resulted in removal of riparian habitat and physical alteration of stream channels, including the creation of barriers to fish migration. Water diversion has resulted in a significant loss of fish habitat in California (NMFS, 1996). Water withdrawals change the natural hydrologic patterns of streams and can directly result in a loss or reduction in the physical habitat that fish occupy. Flow reduction can exacerbate many of the problems associated with land use practices by reducing the capacity of streams to assimilate pollutants.

Construction and operation of dams and diversions have created barriers to fish migration, thereby blocking fish from access to historical habitat. Dams also disrupt the flow of food (i.e., aquatic insects), woody debris, and gravel needed to maintain downstream fish habitat.

This policy establishes principles and guidelines for maintaining instream flows for the protection of fishery resources. It does not specify the terms and conditions that will be incorporated into water right permits, licenses, and registrations. It prescribes protective measures regarding the season of diversion, minimum bypass flow, and maximum cumulative diversion. Site-specific studies may be conducted to evaluate whether alternative protective criteria could be applied. The policy also limits construction of new onstream dams and contains measures to ensure that approval of new onstream dams does not adversely affect instream flows needed for fishery resources. The policy provides for a watershed-based approach to evaluate the effects of multiple diversions on instream flows within a watershed as an alternative to evaluating water diversion projects on an individual basis. Enforcement requirements contained in this policy include a framework for compliance assurance, prioritization of enforcement cases, and descriptions of enforcement actions. The policy contains guidelines for evaluating whether a proposed water diversion, in combination with existing diversions in a watershed, may affect instream flows needed for the protection of fishery resources.

2.0 POLICY FRAMEWORK

2.1 Development of Instream Flow Criteria

In developing this policy, the State Water Board considered the 2002 draft "Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams" (DFG-NMFS Draft Guidelines) jointly developed by DFG and NMFS. (Wat. Code, § 1259.4, subd. (b).) The DFG-NMFS Draft Guidelines were specifically developed to protect and restore anadromous salmonids and their habitat. The DFG-NMFS Draft Guidelines were intended to preserve a level of stream flow that ensures anadromous salmonids are protected from deleterious effects of water diversions.

2.2 Principles for Maintaining Instream Flows

Protection of fishery resources is in the public interest. The primary objective of this policy is to ensure that the administration of water rights occurs in a manner that maintains instream flows needed for the protection of fishery resources. This policy establishes the following five principles that will be applied in the administration of water rights:

1. Water diversions shall be seasonally limited to periods in which instream flows are naturally high to prevent adverse effects to fish and fish habitat;

2. Water shall be diverted only when stream flows are higher than the minimum instream flows needed for fish spawning and passage;

3. The maximum rate at which water is diverted in a watershed shall not adversely affect the natural flow variability needed for maintaining adequate channel structure and habitat for fish;

4. Construction or permitting of new onstream dams shall be restricted. When allowed, onstream dams shall be constructed and permitted in a manner that does not adversely affect fish and their habitat; and

5. The cumulative effects of water diversions on instream flows needed for the protection of fish and their habitat shall be considered and minimized.

2.3 Regionally Protective Instream Flow Criteria

Regionally protective instream flow criteria and other provisions of this policy ensure that water right administration is consistent with the principles established in Section 2.2. The regionally protective criteria[1] are policy area-wide requirements for the season of diversion, minimum bypass flow, and maximum cumulative diversion. Variances from these regionally protective criteria may be obtained if site specific study demonstrates that less restrictive criteria is protective of fishery resources for a specific diversion and its watershed.

2.3.1 Season of Diversion

The season of diversion is the calendar period during which water may be diverted. New diversions cannot be permitted during the late spring, summer, and early fall because instream flows during this period generally limit anadromous salmonid rearing habitat quantity and quality in the policy area. Although the DFG-NMFS Draft Guidelines recommended a season of diversion from December 15 through March 31, an earlier diversion season start date is still protective of fishery resources when minimum instream flows and natural flow variability are maintained. This policy limits new water diversions in the policy area to a diversion season beginning on October 1 and ending on March 31 of the succeeding year.

2.3.2 Minimum Bypass Flow

Adequate minimum stream flows are needed to provide habitat for fish spawning and upstream passage. The minimum bypass flow is the minimum instantaneous flow rate of water that is adequate for fish spawning and passage, as measured at a particular point in the stream. In applying the minimum bypass flow to a diversion, it is the minimum instantaneous flow rate of water that must be moving past the point of diversion (POD) before water may be diverted. The stream flow may naturally fall

[1] For the scientific basis for the regionally protective criteria, see R2 Resources Consultants and Stetson Engineers, 2007a.

below the minimum bypass flow. A minimum bypass flow requirement prevents water diversions during periods when stream flows are at or below the flows needed for spawning and passage.

The regional criteria for the minimum bypass flow in watersheds less than or equal to 290 square miles in area is a function of the mean annual unimpaired stream flow and the **watershed drainage area**[2], either at the point of diversion, or at the upper limit of anadromy. This relationship accounts for the higher instream flows that are needed for spawning and passage in smaller watersheds. The drainage area at the stream's upper limit of anadromy can be used to calculate the minimum bypass flow that is needed for points on the stream above the limit of anadromy and still be protective of fishery resources. For watersheds greater than 290 square miles, the flows needed for spawning and passage is equal to sixty percent of the mean annual unimpaired flow.

The minimum bypass flow criteria are defined by the following equations:

1. The minimum bypass flow for watershed drainage areas less than or equal to 290 square miles is:

$$Q_{MBF} = 8.7\ Q_m\ (DA)^{-0.47}$$

where:

Q_{MBF} = minimum bypass flow in cubic feet per second;
Q_m = mean annual unimpaired flow in cubic feet per second; and
DA = the watershed drainage area in square miles. When using this equation at the point of diversion, if the upper limit of anadromy is downstream of the point of diversion, the drainage area at the upper limit of anadromy may be used.

2. The minimum bypass flow for watershed drainage areas greater than 290 square miles is:

$$Q_{MBF} = 0.6\ Q_m$$

where:

Q_{MBF} = minimum bypass flow in cubic feet per second; and
Q_m = mean annual unimpaired flow in cubic feet per second.

Methods for locating the upper limit of anadromy are provided in section 4.1.4. Guidelines for estimating the mean annual unimpaired flow, watershed drainage areas, and the calculation of the minimum bypass flow are provided in Appendix 1.

2.3.3 Maximum Cumulative Diversion

Adequate magnitude and variability in peak stream flows are needed to meet the habitat needs of anadromous salmonids, including maintaining stream channel

[2] Terms indicated in bold font are defined in the Glossary of Terms in Appendix 2.

geometry, vegetative structure and variability, gravel and wood movement, and other channel features. In this policy these peak stream flows are called **channel maintenance flows**.

Channel maintenance is a long-term process in which the basic habitat structure of a stream is formed and maintained by multiple, variable high flow events recurring on a periodic basis.

The bankfull flow is the flow at which channel maintenance is the most effective. The 1.5 year return peak flow is a hydrologic metric that can be used to estimate bankfull flow and effective channel maintenance flows. The 1.5-year instantaneous peak flow is the annual maximum instantaneous peak stream flow that is equaled or exceeded, on average over the long term, once every one and a half years. The frequency at which this peak flow is expected to occur is referred to as the **recurrence interval**. Limiting the maximum cumulative diversion to a small fraction of the 1.5-year instantaneous peak flow will result in a relatively small change to channel geometry.

The maximum cumulative diversion is the largest value that the sum of the rates of diversion of all diversions upstream of a specific location in the watershed can be in order to maintain adequate peak stream flows. The maximum cumulative diversion criterion is equal to five percent of the 1.5-year instantaneous peak flow.

Guidelines for calculating the maximum cumulative diversion criteria and for determining whether a limit on the rate of diversion is needed are provided in Appendix 1.

2.3.4 Assessment of the Cumulative Effects of Water Diversions on Instream Flows

The cumulative effects of water diversions on instream flows needed for the protection of fishery resources shall be considered and minimized. This policy requires the evaluation of whether a proposed water diversion project, in combination with existing diversions in a watershed, may affect instream flows needed for fishery resources protection. Diversion of water can adversely affect instream flow conditions downstream from the point of diversion. This policy requires the evaluation of instream flows at downstream points in the watershed that could show impacts to fishery resources based on the presence of existing diversions and existing instream flow conditions.

The State Water Board must find that unappropriated water is available to supply an applicant prior to issuing a water right permit. This policy requires a water right applicant to conduct a water availability analysis that includes (1) a Water Supply Report that quantifies the amount of water remaining instream after senior rights are accounted for, and (2) an Instream Flow Analysis that evaluates the effects of the proposed project, in combination with existing diversions, on instream flows needed

for fishery resources protection. Provisions describing these evaluations are contained in Section 4.0, and guidelines for completing the analyses are provided in Appendix 1.

2.3.5 Onstream Dams

Onstream dams can directly impact salmonids if they prevent fish passage and block access to upstream spawning and rearing habitats, intercept and retain spring and summer flows without providing bypass flows, intercept and retain sediments/gravels that would otherwise replenish downstream spawning gravels, intercept and retain large wood that would otherwise provide downstream habitat structure, and/or create slow-moving, lake-like habitats that favor non-native species that may either prey on anadromous salmonids or compete for food and shelter.

Section 4.4 of this policy contains onstream dam requirements that avoid (1) causing individual or additive impacts to flows, (2) interrupting fish migratory patterns, (3) interrupting downstream movement of gravel, woody debris, or aquatic benthic macroinvertebrates, (4) causing loss of riparian habitat or wetlands, or (5) creating habitat for non-native species.

3.0 POLICY APPLICABILITY

3.1 Fishery Resources Covered by the Policy

This policy establishes principles and guidelines for maintaining instream flows for the protection of native fishery resources in Northern California coastal streams. The criteria in this policy were developed based on the requirements of anadromous salmonids, which are among the largest native fish in the policy area. Instream flows that satisfy the needs of anadromous salmonids will also be protective of smaller native fish populations and fish habitat in general.

3.2 Geographic Area Covered by the Policy

This policy applies to water diversions from all streams and tributaries discharging to the Pacific Ocean from the mouth of the Mattole River south to San Francisco, and all streams and tributaries discharging to northern San Pablo Bay. The policy area includes approximately 5,900 stream miles and encompasses 3.1 million watershed acres (4,900 square miles) in Marin, Sonoma, portions of Napa, Mendocino, and Humboldt counties, as indicated on Figure 1. Information from the USGS National Hydrography Database was used to create a list of named streams that are within the policy area. This list is provided in Appendix 3. The policy applies to water diversions from these streams and to water diversions from unnamed and locally named streams that contribute flow to these streams.

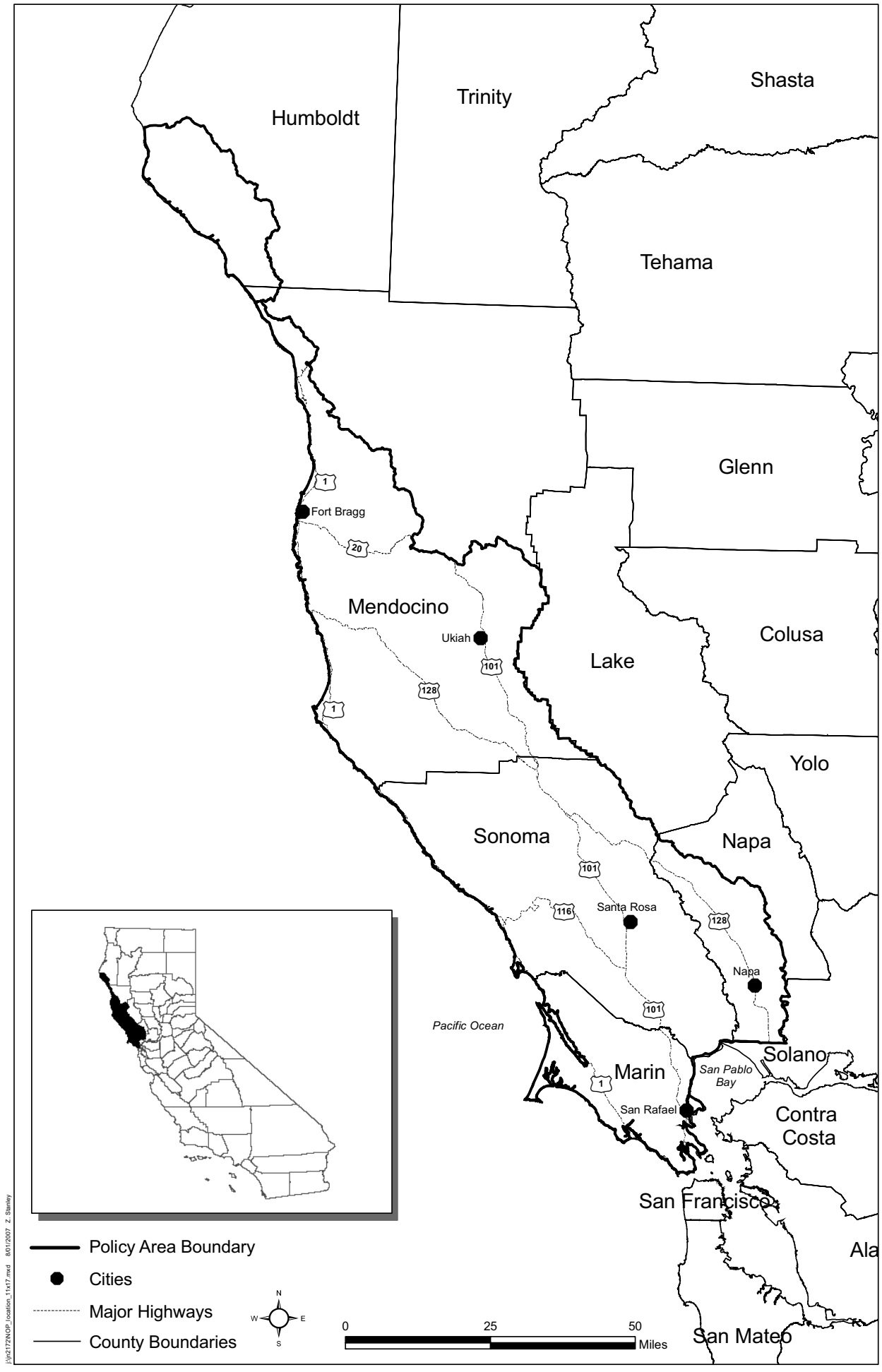


FIGURE 1. GEOGRAPHIC AREA AFFECTED BY THE POLICY

The regionally protective instream flow criteria for season of diversion, minimum bypass flow, maximum cumulative diversion, and the instream flow analysis requirements do not apply to water diversions from (i) the Russian River downstream of Lake Mendocino, and (ii) Dry Creek downstream of Lake Sonoma. However, the policy principles in Section 2.2, the regionally protective criteria pertaining to onstream dams, and all other aspects of this policy apply to these stream reaches. The State Water Board has established minimum instream flows for these streams in its Decisions 1030 and 1610. The minimum flow requirements were selected, in part, to "preserve the fishery and recreation in the [Russian River] and in Lake Mendocino to the greatest extent possible while serving the needs of the agricultural, municipal, domestic, and industrial uses which are dependent on the water." (State Water Board Decision 1610, §13.2). These minimum flows are implemented through terms in the permits held by Sonoma County Water Agency. The State Water Board will consider whether to revise the flows required by those decisions for the protection of fish if there is sufficient information to indicate that such a revision may be appropriate. However, diversions from streams contributing flows to these two stream reaches shall comply with all aspects of this policy.

3.3 Water Right Actions Covered by the Policy

This policy applies to applications to appropriate water, small domestic use and livestock stockpond registrations, and water right petitions. Enforcement requirements include a framework for compliance assurance, prioritization of enforcement cases, and timely and appropriate enforcement actions.

4.0 WATER RIGHT APPLICATIONS

Except as provided for pending applications, below, this section applies to applications to appropriate water from surface water streams or from subterranean streams flowing through known and definite channels.

Applications filed with the State Water Board prior to January 1, 2008 shall be processed as follows:

1. If the applicant has submitted a water available analysis and an analysis of cumulative flow-related impacts prior to January 1, 2008, the State Water Board will consider processing the water availability aspects of the application using the DFG-NMFS Draft Guidelines if the State Water Board determines that the project is consistent with the recommendations contained in the NMFS-DFG Draft Guidelines pertaining to diversion season, onstream dams, minimum bypass flows, protection of the natural hydrograph and avoidance of cumulative impacts. All other aspects of the policy will apply. Examples of projects that are consistent with the recommendations contained in the DFG-NMFS Draft Guidelines are: (1) direct diversions or diversions to offstream storage that have a cumulative flow impairment index (CFII) of less than 5% and (2) onstream dams located on Class III streams that will not dewater a Class II stream and will not result in a cumulative

reduction in instantaneous flow of 10% or more at a location where fish are present.

2. If the applicant has submitted a water available analysis and an analysis of cumulative flow-related impacts prior to January 1, 2008, and the State Water Board determines that the project is not consistent with any of recommendations contained the NMFS-DFG Guidelines, then all of the requirements of this policy shall apply.

3. If a water availability analysis and an analysis of cumulative flow-related impacts have not been submitted prior to January 1, 2008, all of the requirements of this policy shall apply.

4. If, prior to the adoption of the policy, the State Water Board has circulated for public review a negative declaration, mitigated negative declaration, or environmental impact report, pursuant to the California Environmental Quality Act, the State Water Board may continue processing the application without applying the regionally protective criteria contained in Section 2.3.

4.1 Water Availability Analysis

Before the State Water Board can issue a water right permit, it must find that there is "unappropriated water available to supply the applicant." (Wat. Code, § 1375, subd. (d).) "In determining the amount of water available for appropriation for other beneficial uses, the [State Water Board] shall take into account, whenever it is in the public interest, the amounts of water required for recreation and the preservation and enhancement of fish and wildlife resources." (*Id*., § 1243.)

4.1.1 Submittal Requirements

A water availability analysis consists of (1) a Water Supply Report, which quantifies the amount of unappropriated water remaining instream after senior rights are accounted for; and (2) an Instream Flow Analysis, which evaluates the effects of the proposed project, in combination with existing diverters, on instream flows needed for protection of fishery resources.

The following technical reports shall be submitted to document the water availability analysis:

1. Water Supply Report
2. Upper Limit of Anadromy determination, where applicable
3. Instream Flow Analysis
4. Report on site specific studies to obtain variances from the regional criteria, where applicable

The technical reports shall document all underlying analyses.

4.1.1.1 Data Submissions

1. If public domain spreadsheets are used for the analysis, the report shall describe the assumptions used, and include a functional electronic version of the spreadsheet(s) that was used to perform the analysis, including the input data, output data, equations, and assumptions used to complete the analysis.

2. If public domain computer programs are used for the analysis, the input files, calibration results, validation results, and output files shall be provided in electronic format with supporting documentation that describes the model's assumptions, underlying modeling principles, and operation.

3. With the following exception, no proprietary spreadsheets or proprietary computer models will be accepted. Output from proprietary programs used solely to visually summarize or demonstrate the output data or results from public domain spreadsheets or public domain computer programs that meet the above two requirements may be accepted by the State Water Board if the underlying data and assumptions are also submitted.

4.1.2 Water Supply Report

The applicant must demonstrate that there is unappropriated water in the watershed sufficient to supply the proposed project by submitting a Water Supply Report that compares the potential available supply to the demand by senior water right holders, including demand by those claiming riparian and pre-1914 appropriative rights. This analysis is necessary to determine whether a sufficient amount of water remains instream to supply senior rights. The analysis shall be performed along the water flow path from the proposed point of diversion to the Pacific Ocean or to a **regulated mainstem river**. The applicant must consider the water supply impacts of the proposed project only at the points of diversion of senior water rights along this identified flow path; however, the demands of all senior water right holders within the watershed will be needed for the analysis. Only senior water rights with a season of diversion within or overlapping the diversion season of the application need to be considered.

The Water Supply Report shall include the following:

1. A map showing the locations of the points of diversion (PODs) of senior water right holders and water right claimants in the watershed. The map must conform to the map requirements contained in Section 4.1.3;

2. A list of the senior water rights (permit, license, certificate, or registration), their seasons of diversion, and **face values** of their permits or licenses. To the extent information is available in the State Water Board's records, or other sources of information, the demand and season of diversion of riparian

and pre-1914 appropriative water right holders and claimants shall also be included;

3. An estimate of the percentage of unappropriated water supply available at each senior POD on the water flow path. This percentage may be calculated from the unimpaired flow volume of the stream and the seasonal demand volumes of the senior water right holders. The seasonal demand volume is the sum of the demand volumes of the senior water right holders with the right to divert water during the proposed project's diversion season that are within the watershed upstream of identified senior PODs along the water flow path. The demand volume shall be determined using the face value or maximum annual use limitation of each water right; however there may be diversions for which proration of face values or maximum annual use limitations may be appropriate. (A. Miller, SWRCB Internal Memo, December 2007) For guidance on estimating the demand volumes of the senior water right holders, please refer to section A.2.1.4. All results shall be presented in a table listing the calculated percentage for each identified senior POD;

4. A comparison of the remaining unappropriated water supply versus the proposed project's demand at each identified senior POD. This analysis is needed for the purposes of (1) identifying locations where the proposed project is likely to have minimal impacts to the rate of flow, and (2) to assist with selection of points of interest for the instream flow analysis. The comparison shall consist of dividing the proposed project's water demand volume by the remaining unappropriated water supply. These values shall also be presented in a table.

5. A flow frequency analysis of the seasonal unimpaired flow volume. A set of flow frequency analyses shall be provided at the POD(s) of the proposed project, the senior POD at which the percentage calculated in step 3 is the lowest, and any other senior PODs at which the ratio is less than 50%, if any. The frequency of occurrence of the average seasonal unimpaired flow volumes for each year of record should be determined and plotted graphically.

The details of the analysis shall be presented in report format with all necessary tables and graphs.

4.1.3 Map Requirements

The applicant shall provide maps with the Water Supply Report that the State Water Board may use to assist with the selection of POIs. Either digital or hard-copy maps may be submitted. The maps shall be in full color, no smaller than 11"X14", and shall be large enough to present the following information in sufficient detail.

1. The maps shall display topographic contours equivalent to those on USGS 7.5 minute quads.

2. The maps shall be large enough to trace the watershed from the proposed project down to one of the following: (1) the nearest regulated mainstem river, or (2) the Pacific Ocean.

3. All of the PODs associated with the proposed project, including reservoir footprints and place of use footprints. All shall be clearly marked.

4. The identified flow path of watercourses affected by the proposed POD(s) shall be clearly marked. If an affected watercourse is not delineated on a USGS quad map, the applicant shall draw it in manually.

5. The PODs of senior water rights identified along the flow path that were used in the Water Supply Report shall be clearly marked.

6. The applicant shall note on the maps the locations of PODs within the watershed between the proposed POD(s) and the river/ocean used above. Include all pending applications, permits, licenses, small domestic use registrations, livestock stockpond use registrations, riparian users, and pre-1914 rights.

4.1.4 Determination of the Upper Limit of Anadromy

If there is sufficient unappropriated water to supply the proposed project, the applicant must evaluate the effects of senior diversions and the proposed project on instream flows needed for fishery resources to determine if there is unappropriated water available for diversion. First, the applicant must ascertain the upper limit of anadromy because the watershed drainage area at the upper limit of anadromy will be used to calculate the minimum bypass flow. Additionally, the upper limit of anadromy location will aid the State Water Board in selecting points of interest to evaluate the proposed project's effects on fishery resources.

The upper limit of anadromy is defined as the upstream end of the range of anadromous fish that currently are, or have been historically, present year-round or seasonally, whichever extends the farthest upstream. The upper limit of anadromy may be located on a perennial, intermittent, or ephemeral stream.

In some cases, the historic upper limit of anadromy is not known with certainty. In those cases, if the stream reach from which the applicant proposes to divert water appears to support fish under unimpaired conditions, the State Water Board will presume that the POD is located within the range of anadromous fish. This presumption might result in higher calculated minimum bypass flows than would be needed if the POD is actually upstream of the upper limit of anadromy. The applicant may overcome this presumption by demonstrating that the upper limit of

anadromy is at a different location on the stream reach between the POD and the basin outlet, based on one of the following:

1. A study, previously accepted by the State Water Board, NMFS, or DFG, that identifies the location of the upper limit of anadromy on the stream reach between the POD and the basin outlet. Previous studies or surveys that catalog only the presence or absence of anadromous fish might not accurately define the upper limit of anadromy.

2. Information demonstrating that the gradient of a segment of the stream reach between the POD and the basin outlet exceeds a continuous longitudinal slope over a distance of large enough magnitude that anadromous fish can not move upstream beyond the lowest point of the gradient. The gradient shall be a continuous longitudinal slope of 12%, or greater, over a distance of 330 feet along the stream (R2 Resource Consultants, 2007b).

3. Site-specific studies conducted by a qualified fisheries biologist. The applicant may refer to stream classification determinations that were made in accordance with the methods in section 4.2 for preliminary refinement of the geographic extent of the site-specific study. Fisheries biologist qualifications are described in section 4.1.5. Prior to conducting the site-specific study, the name(s) and qualifications of the individual(s) selected to perform the studies shall be submitted to the State Water Board for review and approval. The site-specific studies shall consist of any of the following:

    a. Identification of an impassable natural waterfall. This policy assumes all natural waterfalls are passable unless the applicant provides information satisfactory to the State Water Board that the waterfall is impassable. This information shall include, at a minimum, an evaluation of waterfall drop height, leaping angle, and pool depth in comparison to the documented ability for the target anadromous fish species to successfully ascend the barrier.

    b. Identification of an impassable human-caused barrier. The applicant may choose to demonstrate that the upper limit of anadromy is located below a human-caused barrier such as a dam, culvert, or bridge. This policy assumes that all human-caused barriers are passable or can be made passable unless the applicant provides information satisfactory to the State Water Board that a man-made barrier is impassable and will never be made passable.

    c. Habitat-based stream survey that delineates the upper limit of anadromy based on quantifiable stream conditions.

The applicant shall submit a report documenting the upper limit of anadromy determination. The State Water Board shall review the submitted information. If the State Water Board finds the information does not support the applicant's request to use a different location for the upper limit of anadromy, the applicant shall proceed with the assumption that the POD is within the range of anadromy.

4.1.5 Fisheries Biologist Qualifications

A qualified fisheries biologist is a person with a bachelor's or higher degree in fisheries biology, wildlife biology, aquatic biology, wetland ecology or equivalent other course of study; and five or more years of professional experience in conducting fish habitat assessments. Documentation of qualifications shall be submitted to the State Water Board for approval. Examples of documentation include co-authorship of reports on fish habitat assessments, documentation of presence during field data collection work, or providing a letter from an employer or research facility. Persons proposing to conduct either (1) site specific studies to modify regional policy criteria, or (2) biological assessments for the watershed approach shall provide documentation of direct, substantial participation in at least two previous fish habitat instream flow studies.

4.1.6 Selection of Points of Interest (POIs)

After review and approval of the Water Supply Report and the upper limit of anadromy determination, the State Water Board shall select POIs for an analysis of the proposed project's effects on instream flows. A POI is a location on a stream channel where the applicant shall analyze the effects of the proposed project, in combination with other water diversions, on fishery resources. The POIs identified for analysis will be selected by the State Water Board in consultation with DFG. The POIs will be selected at the following locations:

1. The proposed POD;

2. The upper limit of anadromy, if it is located downstream of the POD; and

3. Locations at which the proposed project may adversely affect instream flows needed for protection of fishery resources. These may include, but are not limited to, locations where fish are present, locations directly upstream or downstream of the confluence of tributaries to the basin mainstem, locations downstream of onstream storage reservoirs, or locations downstream of direct diversion projects or diversions to offstream storage.

At a minimum, two POIs will be selected for the analysis.

Locations at which the proposed project could not adversely affect instream flows needed for protection of fishery resources may be determined using the ratio of the proposed POD's water demand to the remaining instream flow available after

accounting for senior demands, which was calculated in step 4 of section 4.1.2. A POI location at which the proposed project's demand is less than one percent of the remaining unappropriated supply will be considered a location at which the proposed project could not adversely affect instream flows. Additional POIs may be required if there is substantial evidence showing that the proposed project may have an adverse effect on instream flows at another location.

4.1.7 Instream Flow Analysis

Even if the applicant can demonstrate that there is unappropriated water to supply the proposed project, there could still be impacts to instream beneficial uses caused by the proposed project in combination with senior diversions. An Instream Flow Analysis is required to evaluate whether the proposed project, in combination with senior diversions, impacts the instream flows needed for the protection of fishery resources. This involves an evaluation of whether reductions in instream flows caused by the proposed project, in combination with reductions or potential reductions by senior diversions, still meets the policy's regional criteria or site specific criteria for the minimum bypass flow and maximum cumulative diversion. In cases where the Instream Flow Analysis demonstrates that the proposed project, in combination with senior diversions, significantly affects instream flows, water may not be available for appropriation.

The Instream Flow Analysis shall use hydrologic techniques acceptable to the State Water Board to assess the effects of the proposed project, in combination with senior diversions, on instream flows needed for passage, spawning, and channel maintenance at each POI.

In most instances, the Instream Flow Analysis will consist of a daily flow study performed at all POIs; however, proposed projects that are in relatively unimpaired watersheds may be able to complete a streamlined instream flow analysis for the proposed project or a modified project. Guidelines for completing the Instream Flow Analysis are provided in Sections A.5.0 through A.7.0 of Appendix 1. These guidelines are organized to allow the diverter to first evaluate whether the streamlined approach is feasible for the proposed project, moving on to the daily flow studies if the streamlined approach is found to not be feasible.

All applicants shall submit an Instream Flow Analysis report that documents all methods used and assesses the impacts of the proposed project, in combination with senior diversions, on instream flows necessary for the protection of fishery resources.

A. Reports documenting the streamlined instream flow analysis shall include the detailed results of the analysis steps provided in Sections A.5.2 through A.5.10 of Appendix 1.

B. Reports documenting the daily flow studies shall include:

1. The details of the calculation of the season of diversion, minimum bypass flow, and maximum cumulative diversion criteria;

2. Reports on site specific studies for obtaining variances from the regional criteria that contain information addressing the site specific study requirements provided in Section 4.1.8, if site specific studies were performed;

3. The details of an analysis of the estimated effects of the proposed projects and senior diversions on instream flows needed for spawning and passage at each point of interest, including an evaluation of the number of days that instream flows meet or exceed the minimum bypass flow requirement at each POI for three flow conditions: unimpaired; impaired without the proposed project; and impaired with the proposed project.

4. The details of an analysis of the estimated effects of the proposed project and senior diversions on channel maintenance flows, which consists of calculating the 1.5-year instantaneous peak flow for three flow conditions: unimpaired, impaired without the proposed project, and impaired with the proposed project, then either comparing these values against the maximum cumulative diversion criteria or comparing impaired conditions with and without the project.

If the analysis shows that the proposed project, in combination with senior diversions, affects the instream flow needs of fishery resources using the regional criteria or site specific criteria, then there may not be enough water available for the project as proposed.

If the analysis indicates the proposed project, in combination with senior diversions, complies with the regional criteria or site specific criteria, then water is available for the proposed project.

4.1.8 Site-Specific Study to Obtain Variances from the Regional Criteria for Diversion Season, Minimum Bypass Flow and/or Maximum Cumulative Diversion

The applicant may conduct site-specific studies to support a request for the State Water Board to consider granting a variance from the regional criteria that is protective of instream flows. The site-specific studies shall be conducted by a qualified fisheries biologist. Fisheries biologist qualifications are described in section 4.1.5. Prior to conducting the site-specific studies, the name(s) and qualifications of the individual(s) selected to perform the studies shall be provided to the State Water Board for review and approval. The results of the site-specific study shall be submitted for review by the State Water Board. If the State Water

Board approves the proposed variances to the regional criteria, the site-specific criteria may be used to evaluate whether there is enough water available for the proposed project while providing protective instream flows for fish and their habitat.

The site-specific study shall consist of the following elements:

1. For proposed variances from the regional criteria, the geographic scope of the site-specific study shall include all POIs.

2. A description, supported by scientific evidence, of the historical and current presence of anadromous salmonids by fish species and life history stages from the POD to the ocean or to the confluence with a flow-regulated watercourse.

3. A determination of the upper limit of anadromy. Procedures for determining the upper limit of anadromy are described in section 4.1.4.

4. Description of the proposed variance(s) from the regional criteria for diversion season, minimum bypass flow, and/or maximum cumulative diversion.

5. A scientifically based analysis using site specific data and reproducible methods demonstrating that the proposed variance(s) will be protective of instream flows needed for anadromous salmonid habitat. The analysis shall consist of hydraulic analysis, geomorphologic analysis, and aquatic habitat analysis; and shall evaluate the stream flows needed at the POIs for ensuring adequate flows exist for protection of the following anadromous salmonid life history stages and habitat needs:

    a. upstream passage if a variance to the minimum bypass flow criteria is proposed;
    b. spawning and incubation habitat if a variance to the minimum bypass flow criteria is proposed;
    c. for POIs on Class I or II streams, maintenance of channel forming functions, riparian habitat, and gravel and wood transport if a variance to the maximum cumulative diversion criteria is proposed;
    d. for POIs on Class III streams, maintenance of gravel and wood transport if a variance to the maximum cumulative diversion criteria is proposed; and/or
    e. the effects of water temperature on summer rearing habitat and upstream (adult) and downstream (juvenile) migration if a variance to the season of diversion criteria is proposed.

6. Daily flow analyses shall be performed with the site-specific criteria to evaluate whether the project described in the proposed project, in combination with senior water rights, may affect instream flows needed for

the protection of fishery resources. The guidance provided in Section A.5.11 of Appendix 1 may be used for a daily flow analysis, or the applicant may propose a site-specific method of analysis for State Water Board review and approval.

The applicant shall submit technical reports documenting the site-specific studies and daily flow analysis to the State Water Board for review and approval.

4.2 Stream Classification System

The presence or absence of fish or non-fish aquatic species in a stream affects the extent of the fishery protection needed at water diversions. Streams that contain fish require a higher level of protection than streams that do not contain fish. In order to effectively apply protective measures, this policy uses the following stream classification system:

Class I: Fish are always or seasonally present, either currently or historically; or habitat to sustain fish exists.

Class II: Seasonal or year-round habitat exists for **aquatic non-fish vertebrates** and/or **aquatic benthic macroinvertebrates**.

Class III: An intermittent or **ephemeral** watercourse exists that has a defined channel with a defined bank (slope break) that shows evidence of periodic scour and sediment transport.

4.2.1 Determination of Stream Class by the State Water Board

The State Water Board shall make a determination of stream class at a POD using indicators of habitat, not simply the presence or absence of species. Examples of indicators of habitat include, but are not limited to, **coarse gravel**, channel width, depth, and slope, **instream cover**, **canopy**, surface water, **aquatic plants**, or **hydric soils**.

Class I streams, which may include intermittent or ephemeral watercourses, may be indicated by the presence or seasonal presence of fish, either currently or historically, or by the presence of habitat to sustain fish. Streams that are designated by NMFS as critical habitat for steelhead, chinook, or coho will be assumed to be Class I streams. However designated critical habitat does not encompass all Class I streams, and should not be relied upon as a basis for excluding streams from a Class I designation.

Class II streams, which may include intermittent or ephemeral streams, may be indicated by the presence of aquatic non-fish vertebrates or aquatic benthic macroinvertebrates or combinations of other indicators, such as free water, aquatic

plants, or hydric soils. However, in Class II streams fish are never present, either currently or historically.

Class III streams may be indicated by ephemeral watercourses having defined channels with defined banks (slope break) that show evidence that sediment transport process occur, for instance, evidence of periodic scour and deposition of sediment are present. Class III streams also meet both of the following conditions: (1) fish are never present, either currently or historically, nor does habitat to sustain fish exist, and (2) the stream does not provide habitat for aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates.

Not all indicators need to be present to suggest aquatic habitat for fish, aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates. Neither will the presence of isolated indicators always signify that waters contain aquatic habitat for fish, aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates.

4.2.2 Determination of Stream Class by Stream Survey

If the applicant disagrees with the State Water Board's initial determination of stream class, the applicant shall conduct a stream survey to support a different determination. The stream survey shall be performed by a qualified fisheries biologist. Section 4.1.5 provides the minimum education, knowledge, and experience requirements of a qualified fisheries biologist. Prior to conducting the stream survey, the applicant shall inform the State Water Board of the intent to conduct the stream survey, and shall provide the name(s) and qualifications of the individual(s) selected to perform the stream survey to the State Water Board for review and approval.

All data, studies, analysis, and conclusions obtained from the stream survey shall be provided to the State Water Board for review and approval.

Stream surveys shall be conducted as follows:

1. The stream survey shall extend in the channel a minimum distance of 25 **bankfull widths** upstream and downstream of the POD. The total stream survey length shall be a minimum of 50 bankfull widths.

2. Quarterly surveys using appropriate sampling and/or collection equipment shall be conducted to determine the presence of fish, aquatic non-fish vertebrates, and/or aquatic benthic macroinvertebrates. These surveys shall be conducted in the spring, summer, fall, and winter, for at least two years; unless it is demonstrated that the presence of fish, aquatic non-fish vertebrates, and/or aquatic benthic macroinvertebrates can be determined in a shorter time period.

3. A survey of instream habitat conditions shall be made at low flows during the diversion season. Examples of instream habitat condition metrics that could be measured include:

    a. Mean **pool residual depth**
    b. Mean **riffle crest** depth
    c. **Mean riffle width**
    d. **Mean channel bankfull width**
    e. **Mean channel longitudinal gradient**
    f. Water temperature
    g. Amount and type of cover
    h. Substrate type

4. A visual survey shall be made after a storm runoff event for evidence of sediment transport. Such evidence may include, but is not limited to, the presence of gravel bars and deposits composed of gravel and sand. Annotated photographs must be provided for documentary evidence.

Results of the stream survey shall be summarized and analyzed. A stream class determination shall be made using the following guidance:

A. A stream is a Class I stream if the results of the survey indicate any of the following:

    1. Fish were observed during any of the quarterly surveys; or

    2. Instream habitat conditions observed during the requested diversion season provide suitable habitat for fish based on **habitat suitability criteria** provided by the qualified fisheries biologist.

B. A stream is a Class II stream if the results of the survey indicate all of the following:

    1. The stream reach is outside of the known historical distribution limits for fish species. The applicant shall provide evidence supporting this finding.

    2. Fish were not observed during any of the surveys.

    3. Instream habitat conditions for fish were not observed during the requested diversion season based on habitat suitability criteria provided by the qualified fisheries biologist.

    4. Non-fish aquatic vertebrate or aquatic benthic macroinvertebrate species were observed during one or more of the surveys.

C. A stream is a Class III stream if the quarterly surveys showed evidence of sediment transport; and fish, non-fish aquatic vertebrate, and aquatic benthic macroinvertebrate species were not observed during any of the quarterly surveys.

4.3 Fish Screens at Diversions in Class I Streams

With the following exceptions, fish screens shall be installed at diversions on Class I streams that include direct diversions, diversions to offstream storage, and onstream dams with fish passage facilities. Fish screens are not required on offset wells or Ranney collectors.

NMFS screening criteria shall be used to design the fish screening facilities. The NMFS screening criteria can be found in "Fish Screening Criteria for Anadromous Salmonids", which may be obtained from the NMFS website at *http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf*. Hard copies of the document are available from the NMFS Southwest Regional Office.

If the applicant or petitioner disagrees with the requirement to install fish screens, the applicant or petitioner shall provide a written certification from DFG during the environmental review of the application or petition that contains the following information:

1. A statement that the applicant contacted an appropriate representative of DFG for the evaluation of whether fish screening is needed;

2. A statement that the applicant provided adequate information to DFG so that DFG was able to make a determination of whether fish screening is needed; and

3. A written determination by DFG that fish screens are not needed at the diversion facility, and DFG's supporting reasons.

4.4 Permitting Requirements for Onstream Dams

An onstream dam is a structure in a stream channel that impedes or blocks the passage of water, sediment, woody debris, or fish. The permitting requirements for onstream dams are dependent on the stream classification at the point of diversion.

4.4.1 Onstream Dams on Class I streams

The State Water Board will not consider approving a water right permit for an onstream dam on a Class I stream unless all of the following requirements are met:

1. The applicant provides documentation acceptable to the State Water Board that the onstream dam was built prior to July 19, 2006. This is the date the

public notice of preparation of the policy was issued. One year after the adoption of this policy, water right applications for onstream dams built prior to July 19, 2006 will no longer be accepted.

2. Fish passage facilities are constructed in accordance with requirements provided by DFG in a written certification. DFG's written certification shall contain the following information:

   a. Verification that the applicant contacted an appropriate representative of DFG for the evaluation of whether fish passage facilities are needed at the dam;

   b. A copy of DFG's determination of whether fish passage facilities are needed at the dam. If DFG determines that fish passage facilities are not needed, this determination and DFG's supporting reasons shall be provided;

   c. A copy of any conditions required by DFG regarding fish passage facilities at the dam; and,

   d. An agreement by the applicant to comply with all conditions, including, but not limited to, conditions upon the construction and operation of the fish passage facilities, required by DFG.

   The applicant shall provide a copy of the DFG certification to the State Water Board during the environmental review of the application or petition. The State Water Board shall place terms in permits that require the applicant to comply with all of DFG's conditions regarding fish passage facilities at the dam.

3. Fish screens are installed in accordance with the requirements contained in section 4.3;

4. A passive bypass system, or automated computer-controlled bypass system is constructed that conforms with the requirements contained in section 7.0; and

5. Mitigation plans for non-native species eradication, gravel and wood augmentation, and/or riparian habitat replacement are developed and implemented, where needed. Guidance for developing mitigation plans are provided in section 4.4.4.

4.4.2 Onstream Dams on Class II Streams

With the exception below, the State Water Board will not consider approving a water right permit for a proposed or existing onstream dam on a Class II stream unless all of the following requirements are met:

1. The applicant provides documentation acceptable to the State Water Board that the onstream dam was built prior to July 19, 2006. This is the date the public notice of preparation of the policy was issued. One year after the adoption of this policy, water right applications for onstream dams built prior to July 19, 2006 will no longer be accepted.

2. A passive bypass system, or automated computer-controlled bypass system, is constructed that conforms with the requirements contained in section 7.0; and

3. Mitigation plans for non-native species eradication, gravel and wood augmentation, and/or riparian habitat replacement are developed and implemented, where needed. Guidance for developing mitigation plans is provided in section 4.4.4.

The State Water Board may consider approving a water right permit for a proposed onstream dam on a Class II stream if all of the following conditions are met:

1. The proposed dam is located above an existing permitted or licensed reservoir that provides municipal water supply or is under the jurisdiction of the Federal Energy Regulatory Commission;

2. The existing permitted or licensed reservoir was constructed prior to the adoption of this policy and does not have fish passage facilities and it is not feasible to construct fish passage facilities;

3. The applicant prepares and submits a biological assessment demonstrating that the proposed dam will not adversely affect fish between it and the existing permitted or licensed reservoir; and

4. The applicant develops and implements mitigation plans for non-native species eradication, gravel and wood augmentation, and/or riparian habitat replacement, where needed. Guidance for developing mitigation plans is provided in section 4.4.4.

4.4.3 Onstream Dams on Class III Streams

The State Water Board may consider approving a water right permit for an onstream dam on a Class III stream if all of the following requirements are met:

1. A passive bypass system, or automated computer-controlled bypass system, is constructed that conforms with the requirements contained in section 7.0; and

2. Mitigation plans for non-native species eradication, and gravel and wood augmentation, are developed and implemented, where needed. Guidance for developing mitigation plans are provided in section 4.4.4.

4.4.4 Guidance for Developing Mitigation Plans

Construction and operation of onstream dams have the potential to adversely affect instream flows and fishery resources by interrupting fish migratory patterns; interrupting downstream movement of gravel, woody debris, or benthic macroinvertebrates; causing loss of riparian habitat or wetlands; or creating invasive species habitat. For proposed projects that include onstream dams, the applicant may be required to prepare mitigation plans for the eradication of non-native species, gravel and wood augmentation, and/or riparian habitat replacement. The mitigation plans shall be developed by qualified individual(s). The name(s) and qualifications of the individual(s) selected to develop the mitigation plans shall be submitted to the State Water Board for review and approval prior to the preparation of the mitigation plans. The proposed mitigation plans shall be submitted to the State Water Board for review and approval during the environmental review of the water right application.

The water right permit shall include terms describing the mitigation that will be implemented, and shall require regular submittal of reports on mitigation plan activities on specified time schedules. The reports shall contain the following information:

1. A description of the methods or approaches used;

2. The frequencies that the methods or approaches were applied;

3. The results of monitoring;

4. An evaluation of the effectiveness and success of the methods or approaches; and

5. Descriptions of the supplements or modifications to the methods or approaches that were or will be implemented, if any.

The water right permit shall allow the State Water Board to modify the mitigation plan if the permittee or licensee provides documentation that indicates that the plan is ineffective, unsuccessful, or no longer required.

The applicant or petitioner shall provide the following information in proposed mitigation plans:

1. Non-native species eradication plan

    a. The method by which non-native species present or potentially present in the reservoir will be identified.

    b. A description of the approach that will be used to eradicate the species from the reservoir if non-native species are present, including the method and the frequency of applying the method.

    c. Description of the criteria that will be used to evaluate the effectiveness and success of the eradication method.

    d. Description of the program that will be used for monitoring the effectiveness and success of the eradication method.

    e. Description of how the approach will be supplemented or modified if the monitoring program indicates that the current eradication plan is not effective or successful.

    f. Time schedule for periodic inspection of the reservoir and eradication of the non-native species from the reservoir, if present.

2. Gravel and wood augmentation plan

    a. Estimation of the annual volume of **coarse sediment** and **large wood** that would move past the dam location if the dam were not in place, and the annual volume of coarse sediment and large wood that will be trapped in the reservoir.

    b. Determination of the **nature** and size characteristics of the coarse sediment and large wood that will be trapped in the reservoir.

    c. Description of the method that will be used to augment gravel and large wood in the stream reach below the POD, including the location, method, nature and size characteristics of the gravel and large wood being added, and the frequency of applying the method.

    d. Following are suggestions that may be incorporated into the method.

        1) Except as provided in 3) and 4) below, place coarse sediment and large wood into the stream reach downstream of the dam. The coarse sediment and large wood shall have characteristics that are equivalent to the volume, nature, and size

characteristics of the coarse sediment and large wood that will be trapped in the reservoir.

2) The same coarse sediment or large wood that accumulates in the reservoir may be used, or suitable coarse sediment or large wood from an outside source may be used.

3) Sediment finer than one quarter-inch does not need to be moved or placed downstream.

4) Wood pieces with lengths shorter than approximately (i) 6 feet, or (ii) half the **mean channel width**, evaluated upstream above the influence of the dam, whichever criterion is shorter, do not need to be moved or placed downstream as these do not contribute substantially to the formation of stream jams. (R2 Resource Consultants, 2007c.)

5) Coarse sediment must be placed near the **channel thalweg** at a point below the dam and bypass return, a half-channel width upstream of a **riffle crest**.

6) Large wood must be placed below the bypass channel return and scattered over an active bar at an elevation that is exposed during low winter flows.

e. Description of the criteria that will be used to evaluate the effectiveness and success of the augmentation approach.

f. Description of the program that will be used for monitoring the effectiveness and success of the augmentation approach.

g. Description of how the augmentation approach will be supplemented or modified if the monitoring program indicates that the current augmentation approach is not effective or successful.

h. Time schedule for the periodic implementation of the augmentation approach.

3. **Riparian habitat** replacement plan

a. Characterization of the type, species composition, spatial extent, and **ecological functions and values** of the riparian habitat that will be removed, lost, or damaged by the onstream dam.

b. Description of the approach that will be used to replace the riparian habitat removed, lost, or adversely impacted by the onstream dam,

including a list of the soil, plants, and other materials that will be necessary for successful riparian habitat replacement, and a description of planting methods, spacing, erosion protection, and irrigation measures that will be needed, if any.

c. Description of the criteria that will be used to evaluate the effectiveness and success of the riparian habitat replacement approach.

d. Description of the program that will be used for monitoring the effectiveness and success of the riparian habitat replacement approach.

e. Description of how the riparian habitat replacement approach will be supplemented or modified if the monitoring program indicates that the current approach is not effective or successful.

f. Time schedule for the implementation and monitoring of the riparian habitat replacement.

5.0 SMALL DOMESTIC USE AND LIVESTOCK STOCKPOND REGISTRATIONS

A person may obtain a right to appropriate water for a small domestic or livestock stockpond use by registering the use with the State Water Board. (Wat. Code, § 1228 et seq.) The State Water Board may impose general conditions on small domestic use and livestock stockpond use registrations. (*Id.,* § 1226.) An appropriation pursuant to a registration within the policy area is subject to the following conditions:

1. The season of diversion of the registration is limited to October 1 through March 31. If the project that is the subject of the water right registration involves demands for water that cannot be met with water diverted during this limited season, an alternative supply of water or appropriation under another basis of right must be available. The alternative source must be used when water diverted within the limited season is no longer available to supply the registered project.

2. No water may be stored or diverted under the registration by means of an onstream dam constructed on a Class I or Class II streams after July 19, 2006.

A registration of water use must include a certification that the registrant agrees to comply with all conditions, including conditions on the construction and operation of the diversion work, required by DFG. (*Id.,* §1228.3, subd. (a)(7).) DFG shall

impose conditions consistent with the principles of this policy that are stated in Section 2.2.

6.0 WATER RIGHT PETITIONS

Under this policy, a petitioner shall provide adequate information for the State Water Board to determine whether the proposed change may affect instream flows.

6.1 Petitions that will not Result in Decreased Flow in a Stream Reach

The policy requirements for diversion season, minimum bypass flow, and maximum cumulative diversion do not apply to petitions that do not result in decreased flow in a stream reach.

Petitions that do not result in decreased flow in a stream reach but involve moving or adding an onstream dam shall comply with the Permitting Requirements for Onstream Dams contained in section 4.4.

6.2 Petitions that may Result in Decreased Flow in a Stream Reach

Approval of a petition may result in an incremental increase in the amount of water diverted as compared to the amount of water that would be diverted if the petition was denied. For permits, the incremental increase is equal to the full face value of permit minus the amount of water put to beneficial use in compliance with all existing permit conditions. Because water right licenses are limited to the amount of water actually put to beneficial use during the permit development schedule, approval of a change petition filed on a license will not result in an incremental increase in the amount of water diverted. However, some petitioned changes may result in changes in flow of a particular stream reach, particularly those changes that affect the location of a point of diversion or those that result in a change in the timing or location of return flows from the approved use. Any increase in diversion or reduction in return flows corresponds to a decrease in stream flow. With the following exception, the incremental decrease in stream flow resulting from the approval of a petition shall be evaluated for adverse effects to fish and wildlife using the regionally protective criteria or site-specific criteria and the instream flow assessment methods established in this policy. Only the reach of the stream potentially affected by the proposed change need be evaluated.

The State Water Board may waive this requirement when the following conditions are met:

1. The purpose of the petition is to improve conditions for fish and wildlife; or
2. The purpose of the petition is to provide the water right holder with the flexibility to divert water for beneficial use in a manner that improves conditions for fish and wildlife.

7.0 PASSIVE BYPASS SYSTEMS

The policy requirements for the minimum bypass flow and maximum rate of diversion shall be met on an instantaneous basis. With the following exception, to ensure compliance with these requirements, all diversions under this policy shall operate using passive bypass systems. Upon State Water Board approval, if physical site conditions prevent the construction of a passive bypass system, an automated computer-controlled bypass system shall be designed, installed, and operated.

The bypass system must be designed by a civil engineer with a valid California registration. The design must satisfy the minimum bypass flow and maximum rate of diversion requirements for the project, and shall be capable of bypassing the entire stream flow when stream flows are less than the minimum bypass flow, and be capable of bypassing all flowrates above the maximum rate of diversion, where applicable. Design drawings of bypass systems shall be submitted to the State Water Board for review and approval prior to construction. The design drawings shall include sufficient detail demonstrating how the bypass system will function.

Passive bypass structures shall be designed so that the bypass requirements are met through the design of the bypass facility, rather than through frequent human interaction after the bypass facility is built. Passive bypass systems do not need bypass flow monitoring after the initial validation of the design because the installed design characteristics of the structure prevent diversion of water in violation of the bypass flow conditions.

The passive bypass system shall be constructed when the diversion facilities are built. For projects with existing diversion facilities, the passive bypass system shall be constructed before water is diverted under the permit or the order approving a petition. After installation, the registered engineer shall make sufficient flow measurements to confirm bypass flows are satisfied as designed. The data and analysis confirming that bypass flows are satisfied shall be submitted to the State Water Board. Manipulation of a control valve or weir plate by a human operator at the beginning and/or end of the diversion season may be necessary to adjust the structure to satisfy the bypass requirements. If the system is damaged or partially blocked, the system shall be repaired, and flow measurements to confirm bypass flows are satisfied shall be made, if necessary, to verify successful repair. Such verification, and any modifications made to the facility, shall be submitted to the State Water Board.

If automated computer controlled bypass systems are approved, the bypass system shall be constructed when the diversion facilities are built. For projects with existing diversion facilities, the system shall be operational before water is diverted under the permit or order approving a petition. After installation, the registered engineer shall confirm the system is operating as designed. The data and analysis confirming that bypass flows are satisfied shall be submitted to the State Water

Board. If the system is damaged, the system shall be repaired, and confirmation provided to the State Water Board that bypass flow requirements are still being satisfied.

8.0 FLOW MONITORING AND REPORTING

This section details the monitoring and reporting necessary for showing compliance with minimum bypass flow and maximum rate of diversion requirements.

8.1 Flow Monitoring and Reporting Requirements for Passive Bypass Systems

Bypass flow monitoring is not necessary for passive bypass systems. However, permittees and licensees subject who are required to have passive bypass systems shall annually prepare a signed statement, with photographic evidence, certifying that the passive bypass system is still operational as designed. This certification shall be submitted with Permittee Progress Reports, Reports of Licensee, or whenever requested by the State Water Board.

Additional flow monitoring may be needed to comply with other water right terms and conditions placed in permits and licenses.

8.2 Flow Monitoring and Reporting Requirements for Automated Computer Controlled Bypass Systems

If an automated computer-controlled bypass system is implemented, compliance with the minimum bypass flow and the rate of diversion (where applicable) requirements shall be demonstrated by hourly monitoring using automated flow measuring device(s). The flow data shall be recorded so that it is retrievable and viewable using commonly available computer software. The hourly data shall be presented both graphically and numerically for the previous reporting period, and shall be submitted with Permittee Progress Reports, Reports of Licensee, or whenever requested by the State Water Board.

Additional flow monitoring may be needed to comply with other water right terms and conditions placed in permits and licenses.

9.0 COMPLIANCE PLANS

The State Water Board shall require applicants and petitioners to submit a compliance plan for the State Water Board' review and approval. The compliance plan shall identify how the water diverter will comply with the terms and conditions of permits or orders, and may include a schedule for the construction of facilities and the implementation of mitigation plans. The compliance plan shall be prepared by a qualified person and subject to approval by the Deputy Director of the Division of Water Rights. The diversion and use of water prior to approval by the Deputy

Director of the Division of Water Rights shall be subject to enforcement action, even if the project was constructed prior to filing of the application.

The State Water Board may condition its approval of an application on the applicant's compliance with certain measures. (Cal. Code Regs., tit. 23, § 845, subd. (a).) Accordingly, the State Water Board may withhold issuance of a permit pending compliance with the measures required by this policy as necessary to further the purposes of this policy.

10.0 Policy Effectiveness Monitoring

The State Water Board may develop and implement a policy effectiveness monitoring program.

The purpose of the program would be to develop data through field monitoring and, based on the data, evaluate (1) the effectiveness of the regional criteria in maintaining instream flows that are protective of anadromous salmonids and their habitat over the long-term, in the range of a 10 to 20 year time horizon, and (2) whether the regional criteria may need to be modified. The program may focus on evaluating the effectiveness of the regional criteria for diversion season, minimum bypass flow, maximum cumulative diversion, and onstream dam mitigation measures.

The program may develop data through monitoring of stream hydrology, geomorphology, and anadromous salmonid habitat conditions in selected representative streams throughout the policy area.

The program may coordinate with and utilize and incorporate data from other ongoing monitoring programs carried out by other state, federal, and local agencies, to the fullest extent practicable.

The State Water Board may refer to recommendations contained in Chapter 10 and Appendix K of R2 Resource Consultants (2007a) when implementing this program.

11.0 ENFORCEMENT

Timely and appropriate enforcement is critical to the successful implementation of the policy and to ensure that instream flows in north coast streams are maintained. This section of the policy provides guidance in the exercise of the State Water Board's enforcement discretion by establishing a framework for identifying and investigating instances of noncompliance, for taking enforcement actions that are appropriate in relation to the nature and severity of the violation, and for prioritizing enforcement resources to achieve maximum environmental benefits and compliance with the policy. It also provides notice to the regulated community of the State Water Board's intent to enforce the policy and the methods of enforcement. It is not intended to provide support for any defenses raised in

response to an enforcement action. This section is organized into the following subject areas: (1) compliance assurance, (2) prioritization of enforcement cases, and (3) enforcement actions.

11.1 Compliance Assurance

For compliance assurance, there must be a clear understanding of the requirements that implement this policy and a subsequent review of compliance with those requirements. The State Water Board will assure compliance with this policy by developing clear and enforceable permit terms and conditions, requiring and reviewing compliance plans, reviewing self-monitoring reports, and maintaining a field presence in the policy area through compliance inspections, licensing inspections and complaint investigations.

11.1.1 Enforceable Terms and Conditions of Permits, Licenses and Orders

Water users must have a clear understanding of the terms and conditions that implement this policy. New water right permits issued under this policy will contain terms and conditions implementing policy requirements. The State Water Board also will consider adding terms and conditions to existing water rights or revising ambiguous or inappropriate terms and conditions when analyzing petitions. Additionally, the State Water Board may impose terms and conditions to implement this policy through a public trust proceeding, an enforcement proceeding or as a result of a complaint investigation. In all of these situations, the State Water Board will issue permits, license, and orders, with clear and enforceable provisions.

11.1.2 Self-Monitoring Reports

The State Water Board will monitor for compliance by requiring self-monitoring reports. These reports include certain reports that are already required such as the annual Progress Report by Permittee and the triennial Report of Licensee. Self monitoring reports are signed under penalty of perjury. Special permit or license terms may also require submittal of special reports.

The State Water Board will revise its self-monitoring reports to require a permittee or licensee to clearly identify any violations of applicable requirements and to identify any corrective actions taken or planned within a specified time schedule. State Water Board staff will review the self-monitoring reports, identify potential violations, and determine whether an immediate enforcement action is appropriate. A failure to report a violation or falsification of diversion records will be taken into consideration in determining the scope and magnitude of enforcement.

The State Water Board also receives requests for renewal of small domestic registrations and livestock stockpond registrations. The State Water Board staff will review these requests for compliance with the terms and conditions included therein.

11.1.3 Inspections for Licensing

Water Code section 1605 requires that before issuance of a license, the State Water Board make a full inspection and examination of the works constructed under each water right permit to determine whether the construction of the works and the use of water are in conformity with applicable law, including the State Water Board's regulations and the conditions of the permit. Licensing of a water right permit represents the culmination of the water right permitting process. A license inspection provides a valuable field check for compliance. A license inspection allows the State Water Board to verify that information submitted in self-monitoring reports is complete and accurate. A recommendation that a license be issued is based on confirmation that a permittee is in full compliance with the terms and conditions of the permit, such as season of diversion, character of use, and point of diversion and place of use served. The State Water Board must also identify the maximum amount of water being put to a beneficial use under the permit. Any permit violations identified during license inspections are subject to enforcement.

11.1.4 Compliance Inspections

The State Water Board will conduct a compliance inspection program in the policy area. All permit and license holders will be subject to inspection. The State Water Board generally will contact permit and license holders by letter to inform them of a potential compliance inspection, or may investigate with limited notice. This notification will provide the water right holder with an opportunity for voluntary compliance prior to the inspection. The compliance inspection program initially will target high resource-value watersheds. Targeted watersheds will be selected annually based, in part, on input from the Regional Water Quality Control Boards, the Department of Fish and Game, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. For each target watershed, State Water Board staff will develop a project priority list based on diversion quantity, special terms, or potential violations gleaned from self-monitoring reports. State Water Board staff also may perform a watershed-wide investigation of diversion facilities constructed without a known basis of right. If the State Water Board has reason to believe that a serious or chronic violation is occurring, the State Water Board may conduct an investigation without first contacting the permittee or licensee by letter.

The State Water Board shall place a priority on compliance inspections within the five-county area covered by this policy. State Water Board staff may also establish random surveillance stations to monitor stream flows below projects having bypass conditions. Violations identified during this surveillance will be prioritized according to the criteria identified below in Section 11.2 and may be subject to immediate enforcement action.

11.1.5 Complaint Investigations

The State Water Board relies on local residents, other agencies, and other interested persons to help them identify potential water right violations. The complaint process affords the State Water Board an opportunity to be apprised of unauthorized diversions. Information regarding an actual or potential unauthorized activity is often obtained through a complaint filed by the public or by another public agency. Complaints may be based on allegations that a diversion of water is in violation of permit or license terms or conditions, is without basis of right, constitutes the waste or unreasonable use of water, or adversely affects public trust resources.

The State Water Board responds to all written complaints. State Water Board staff may conduct a field investigation to gather additional information not contained in the complaint or in the water diverter's response to the complaint. State Water Board staff will consider this policy when analyzing complaints and determining enforcement priorities within the policy area.

11.1.6 Enforcement Case Record Maintenance and Review

The State Water Board will post copies of water right enforcement notices and complaints that have been mailed cases and post-enforcement complaints and notices on its website. All State Water Board decisions resulting from hearings, orders or settlement of enforcement actions will also posted on the website.

11.2 Prioritization of Enforcement

Every violation deserves an appropriate enforcement response. Because resources may be limited, however, the State Water Board will balance the need to complete its non-enforcement tasks with the need to address violations. It must also balance the importance or impact of each potential enforcement action with the cost of that action. Informal enforcement actions, described below, have been the most frequently used enforcement response. Such informal actions will continue to be part of this policy for low priority violations. Formal enforcement actions are resource-intensive and must therefore be targeted to the highest priority violations. Some violations, although they may have a low impact individually, may be systemic. The State Water Board will take this into consideration when determining how to set enforcement priorities, recognizing that addressing systemic violations can result in behavioral changes that improve conditions.

The first step in enforcement prioritization is the determination of the relative weight of the violation. The criteria for prioritization used in the policy area should be applicable statewide and focus on watershed conditions, the injury, or potential for injury, from the violation, and the project characteristics. In the policy area, the State Water Board will use a set of criteria. The priority of the violation will also consider the water diverter's history of past violations or submission of willful misstatements, whether the water diverter has implemented an internal mechanism

for ensuring compliance, such as internal audits or early detection programs, and the violator's willingness to voluntarily correct violations, especially prior to State Water Board identification of a compliance issue.

The following comprises a non-exclusive list of criteria that State Water Board staff will use in setting enforcement priorities regarding violations. State Water Board staff will enter known violations in an enforcement database. Any violation in this database can be further evaluated for possible formal enforcement, and at a minimum shall receive informal enforcement. Violations meeting more than one of the criteria should receive a higher priority ranking. State Water Board staff will conduct a monthly review of the prioritized violations in the database and make a decision about the appropriate enforcement response based on the following criteria. State Water Board staff will assign a relative priority for enforcement for each violation.

11.2.1 Violation Within Class I and II Streams in the Policy Area or Within an Existing or Wild and Scenic River System

The protection of California's public trust resources is of paramount importance. Class I streams contain habitat for fishery resources, and Class II streams contain habitat for biological organisms that provide sustenance for fishery resources. Any violations on Class I or Class II streams within the policy area; or within any component of the California Wild and Scenic River System or the National Wild and Scenic River System shall be given enforcement priority.

11.2.2 Violations Within Fully Appropriated or Adjudicated Stream Systems

The State Water Board is responsible to protect existing water rights. Any violations affecting the available water supply of a stream that (1) the State Water Board has declared a fully appropriated stream system pursuant to Water Code section 1205 or (2) a Superior Court has rendered a judgment for the adjudication of water rights shall be given enforcement priority.

11.2.3 Potential injury to Endangered Species

Any violation that threatens or causes a take of endangered species shall be given enforcement priority. State Water Board staff will work with the Department of Fish and Game and federal fishery agencies in prioritizing enforcement regarding this potential injury.

11.2.4 Waste and Unreasonable Use

The prevention of waste, unreasonable use, or unreasonable method of use of water shall be given enforcement priority.

11.2.5 Injury to Prior Right Holder

Any violation that injures a prior right holder shall be given enforcement priority.

11.2.6 Violations by Large Consumptive Use Projects with Economic Gain

Any large consumptive use project receiving any economic benefit from a violation or unauthorized diversion shall be given enforcement priority. A large project for this policy means a project that (1) directly diverts more than 1 cubic feet per second; (2) collects more than 50 acre-feet per annum, or stores water via a dam within the jurisdiction of the Department of Water Resources for safety, as defined in Water Code sections 6002 and 6003; or (3) involves one entity that uses numerous diversions that cumulatively satisfies conditions (1) or (2).

11.2.7 Recalcitrant Violators, Repeat Violators, and Willful Misstatements

The State Water Board will give priority in taking enforcement against the following persons who have violated a term of their permit or license:

1. Any person who fails to take corrective actions prescribed by the State Water Board in a previous informal or formal enforcement action within the time provided;
2. Any person shown in State Water Board records to have previously violated a term of their permit or license;
3. A person who willfully submits misstatements to the State Water Board;
4. A person that requested cancellation or revocation of an application, permit or license but continues to divert water.

11.2.8 Other Factors as Justice May Require

In addition to the factors that are discussed above, the State Water Board shall consider any other factors as justice may require when determining the enforcement priority of a violation. For example, the State Water Board shall consider Environmental Justice concerns when determining if a violation is an enforcement priority.

11.3 Timely and Appropriate Enforcement Actions

The State Water Board has a number of enforcement tools to respond to water right violations. This section describes these options and discusses procedures that are common to some or all of these options.

11.3.1 Standard Language

The State Water Board shall maintain a standardized format for enforcement orders citing the appropriate Water Code authority. The State Water Board staff shall use

this format, taking into account the need to adapt the format to the facts of an individual situation.

11.3.2 Informal Enforcement Actions for Lower Priority Violations

For low priority violations, State Water Board staff may recommend an informal enforcement action. The purpose of an informal enforcement action is to quickly bring a violation to the water diverter's attention and to give the diverter an opportunity to voluntarily correct the violation and return to compliance as soon as possible. The State Water Board, however, may take a formal enforcement action in place of, or in addition to, an informal enforcement action. Continued or repeated violations should trigger a formal enforcement action.

The informal enforcement action can include any form of communication (verbal, written, or electronic) between State Water Board staff and the water diverter. For many violations, the first step is a verbal notice, either by phone or in person, of the violation. Staff will discuss how and why a violation occurred, and discuss how and when the water diverter plans to correct the violation and achieve compliance. Staff shall document the conversation with a contact report and file that report in the appropriate file.

The State Water Board may issue a letter providing notice of a violation as a follow-up to, or in lieu of, a verbal notice. The letter will inform the diverter of the specific violations and, if known to staff, discuss how and why the violations occurred, and how and when the diverter must correct the violation and achieve compliance.

An informal enforcement action must not include language that excuses the violation or that modifies a compliance date in a permit, license, or other order issued by the State Water Board. An informal action must inform the diverter that the State Water Board retains the discretion to take formal enforcement action.

11.3.3 Formal Enforcement Actions

A formal enforcement action is a statutorily authorized enforcement action. Formal enforcement actions should contain findings of fact that establish all of the statutory requirements of the specific statutory provision being utilized. The actions listed below present options available for water right enforcement.

11.3.3.1 Administrative Civil Liability (ACL) Complaints

Pursuant to Water Code section 1052, an unauthorized diversion or use of water is a trespass against the State subject to a maximum civil liability of $500 per each day of unauthorized diversion or use of water. Water Code section 1055, subdivision (a), provides that the Executive Director of the State Water Board may issue an ACL complaint to any person or entity on which the ACL may be imposed.

Water Code section 1055.3 provides that:

> "In determining the amount of civil liability, the board shall take into consideration all relevant circumstances, including, but not limited to, the extent of harm caused by the violation, the nature and persistence of the violation, the length of time over which the violation occurs, and the corrective action, if any, taken by the violator."

The Water Code does not specify how these factors are to be weighed or combined when setting the actual dollar amount of liability. The manner in which the State Water Board considers these factors for any given situation is up to the discretion of the Board within the limits of the statutory maximum. The liability should be high enough to take into consideration of the market value of the water used, the costs to the State Water Board in taking enforcement action, and the effects on other water users and instream uses of water of diverting and using water without authorization. The amount of liability should serve as a deterrent to future unauthorized diversions by the diverters. The liability shall be assessed within the statutory maximum amount and at a minimum at a level that recovers the staff costs and economic benefits, if any, associated with the acts that constitute the violation.

State Water Board staff will consider the following factors and any other appropriate factors when setting the liability amount:

Avoided Costs

The avoided cost should represent the true cost the violator would have to spend to legally acquire water equivalent to the water supply illegally diverted. This amount is based on the average value of water available in the area of the diversion. If water is not available in the area, the highest regional water cost will be used. Avoided water right fees will be included. Any investment costs for the infrastructure necessary to deliver water to the point of use also may be considered if the infrastructure does not already exist.

Economic Benefit Amount

The Economic Benefit Amount is any savings or monetary gain derived from the acts that constitute the violation in addition to the avoided cost. Economic benefit includes all savings from, and all income and profits resulting from, the use of the illegally diverted water over the time period of that use. This could include benefits resulting from the time value of money.

Deterrent Amount

The civil liability should be set at a level that will deter future noncompliance by the violator or others in the same regulated community. In establishing this amount, the State Water Board will consider both the violator's culpability and the extent of harm associated with the violation as follows:

Culpability
The culpability amount will be determined based on the nature and persistence of the violation, length of time that the violation has continued, the diverter's knowledge of water rights requirements, the diverter's role in construction and operation of the diversion project, responsiveness to previous notifications by the State Water Board or the Division, and any voluntary efforts undertaken or not undertaken to correct the violation. A diverter's knowledge of the water right system will be assessed based on information in the State Water Board's records. A diverter's participation in construction may be determined using the County Assessor's records (dates of ownership) and aerial or topographic maps (dates for project existence). Finally, staff will consider any corrective actions that were taken, or actions that were prescribed but not taken, as well as any falsification of records.

Extent of Harm Amount
Staff will estimate an amount that mitigates for any harm to public trust resources known to be specifically caused by the violation. State Water Board staff will consult with the Department of Fish and Game, US Fish and Wildlife Services and National Marine Fishery Service estimating liability amount for impacts to fish and wildlife resources.

Staff Costs
Staff costs will be calculated for all State Water Board staff time expended on the investigation of the violation, preparation and review of the staff report, and preparation and review of the enforcement action. The staff costs will include salary, benefits and all overhead costs. The civil liability amount should, at a minimum, be set at a level that recovers economic benefit plus staff costs.

Ability to Pay
There are situations when it is appropriate to consider ability to pay when setting a liability amount. The ability to pay administrative civil liability is limited by diverter's revenues and assets. In some cases, it is in the public interest for the diverter to continue in business and bring operations into compliance. If there is strong evidence that administrative civil liability would result in widespread hardship to the service population or undue hardship to the diverter, it may be reduced on the grounds of ability to pay. Any consideration of ability to pay shall be supported by tax or other financial records. State Water Board staff may also consider increasing administrative civil liability to assure that the enforcement action will have a deterrent effect for a water diverter having a greater ability to pay.

11.3.3.2 Cease and Desist Order (CDO)

The State Water Board may issue an order to cease and desist when it determines that any person is violating, or threatening to violate (1) the prohibition set forth in Water Code section 1052 against the unauthorized diversion or use of water; (2) any term of condition of a water right permit, license, certificate, or registration; or (3) any decision or order of the State Water Board issued pursuant to part 2

(commencing with section 1200) of the Water Code, Water Code section 275, or article 7 (commencing with section 13550) of chapter 7 of division 7 of the Water Code (relating to water reuse).

The State Water Board must provide notice of the proposed CDO by certified mail. The notice shall contain a statement of facts and information that would tend to show the proscribed action and inform the respondent that unless a request for hearing is received by the State Water Board within a certain time period, the State Water Board may adopt the CDO without a hearing. After notice and an opportunity for hearing, the State Water Board may adopt, modify, revoke, or stay in whole or in part any CDO.

Under this policy, the State Water Board will issue a Notice of CDO commensurate with any ACL complaint issued for the unauthorized diversion or use of water within the policy area. A notice of CDO shall also be issued for any priority violation within the policy area that is not subject to an ACL compliant.

A CDO issued in accordance with this policy shall clearly identify the actions required to come into compliance and a schedule for compliance. Any violation of a CDO adopted by the State Water Board shall be a priority violation. The State Water Board may consider imposing civil liability for an amount not to exceed $1,000 for each day of violation. The State Water Board may also consider requesting the Attorney General to petition the superior court to impose civil liability, or for the issuance of prohibitory or injunctive relief.

11.3.3.3 Revocation of Permits and Licenses

The State Water Board may revoke a permit or license pursuant to Water Code sections 1410 or 1675, respectively. The State Water Board may revoke a permit to appropriate water if work is not commenced, prosecuted with due diligence, and completed or the water applied to beneficial use in accordance with the permit and applicable statutes or regulations. A license may be revoked if the State Water Board finds that the licensee has not put water to a useful or beneficial use, has ceased to put water to such use, or has failed to observe any of the terms and conditions in the license.

The State Water Board must provide notice of the proposed revocation. The notice must contain a statement of facts and information on which the proposed revocation is based. Unless a request for hearing is received, the State Water Board may act on the proposed revocation without a hearing.

12.0 WATERSHED APPROACH

The State Water Board recognizes that a watershed approach for determining water availability and evaluating environmental impacts of multiple water diversions in a watershed may be a viable alternative to evaluating individual projects using the

regionally protective criteria set forth in this policy. Accordingly, flexibility should be provided to groups of diverters who endeavor to work together to allow for cost sharing, real-time operation of water diversions, and implementation of mitigation measures, as long as the proposed watershed management approaches are consistent with the principles for maintaining instream flows provided in section 2.2.

12.1 Definition of a Watershed Group

A watershed group is a group of diverters in a watershed who enter into a formal agreement to effectively manage the water resources of a watershed by maximizing the beneficial use of water while protecting the environment and public trust resources.

12.2 Project Charter

Water right applicants that choose to form a watershed group shall submit a proposed project charter to the State Water Board. The purpose of the charter is to ensure that watershed group participants are in agreement regarding the goals of the group and the tasks that must be completed to achieve these goals. The charter shall contain watershed group participant names, roles, and responsibilities, and a description of the individual water right applications or petitions involved. It shall also describe the key contents of the technical documents that will be prepared by the watershed group, and include an estimated schedule for submitting these documents to the State Water Board.

The State Water Board shall review and concur with the proposed project charter before the watershed group commences work. The State Water Board will consider the extent of participation from applicants and petitioners relative to the total number of pending applications and petitions in a watershed as one factor in deciding whether to approve the proposed project charter.

12.3 Required Technical Documents

The watershed group shall provide the technical information necessary for the State Water Board to determine water availability, satisfy the requirements of CEQA (if applicable), evaluate the potential impacts of water appropriation on public trust resources, make decisions on whether and how to approve pending water right applications for diverters in the watershed group, and make decisions on whether to approve the watershed group's proposed watershed management plan.

The watershed group shall perform technical work and submit technical documents as described below:

1. The watershed group shall study the instream flow needs of fish and fish habitat using the site specific study guidance contained in Section 4.1.8 of

this policy. The watershed group shall submit a report detailing the results of the study to the State Water Board.

2. The watershed group shall submit information necessary to prepare appropriate environmental documents so that the State Water Board may make a determination of the impacts of the proposed projects to the environment, public trust, and the public interest for the purposes of preparing water right permits for the proposed projects. At a minimum, this information shall include an evaluation of water potentially available for diversion, descriptions of the significance of the potential impacts of the proposed projects caused by reductions in stream flow and/or the presence of onstream dams, descriptions of proposed mitigation measures for impacts identified as potentially significant, information needed for draft initial studies or other CEQA documents, and an evaluation of the potential impacts of the proposed projects on public trust resources.

3. Watershed groups proposing to coordinate operation of water diversions shall provide a watershed management plan that describes: (1) how diversions will be operated, monitored, and maintained, including monitoring and reporting methods; and (2) mitigation measures to be implemented, a time schedule for implementation, and how the watershed group will ensure that such measures are implemented. The watershed management plan shall include a certification that the watershed group has the financial resources to build, operate, maintain, and monitor the proposed projects consistent with the terms of any water right permits issued for the project(s) and shall provide proof of financial resources. Watershed management plans shall be consistent with the general requirements of this policy and all appropriate federal, state, and local laws. The watershed management plan shall not propose actions that result in any diminishment of the State Water Board's authority to require or enforce conditions to protect fish and wildlife, other public trust resources, or senior water right holders.

12.4 Approval of Technical Documents

The State Water Board shall review and approve the technical documents before issuing water right permits or approving petitions.

12.5 Water right permit and license terms

In addition to standard or special water right permit and license terms, water right permits and licenses for watershed groups operating under a watershed management plan shall contain special terms designed to assess the effectiveness of the watershed management plan in meeting the requirements of this policy. At a minimum, a special term shall be included in water right permits and licenses issued to members of a watershed group that require the performance of a biological assessment every five years to evaluate the condition of the fish and fish habitat in

the watershed. The biological assessment shall be conducted by a qualified fisheries biologist. Fisheries biologist qualifications are described in section 4.1.5. Prior to conducting the assessment, the watershed group shall provide the name(s) and qualifications of the individual(s) selected to perform the assessment to the State Water Board for review and approval. The watershed group shall provide reports to the State Water Board detailing the results of the biological assessment.

12.6 Retraction of State Water Board approvals

The State Water Board may retract its approval of the watershed group, project charter, and/or the watershed management plan if the watershed group does not proceed with preparation of the technical documents in a timely manner, if some or all of the diverters do not build, operate, maintain, and/or monitor diversions according to the terms of the water right permit(s) or license(s); or if any of the biological assessments show a decline in fish population or degradation of fish habitat.

13.0 CASE-BY-CASE EXCEPTIONS TO POLICY PROVISIONS

The State Water Board may grant an exception to specific provisions of this policy where the State Water Board determines that:

1. The exception will not compromise maintenance of instream flows in the policy area; and

2. The public interest will be served.

Requests for case-by-case exceptions shall be submitted to the State Water Board during the environmental review of an application or petition, and shall contain:

1. A detailed description of the reason for the request,

2. The policy provisions that are involved;

3. Documentation of the reasons why the exception will not compromise maintenance of instream flows in the policy area; and

4. An explanation of how the public interest will be served by the exception.

The State Water Board will evaluate whether the request is reasonable and whether sufficient cause exists for an exception. Case-by-case exceptions shall be granted at a public meeting of the State Water Board. The Deputy Director for Water Rights shall recommend to the State Water Board whether to approve or deny the proposed exception.

Appendix 1. Guidelines for Preparation of Water Supply Report and Instream Flow Analysis

The following sections provide guidelines for preparing a Water Supply Report which quantifies the amount of unappropriated water supply remaining instream after senior rights are accounted for, and an Instream Flow Analysis, which evaluates the effects of a proposed project, in combination with existing diversions, on instream flows needed for protection of fishery resources. These analyses are outlined in the flowchart shown in Figure A-1.

A.1.0 Gather Information Needed for Water Availability Analysis

The information needed for the water availability analysis include:

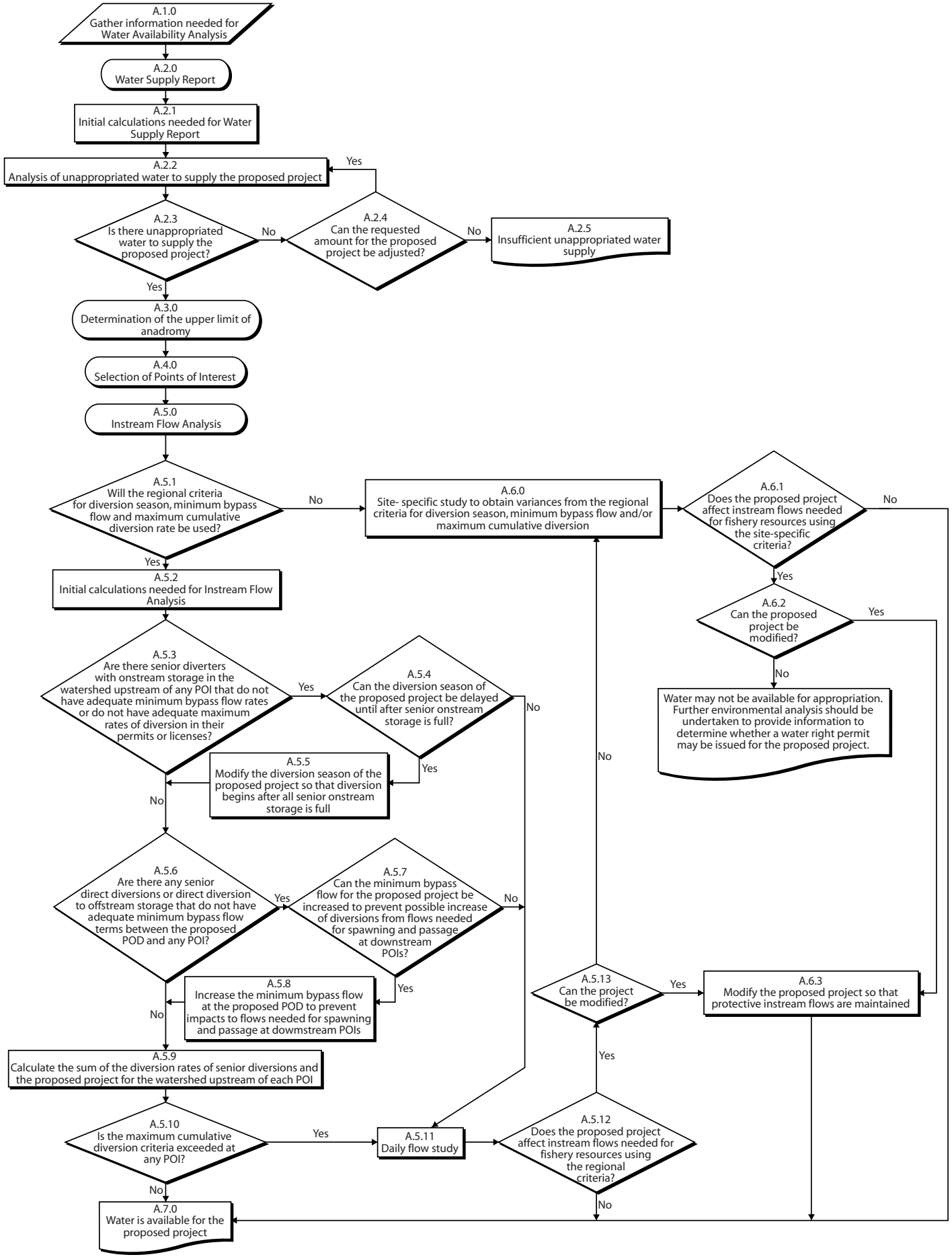
1. Streamflow records from gages near the Point(s) of Diversion (POD) proposed in the application; and,

2. Information from State Water Board files and records on senior water right diverters within the watershed. This includes any unpermitted applications with a higher priority than the project being analyzed and any claims of a pre-1914 or riparian water right. Information gathered for each diverter shall include location of diversion, season of diversion, storage capacity, rate of diversion, and any minimum bypass flow terms. For unpermitted applications with a higher priority than the proposed project, it shall be assumed that the minimum bypass equals the bypass flow required by the Policy unless better information is available. The minimum bypass flow information is not needed for the Water Supply Report, but will be needed for the Instream Flow Analysis.

A.1.1 Obtain Streamflow Records Near the Point(s) of Diversion

Streamflow data is used to estimate unimpaired flow for the water availability analysis. The applicant shall identify all streamflow gages within the **watershed**. Streamflow gaging stations are typically operated by the United States Geological Survey (USGS), the California Department of Water Resources (DWR), or local agencies. Streamflow records may be obtained from the USGS via the internet using their National Water Information System (NWIS) web interface (http://waterdata.usgs.gov/nwis), from DWR via the internet using their California Data Exchange Center (CDEC) online hydrologic data collection network (http://cdec.water.ca.gov/) or from other federal, state, or local agencies, if available. If there are no stream flow gages within the watershed, the applicant shall locate the nearest stream flow gages.

Figure A-1. Guidelines for Preparation of Water Supply Report and Instream Flow Analysis



The streamflow gage closest to a POD with at least ten water years (October-September) of complete record may be used for analysis. Other streamflow gages may be used if sufficient justification is provided. The water years do not have to be over a continuous time period. Missing records that have been filled with estimates by the USGS or DWR based on standard methods may be used. If the streamflow gage closest to a POD with at least ten years of complete records is influenced by many water diversions, a gage that is less influenced by diversions may be used for the water availability analysis.

The following information is required at each streamflow gage selected for the analysis:

1. Gage location;

2. Gage watershed drainage area;

3. Period of data record at the gage; and,

4. Daily flow time series data for the period of record for the gage.

A.1.2 Obtain Information on Authorized Senior Diverters in the Watershed

To determine the scope of information gathering, it is necessary to identify the **flow path** from the proposed point of diversion to the Pacific Ocean or to a **regulated mainstem river**. The geographic extent of the analysis includes the **watershed** upstream of the most downstream POD associated with the senior water right that is located the farthest downstream on the identified flow path. The applicant shall identify all senior water rights within the affected watershed that authorize diversion during the diversion season proposed in the application. The applicant shall identify senior water rights using the State Water Board Division of Water Rights files and records. The following information is required for each POD:

1. Location;

2. Direct diversion rate, unless a maximum rate of diversion is imposed as a term on the permit or license, in which case the maximum rate of diversion should be used;

3. Storage volume and position relative to the stream (onstream or offstream)

4. Maximum annual use limitation when it is less than the face value of the permit or license;

5. Minimum bypass flow, if imposed as a term on the permit or license. The minimum bypass term is not needed for the Water Supply Report, but will be needed for the instream flow analysis;

6. Diversion season; and

7. Authorized uses at the point of diversion as specified in the permit or license.

A.2.0 Water Supply Report

The applicant must demonstrate that there is unappropriated water in the watershed sufficient to supply the proposed project by preparing a report that compares the potential available supply to the potential demand by senior water right holders, including demand by those claiming unconfirmed riparian and pre-1914 appropriative rights.

A.2.1 Initial Calculations for Water Supply Report

Any senior water right with a point of diversion along the flow path shall be identified as a point of analysis for water supply. The following should be calculated at each identified senior POD along the flow path:

1. Drainage area (section A.2.1.1)

2. Average annual precipitation (section A.2.1.2)

3. Unimpaired seasonal flow volume (section A.2.1.3)

4. Demand volume of all upstream demands (section A.2.1.4)

A.2.1.1 Determine the Watershed Drainage Area Above Each Aenior Point of Diversion Identified for Analysis Along the Flow Path

The watershed above an identified POD encompasses the total area that drains to the POD. The drainage area at each identified POD is determined by measuring the area of the upstream watershed. Steps required to measure the drainage area at each POD identified for analysis along the flow path are:

1. Locate the POD on a topographic map (digital or hard-copy map).

2. Delineate the watershed at the POD on the topographic map.

3. Measure the area of the delineated watershed using a manual planimeter or standard Geographic Information System (GIS) methods.

A.2.1.2 Estimate the Average Annual Precipitation for Each Senior Point of Diversion identified for Analysis Along the Flow Path and the Selected Streamflow Gage

The average annual precipitation at each identified senior POD and at the streamflow gage is determined by averaging the average precipitation over its watershed. Steps required to estimate the average annual precipitation of the watershed upstream of a senior POD or stream gage are:

1. Obtain average annual precipitation maps. Digital maps of average annual precipitation (1961-1990) developed by the PRISM group at Oregon State University (OSU) are available from the National Resource Conservation Service (NRCS) climate mapping web site (*http://www.wcc.nrcs.usda.gov/climate/prism.html*). Hard-copy maps of average annual precipitation (1931-1963) developed by Rantz and Thompson (1967) are available from the USGS.

2. Overlay the delineated watershed for the identified senior POD and the average annual precipitation maps.

3. Divide the watershed into precipitation bands defined by the precipitation contour lines (lines of equal annual precipitation delineated at defined precipitation intervals).

4. Calculate the average annual precipitation over each precipitation band by averaging the annual precipitation of the precipitation contour lines that define the band.

5. Calculate the area-weighted average annual precipitation over the watershed by summing the products, for all the bands, of the area of each band multiplied by its average annual precipitation, and dividing the sum of the products by the drainage area of the watershed.

A.2.1.3 Estimate the Average Seasonal Unimpaired Flow Volume at Each Senior POD Identified for Analysis Along the Flow Path

The average seasonal unimpaired flow volume at the identified POD shall be estimated by one of the following methods: (A) adjustment of streamflow records, (B) using a precipitation-based streamflow model, or (C) another method acceptable to the State Water Board.

A. <u>Adjustment of streamflow records method</u>

Steps for calculating the average seasonal unimpaired flow volume at the identified PODs from streamflow records include:

1. Select a streamflow gage near the POD with at least ten water years of complete record of daily streamflow data (streamflow time series).

2. Calculate the average seasonal flow volume at the gage. Assume this is the average unimpaired seasonal flow volume. For each month in the diversion season, calculate the mean monthly flow volume at the gage. To get the mean monthly flow volume for a particular month, sum the daily flow data for that month to get a total volume, and repeat for that month for each year in the period of record. Next, sum the total monthly volumes for that month and divide by the number of years in the record to obtain the mean monthly volume for the particular month. Repeat these calculations for each month in the diversion season and sum up each mean monthly total to get the average unimpaired seasonal flow volume for the diversion season at the gage.

3. The average unimpaired seasonal flow volume at each identified senior POD along the flow path can be estimated by using the average unimpaired seasonal flow volume at the gage, the watershed area for the gage and at the identified senior POD, and the average annual precipitation at the gage and at the identified senior POD with the following equation:

$$Q_{POD} = Q_{gage} * (DA_{POD} / DA_{gage}) * (P_{POD} / P_{gage})$$

where:

Q_{POD} = average unimpaired seasonal flow volume estimated at the POD, in acre-feet;
Q_{gage} = average unimpaired seasonal flow volume recorded at the gage, in acre-feet;
DA_{POD} = drainage area at the POD, in square miles;
DA_{gage} = drainage area at gage, in square miles;
P_{POD} = average annual precipitation at the POD, in inches; and
P_{gage} = average annual precipitation at the gage, in inches.

B. <u>Precipitation-Based Streamflow Model</u>

Subject to State Water Board approval, the applicant may propose using standard hydrologic techniques or public domain computer models for estimating the average seasonal unimpaired flow volume. Precipitation input data shall be provided over a minimum of ten complete and continuous water years. Model results shall be validated by comparison with recorded flows on or near the POD watershed. The recorded flows do not have to be unimpaired but the applicant shall take the impairment into consideration when calibrating the model. The modeled output flows shall be summed in units of acre-feet to obtain an average seasonal unimpaired volume. Model submittal requirements are described in section 4.1.1.1 of the policy.

A.2.1.4 Determine the Demand Volume of all Senior Water Right Holders in the Watershed Upstream of Each Identified POD Along the Flow Path

For each POD identified along the flow path, the senior water right demand in the watershed upstream of that point must be determined for the Water Supply Report. Using the information gathered in section A.1.2, the senior demand should be determined using the face value or maximum annual use limitation of each water right in units of acre-feet, with the following exceptions (Miller, A., SWRCB, December 2007):

1. Only senior water right diverters with an authorized season of diversion during the proposed project's season of diversion shall be used.

2. Because the season of diversion specified in the Policy is October 1 to March 31, and irrigation of crops in the policy area typically does not begin before March 31, senior water rights authorizing direct diversion for irrigation before March 31 do not need to be considered part of the seasonal demand. However, since a post-harvest irrigation may occur between October 1 and October 31, the October demand of senior water rights with an authorized season extending into this period should be included.

3. Because a typical frost season starts around March 15, water rights authorizing direct diversion for frost protection shall use the authorized diversion rate times 10 hrs a day for 8 days between March 15 and March 31.

4. If the direct diversion season is year round or partially within the season of diversion allowed by this Policy, the senior demand shall be prorated by multiplying its face value or maximum annual use by the ratio of the months in the Policy's diversion season divided by the number of months authorized by the senior permit or license, unless more detailed water use information is known.

5. To be conservative, assume storage reservoirs are empty at the beginning of the diversion season. Therefore the demand for the storage right is the capacity of the reservoir, unless the water right for the reservoir authorizes refill. If a reservoir has a minimum pool which is not normally depleted, the amount of water held in the minimum pool may be taken into consideration in calculating the available storage capacity.

6. If the authorized collection season for storage reservoirs extends beyond March 31, either assume the reservoir(s) are full by March 31, or sum up the volume of water collected every month under the senior demand between the start of diversion season and March 31. The water collected to storage each month should be based on the proration methods to calculate the average seasonal unimpaired flow volume described in method A of section A.2.1.3, unless an alternative method is authorized by the State Water Board.

A.2.2 Analysis of Unappropriated Water to Supply the Proposed Project

An analysis of unappropriated water to supply the project is necessary to determine if there is sufficient water to supply the proposed project after senior rights are accounted for. As stated in A.1.2, the flow path from the proposed point of diversion to the Pacific Ocean or to a regulated mainstem river shall be identified for this analysis. Any senior water right with a point of diversion along this identified flow path shall be identified as a point of analysis for water supply. Only senior water rights with a season of diversion within or overlapping the diversion season of the application need to be considered. The analysis includes the following steps:

1. The analysis shall include a determination of the percentage of unappropriated water supply available at each identified senior POD. This shall be determined by subtracting the seasonal demand volume of all senior water right holders in the watershed upstream of each identified senior POD from the average seasonal unimpaired flow volume at the identified senior POD, then dividing this quantity by the average seasonal unimpaired flow volume. To obtain a percentage, multiply this value by 100. All results shall be presented in a table listing the calculated percentage for each identified senior POD.

2. To assist with the selection of points of interest, a comparison of the remaining unappropriated water supply versus the proposed project's demand shall be determined at each identified senior POD. The remaining unappropriated water supply is determined by subtracting the seasonal upstream demand volume within the watershed of the identified senior POD from the seasonal unimpaired flow volume at the identified senior POD. This value and the proposed project's demand volume shall be compared at each identified senior POD for the purposes of (1) identifying locations where the proposed project is likely to have minimal impacts to the rate of flow, and (2) to assist with selection of points of interest for the instream flow analysis. The comparison shall consist of dividing the proposed project's volume by the remaining unappropriated water supply. These values shall also be presented in a table.

3. The Water Supply Report shall include a **flow frequency analysis** of the seasonal unimpaired flow volume. A set of flow frequency analyses shall be performed at the proposed POD, the senior POD at which the percentage calculated in step 1 is the lowest, and any other senior PODs at which the ratio is less than 50%, if any. The frequency of occurrence of the average seasonal unimpaired flow volumes for each year of record should be determined and plotted graphically. The frequency of occurrence can be obtained from the Weibull formula:

F=1-(m/(N+1)),

where:

F = the frequency of occurrence,

m = the rank of the average seasonal unimpaired flow volume, with the largest value receiving m=1, and

N = the length of the gage data record, in years.

Generate graphs of frequency of occurrence plotted against average seasonal unimpaired flow volume. Draw a curve of best fit through the data points. A separate graph will be needed for each POD evaluated.

All the analysis described above shall be presented in report format with all necessary tables and graphs.

A.2.2.1 Map Requirements

The applicant shall provide maps with the Water Supply Report that the State Water Board may use to assist with the selection of POIs. Either digital or hard-copy maps may be submitted. The maps shall be in full color, no smaller than 11”X14”, and shall be large enough to present the following information in sufficient detail.

1. The maps shall display topographic contours equivalent to those on USGS 7.5 minute quads.

2. The maps shall be large enough to trace the watershed from the proposed project down to one of the following: (1) the nearest regulated mainstem river, or (2) the Pacific Ocean.

3. All of the PODs associated with the proposed project, including reservoir footprints and place of use footprints. All shall be clearly marked.

4. The identified flow path of watercourses affected by the proposed POD(s) shall be clearly marked. If an affected watercourse is not a blue line stream on a USGS quad map, the applicant shall draw it in manually.

5. The PODs of senior water rights identified along the flow path that were used in the Water Supply Report shall be clearly marked.

6. The applicant shall note on the maps the locations of PODs within the watershed between the proposed POD(s) and the river/ocean used above. Include all pending applications, permits, licenses, small domestic use registrations, livestock stockpond use registrations, riparian users, and pre-1914 rights.

A.2.3 Is there unappropriated water to supply the proposed project?

After submittal of the Water Supply Report, the State Water Board will evaluate the unappropriated water supply that exists for the proposed project. This is not a determination of water availability because the effects of the proposed project, in combination with senior diversions, on instream flows needed for fishery resources, have not been evaluated yet.

A.2.4 Can the requested amount for the proposed project be adjusted?

If there does not appear to be a sufficient amount of unappropriated water to supply the proposed project, the applicant must decide whether the proposed project can be modified to use only the available unappropriated water supply. This decision provides the applicant an opportunity to continue with a modification of the requested amount rather than having the application denied.

A.2.5 Insufficient Unappropriated Water Supply

If the Water Supply Report shows that the amount of water requested by the proposed project is greater than the amount of unappropriated water remaining instream after senior vested rights and permits are accounted for, and the requested amount is not modified, the application may be denied.

If there are competing applications on a watercourse and there is sufficient unappropriated water to supply senior vested water rights and permit holders, but not sufficient unappropriated water available to also supply all competing applications, the State Water Board may choose between the competing applications for the water, and where factual circumstances warrant, adjust the relative priorities of the applications (Wat. Code, §§ 1253 and 1255.) The State Water Board may do so when it is in the public interest.

A.3.0 Determination of the Upper Limit of Anadromy

If there is sufficient unappropriated water to supply the proposed project, the applicant will need to evaluate the effects of senior diversions and the proposed project on instream flows needed for fishery resources to determine if the unappropriated water is available for diversion. Before this evaluation can be completed, the upper limit of anadromy needs to be determined because the watershed drainage area at the upper limit of anadromy is needed to calculate the minimum bypass flow. Additionally, the upper limit of anadromy location will aid the State Water Board in its selection of points of interest for the evaluation of the effects on fishery resources.

The upper limit of anadromy is defined as the upstream end of the range of anadromous fish that currently are, or have been historically, present year-round or

seasonally, whichever extends the farthest upstream. The upper limit of anadromy may be located on a perennial, intermittent, or ephemeral stream.

In some cases, the historic upper limit of anadromy is not known with certainty. In those cases, if the stream reach from which the applicant proposes to divert water appears to support fish under unimpaired conditions, the State Water Board will presume that the POD is located within the range of anadromous fish. This presumption might result in higher calculated minimum bypass flows than would be needed if the POD is actually upstream of the upper limit of anadromy. The applicant may overcome this presumption by demonstrating that the upper limit of anadromy is at a different location on the stream reach between the POD and the basin outlet, based on one of the following:

1) A study, previously accepted by the State Water Board, NMFS, or DFG, that identifies the location of the upper limit of anadromy on the stream reach between the POD and the basin outlet. Previous studies or surveys that catalog only the presence or absence of anadromous fish might not accurately define the upper limit of anadromy.

2) Information demonstrating that the gradient of a segment of the stream reach between the POD and the basin outlet exceeds a continuous longitudinal slope over a distance of large enough magnitude that anadromous fish can not move upstream beyond the lowest point of the gradient. The gradient shall be a continuous longitudinal slope of 12%, or greater, over a distance of 330 feet along the stream (R2 Resource Consultants, 2007b).

3) Site-specific studies conducted by a qualified fisheries biologist. The applicant may refer to stream classification determinations that were made in accordance with the methods in section 4.2 of the policy for preliminary refinement of the geographic extent of the site-specific study. Fisheries biologist qualifications are described in section A.3.1 Prior to conducting the site-specific study, the name(s) and qualifications of the individual(s) selected to perform the studies shall be submitted to the State Water Board for review and approval. The site-specific studies shall consist of any of the following:

    a. Identification of an impassable natural waterfall. This policy assumes all natural waterfalls are passable unless the applicant provides information satisfactory to the State Water Board that the waterfall is impassable. This information shall include, at a minimum, an evaluation of waterfall drop height, leaping angle, and pool depth in comparison to the documented ability for the target anadromous fish species to successfully ascend the barrier.

b. Identification of an impassable human-caused barrier. The applicant may choose to demonstrate that the upper limit of anadromy is located below a human-caused barrier such as a dam, culvert, or bridge. This policy assumes that all human-caused barriers are passable or can be made passable unless the applicant provides information satisfactory to the State Water Board that a man-made barrier is impassable and will never be made passable.

c. Habitat-based stream survey that delineates the upper limit of anadromy based on quantifiable stream conditions.

The applicant shall submit a report documenting the upper limit of anadromy determination. The State Water Board shall review the submitted information. If the State Water Board finds the information does not support the request to use a different location for the upper limit of anadromy, the applicant shall proceed with the assumption that the POD is within the range of anadromy.

A.3.1 Fisheries Biologist Qualifications

A qualified fisheries biologist is a person with a bachelor's or higher degree in fisheries biology, wildlife biology, aquatic biology, wetland ecology or equivalent other course of study; and five or more years of professional experience in conducting fish habitat assessments. Documentation of qualifications shall be submitted to the State Water Board for approval. Examples of documentation include co-authorship of reports on fish habitat assessments, documentation of presence during field data collection work, or providing a letter from an employer or research facility. Persons proposing to conduct either (1) site specific studies to modify regional policy criteria, or (2) biological assessments for the watershed approach shall provide documentation of direct, substantial participation in at least two previous fish habitat instream flow studies.

A.4.0 Selection of Points of Interest (POIs)

After review and approval of the Water Supply Report and the upper limit of anadromy determination, the State Water Board shall select POIs for an analysis of the effects of the proposed project, in combination with other water diversions, on instream flows. A POI is a location on a stream channel where the applicant shall analyze the effects of the proposed project, in combination with other water diversions, on fishery resources. The POIs identified for analysis will be selected by the State Water Board in consultation with DFG. The POIs will be selected at the following locations:

1. The proposed POD;

2. The upper limit of anadromy, if it is located downstream of the POD; and

3. Locations at which the proposed project may adversely affect instream flows needed for protection of fishery resources. These may include, but are not limited to, locations where fish are present, locations directly upstream or downstream of the confluence of tributaries to the basin mainstem, locations downstream of onstream storage reservoirs, or locations downstream of direct diversion projects or diversions to offstream storage.

At a minimum, two POIs will be selected for the analysis.

Locations at which the proposed project could not adversely affect instream flows needed for protection of fishery resources may be determined using the ratio of the proposed POD's water demand to the remaining instream flow available after accounting for senior demands, which was calculated in step #2 of section A.2.2. A POI location at which the proposed project's demand is less than one percent of the remaining unappropriated supply will be considered a location at which the proposed project could not adversely affect instream flows. Additional POIs may be required if there is substantial evidence showing that the proposed project may have an adverse effect on instream flows at another location.

A.5.0 Instream Flow Analysis

Even if the Water Supply Report demonstrates that there is unappropriated water to supply the proposed project, there still could be impacts to instream beneficial uses caused by the proposed project in combination with senior diversions. An analysis of impacts to instream flows is required to evaluate the impacts of the proposed project, in combination with senior diversions, to instream flows needed for the protection of fishery resources. This involves an evaluation of whether reductions in instream flows caused by the proposed project, in combination with reductions or potential reductions by senior diversions, still meets the policy's criteria for minimum bypass flow and maximum cumulative diversion. Senior diverters include any unpermitted applications with a higher priority than the project being analyzed and any claims of a pre-1914 or riparian water right. In cases where the Instream Flow Analysis demonstrates that the proposed project, in combination with senior diversions, significantly affects instream flows, water may not be available for appropriation.

The following sections contain methods for evaluating the impacts to instream flows and for determining if water is available for appropriation. These methods include:

1. Steps that can be used to obtain a streamlined water availability determination by evaluating existing instream flow conditions resulting from senior diversions that received permits prior to the adoption of this policy (sections A.5.3 through A.5.10);

2. A daily flow study method, for projects that cannot obtain a streamlined water availability determination, to assess whether the proposed project, in combination with senior diversions, will affect instream flows needed for fishery resources (sections A.5.11 through A.5.13); and

3. Guidance for conducting site-specific studies to obtain variances to the regional criteria (section A.6.0).

A.5.1 Will the regional criteria for diversion season, minimum bypass flow and maximum cumulative diversion rate be used?

This decision allows the applicant to choose whether to (1) complete the instream flow analysis using the regional criteria for diversion season, minimum bypass flow and maximum cumulative diversion, or (2) go directly to conducting a site-specific study to develop site-specific criteria, then complete the instream flow analysis using the site-specific criteria.

Most applicants would probably perform the instream flow analysis using the regional criteria first, then conduct a site-specific study for a variance from the regional criteria if the analysis indicates that the proposed project may negatively impact the instream flows needed for fishery resources. However, the applicant has the option to go directly to site-specific studies, especially if there is existing information available that indicates that a variance to the regional criteria may be warranted or other site specific information is readily available. The site-specific study requirements are described in section A.6.0.

A.5.2 Initial calculations needed for Instream Flow Analysis

After the POIs have been selected, the applicant will need additional information to complete the analysis of the impacts to instream flows. The stream flow records and the information on senior water right holders from State Water Board Division of Water Rights files that have already been gathered will be used in this analysis. In addition the applicant will need to calculate the following at the POIs:

- Drainage area, using methods previously described in section A.2.1.1;
- Average annual precipitation, using methods previously described in section A.2.1.2;
- Mean annual unimpaired flow (section A.5.2.1);
- Minimum bypass flow (section A.5.2.2), and
- Maximum cumulative diversion (section A.5.2.3).

A.5.2.1 Estimate the mean annual unimpaired flow at the POIs

Mean annual unimpaired flow is the average rate of flow past a location if no diversions (impairments) were taking place in the watershed above that point.

Mean annual unimpaired flow shall be estimated by one of the following methods: (A) adjustment of streamflow records, (B) using a precipitation-based streamflow model, or (C) another method acceptable to the State Water Board.

A. Adjustment of streamflow records method

Steps required for this method are:

1. From the streamflow records collected in A.1.1, select a streamflow gage near the POD with at least ten water years of complete record of streamflow (streamflow time series). The water years do not have to be over a continuous time period if not available. Missing data that has been filled with estimates by the agency operating the gage based on standard methods is acceptable for use.

2. Calculate the mean annual flow rate at the gage by summing the recorded daily streamflow data for each day in the period of record and dividing it by the number of days in the period of record. Do not include data recorded for partial water years.

3. If the gage is located in a watershed that is impaired by water diversions, the mean annual flow rate at the gage shall be adjusted for the impairments to obtain an estimate of the unimpaired mean annual flow rate at the gage (Q_{gage}). The details of how the upstream demands were estimated, and how they were used to unimpair the gage shall be detailed in the analysis report. Use of average annual demand is acceptable for the purposes of this analysis.

4. The mean annual unimpaired flow rate at each POI is calculated from Q_{gage} by multiplying by the ratio of drainage areas and precipitation, according to the following equation:

$$Q_{POI} = Q_{gage} * (DA_{POI} / DA_{gage}) * (P_{POI} / P_{gage})$$

where:

Q_{POI} = mean annual unimpaired flow rate estimated at the POI, in cubic-feet per second;
Q_{gage} = unimpaired mean annual flow rate recorded at the gage, in cubic-feet per second;
DA_{POI} = drainage area at the POI, in square miles;
DA_{gage} = drainage area at gage, in square miles;
P_{POI} = average annual precipitation of the POI, in inches; and
P_{gage} = average annual precipitation of the gage, in inches.

B. Precipitation-Based Streamflow Model

Subject to State Water Board approval, the applicant may propose using standard hydrologic techniques or public domain computer models for estimating the mean annual unimpaired flow at the POI. This analysis shall be based on a ten-year simulation period, at a minimum. Model results shall be validated by comparison with recorded flows on or near the POD watershed. The recorded flows do not have to be unimpaired but the applicant shall take the impairment into consideration when calibrating the model. Model submittal requirements are described in section 4.1.1.1 of the policy.

A.5.2.2 Regional Criteria for the Minimum Bypass Flow

The minimum bypass flow is estimated using equations that are based on **watershed** drainage area, mean annual unimpaired flow, and the upper limit of anadromy in the watershed.

1. The minimum bypass flow for watershed drainage areas less than or equal to 290 square miles is provided in the following equation:

$$Q_{MBF} = 8.7\ Q_m\ (DA)^{-0.47}$$

where:

Q_{MBF} = minimum bypass flow in cubic feet per second;
Q_m = mean annual unimpaired flow in cubic feet per second; and
DA = the watershed drainage area at the POI in square miles. For POIs located at the POD, if the upper limit of anadromy is downstream of the POD, use the drainage area at the upper limit of anadromy.

2. The minimum bypass flow for watershed drainage areas greater than 290 square miles is:

$$Q_{MBF} = 0.6\ Q_m$$

where:

Q_{MBF} = minimum bypass flow in cubic feet per second; and
Q_m = mean annual unimpaired flow in cubic feet per second.

The minimum bypass flow shall be calculated at every POI used in the instream flow analysis.

A.5.2.3 Regional Criteria for the Maximum Cumulative Diversion

The maximum cumulative diversion is equal to 5 percent of the 1.5-year instantaneous peak flow, in cubic feet per second. The 1.5-year instantaneous peak flow is the maximum instantaneous peak stream flow that occurs or is exceeded, on average over the long term, once every one and a half years. The

frequency at which this peak flow is expected to occur is referred to as the **recurrence interval**. The 1.5-year instantaneous peak flow shall be calculated at each POI either by peak flow frequency analysis of instantaneous peak flow records, by regional regression methods, or other method acceptable to the State Water Board. Details on these methods are provided in the following sections.

A. Peak flow frequency analysis method

If peak flow data are available for a minimum of ten complete water years for a gage at a location on or near the POI watershed, the applicant may calculate the 1.5-year instantaneous peak flow using peak flow frequency analysis. The peak flow frequency analysis assumes that the instantaneous peak flow data are representative of unimpaired conditions.

The peak flow frequency analysis shall be performed using either the annual flood methodology described in Bulletin 17B "Guidelines for Determining Flood Flow Frequency" (IACWD, 1982) or the peaks over threshold methodology (also referred to as the partial duration method) described in Hydrology for Engineers (Linsley, et al, 1982). A summary of each methodology is provided below.

The peak flow frequency analysis results provide the 1.5-year instantaneous peak flow at the gage. The 1.5-year instantaneous peak flow at each POI shall be estimated from the 1.5-year instantaneous peak flow at the gage using the proration methods described in method A of section A.5.2.1.

A.1. Bulletin 17B Flood Flow Frequency methodology

The following is a summary of the basic steps needed to determine the instantaneous 1.5 year peak flow based on the Bulletin 17B guidelines. Bulletin 17B provides guidelines for determining flood flow frequency using annual peak flow data in a log-Pearson Type III distribution. Before starting the analysis, the peak flow from each year of record should be ranked in order of magnitude with the highest annual peak flow in the data set receiving a rank of 1 and the lowest receiving the rank of the N^{th} year of record. After ranking the annual peak flow data the following steps should be taken to determine the instantaneous 1.5 year peak flow for the gage:

1. Calculate the base 10 logarithm (Log) of each annual peak flow value Q_i.
2. Calculate the average of all the Log Q_i values
3. Calculate the standard deviation (S) of the Log Q_i values using the following equation:

$$S = \left[\frac{\sum_{i=1}^{N} \left(X_i - \overline{X} \right)^2}{(N-1)} \right]^{0.5}$$

where:

X_i = Log Q_i

$\overline{X}$ = the average of the Log Q values

N = number of years of annual peak flow data

4. Calculate the skew coefficient (G) using the following equation:

$$G = \frac{N \sum_{i=1}^{N} \left(X_i - \overline{X} \right)^3}{(N-1)(N-2)S^3}$$

where:

X_i = Log Q_i

$\overline{X}$ = the average of the Log Q_i values

N = number of years of annual peak flow data

S = the standard deviation

5. Using the calculated skew coefficient and an exceedance probability of 0.66 (1.5 year recurrence interval) determine the frequency factor K from Appendix 3 of Bulletin 17B

6. Calculate the instantaneous 1.5 year peak flow using the following equation:

$$Q = 10^{\overline{X} + KS}$$

A hard-copy of Bulletin 17B is available for purchase from the National Technical Information Service (NTIS), Springfield VA 22161, as report no. PB 86 157 278.

A digital copy of Bulletin 17B is available for free download in PDF format from the USGS web page at http://water.usgs.gov/osw/bulletin17b/bulletin_17B.html.

A.2. Peaks over threshold method

The peaks over threshold method (also referred to as the partial duration method) is more accurate for recurrence intervals less than five years (Linsley et al, 1982). Steps required are as follows:

1. Select a flow threshold so that approximately three peaks over the threshold will be recorded per year on average.

2. Select all distinct well-separated flood peaks exceeding the selected flow threshold.

3. Rank the peaks from largest to smallest.

4. Estimate the recurrence interval, T, for each peak flow by the Weibull formula:

$$T=(N+1)/m$$

where:

T= recurrence interval in years;
N= the record length in years; and
m=the rank of the peak, the largest peak having m=1.

5. Plot the magnitude of the peak flow versus the recurrence interval on log-log scale and estimate the 1.5-year instantaneous peak flow from a curve fit of the data.

B. Regional regression method

If the regional regression method is used for the peak flow analysis, then the most accurate regional regression method available shall be used.

No regional regression equations are currently available to estimate the 1.5-year instantaneous peak flow in the policy area. The USGS California peak-flow equations developed by Waanen and Crippen (1977) can be used to estimate the instantaneous peak flow for higher recurrence interval floods. The 1.5-year instantaneous peak flow can be extrapolated from the higher recurrence interval flood peak flows as follows:

1. Calculate the instantaneous peak flows for 2-year, 5-year, 10-year and 25-year recurrence intervals based on the following equations:

$$Q_{peak\ 2\text{-}year} = 3.52 * DA^{0.90} * P^{0.89} * H^{-0.47}$$
$$Q_{peak\ 5\text{-}year} = 5.04 * DA^{0.89} * P^{0.91} * H^{-0.35}$$

$$Q_{peak\ 10\text{-}year} = 6.21 * DA^{0.88} * P^{0.93} * H^{-0.27}$$
$$Q_{peak\ 25\text{-}year} = 7.64 * DA^{0.87} * P^{0.94} * H^{-0.17}$$

where:

Q_{peak} = instantaneous peak flow at the specified recurrence interval in cubic feet per second;
DA = drainage area in square miles;
P = average annual precipitation in inches;
H = altitude index calculated as the average of elevation in thousands of feet at points along the main channel at 10 percent and 85 percent of the distances from the POI to the watershed divide. In the policy area, H has a minimum value of 1.0.

2. Using the instantaneous peak flows and the natural log of the recurrence intervals, develop a straight line of best fit. The straight line fit shall be in an equation of the form:

$$Q_{peak\ yr} = A * \ln(yr) + B$$

where:

$Q_{peak\ yr}$ = peak flow in cubic feet per second for the specified recurrence interval in years;
Yr = recurrence interval in years;
A = the slope of the straight line fit of peak flows to the log of the recurrence intervals;
B = the y-intercept of the straight line fit of peak flows to the log of the recurrence intervals.

3. Determine the 1.5-year instantaneous peak flow by extrapolating along the straight line down to the 1.5-year recurrence interval.

A.5.3 Are there senior diverters with onstream storage in the watershed upstream of any POI that do not have adequate minimum bypass flow rates or do not have adequate maximum rates of diversion in their permits or licenses?

Reservoirs associated with onstream dams have historically operated as “fill and spill” facilities. Diversions to onstream storage have the potential to reduce instream flows to levels below those needed for the protection of fish and fish habitat during the time that their storage is filling for the following reasons:

a. Diversions to onstream storage that do not have minimum bypass flow terms that conform to policy requirements may contribute to inadequate instream flows needed for spawning and passage in the stream channel downstream of the dam during the fill period.

b. Diversions to onstream storage that do not have maximum rate of diversion terms that conform to policy requirements may contribute to inadequate channel maintenance flows in the stream channel downstream of the dam during the fill period because the diversions have no limitations as to how fast water is removed from the stream.

If the project is allowed to divert water during the period that these permitted or licensed reservoirs are filling, the project may cause further reductions in instream flows, even if the project complies with the regional criteria for minimum bypass flow and maximum cumulative diversion.

Use the following steps to determine whether there are any senior diverters in the watershed that do not have requirements to bypass enough water to protect stream flows needed for spawning and passage or do not have requirements that adequately control the rate at which collection of flows into the reservoir occurs.

1. Check the State Water Board Division of Water Rights files and records to locate senior diverters in the watershed that have:

    a. Onstream storage with no minimum bypass term;
    b. Onstream storage with minimum bypass flow terms that do not conform to policy requirements; or
    c. Onstream storage without a maximum rate of diversion term.

2. If there are no senior diverters in the watershed upstream of any POI that fall into any of these three categories, the applicant may proceed to section A.5.6. If there are senior diverters in the watershed that fall into any of these three categories, the applicant shall proceed to section A.5.4.

A.5.4 Can the diversion season of the proposed project be delayed until after senior onstream storage is full?

If there are senior diverters in the watershed with onstream storage that do not have adequate minimum bypass flow terms or maximum rate of diversion terms, to prevent further reductions in instream flow during the time which senior reservoirs are filling, the applicant may modify the start of the proposed project's diversion season to begin after all senior onstream storage without adequate minimum bypass flows or without maximum rates of diversion are full. Suggested procedures for estimating the number of days the proposed project's diversion season may be delayed are as follows:

1. Calculate the unimpaired mean monthly flow, $Q_{POD, month,}$ at each onstream storage POD by scaling the unimpaired mean monthly flow at the gage according to drainage area and precipitation, using the following equation:

$$Q_{POD, month} = Q_{gage, month} * (DA_{gage} / DA_{POD}) * (P_{gage} / P_{POD})$$

where:

$Q_{POD, month}$ = unimpaired mean monthly flow during the specified month at each onstream storage POD, in cubic feet per second;

$Q_{gage, month}$ = mean monthly flow recorded at the gage, in cubic-feet per second;

DA_{POD} = the drainage area at each onstream storage POD, in square miles;

DA_{gage} = the drainage area at the gage, in square miles;

P_{POD} = the average annual precipitation at the POD, in inches; and

P_{gage} = the average annual precipitation at the gage, in inches

2. Determine the number of days until storage is full at each onstream storage POD, starting at the most upstream onstream storage POD, according to the following steps:

    a. With the following exception, assume that onstream storage volume is empty at the start of the diversion season. A different assumption may be used if actual operating conditions are known. Supporting information must be provided to the State Water Board for review and approval.

    b. Convert the unimpaired mean monthly flow for each on-stream reservoir ($Q_{POD, month}$) from cfs to acre-feet per day by multiplying by 1.9835. For each on-stream reservoir, divide the storage volume in acre feet by the unimpaired mean monthly flow ($Q_{POD, month}$) in acre feet per day to calculate the number of days it takes for each reservoir to fill. If a reservoir does not fill in the first month of the analysis (typically October) repeat the process for each consecutive month, accounting for accumulated storage from previous months, until the reservoir is full.

    c. In cases where multiple on-stream reservoirs are in-line (i.e, located on a common stream segment) above a POI, the reservoir volumes may be summed and evaluated as a single reservoir. Alternatively, each reservoir may be evaluated separately; in which case the inflow to each reservoir must account for the rate of collection at any upstream reservoir(s), in other words, the impairment of flow due to each onstream reservoir must be calculated sequentially starting at the most upstream reservoir and moving downstream.

    d. Add the number of days to fill each reservoir to the respective start dates of the diversion season. Determine the date on which the last reservoir fills. This is the date on which the proposed reservoir may begin diverting water without overlapping with the period when senior onstream dams are filling.

A.5.5 Modify the Diversion Season of the Proposed Project so that Diversion Begins After all Senior Onstream Storage is Full

If the analysis shows that all senior onstream storage is filled before the end of the proposed diversion season, the applicant may request to delay the start of the diversion season to begin after all senior onstream storage is full, then continue with the analysis described in A.5.6. If the applicant does not want to delay the start of the proposed diversion season, then the applicant shall conduct daily flow studies to evaluate whether the proposed project, in combination with senior diversions, may be causing flow reductions that may result in conditions that are not protective of fishery resources. The details of the daily flow studies are provided in section A.5.11.

A.5.6 Are there any senior direct diversions or direct diversions to offstream storage that do not have adequate minimum bypass flow terms between the proposed POD and any POI?

Direct diversions that do not have protective minimum bypass flow requirements have the potential to divert water needed for fish spawning and passage. Even if the project provides minimum bypass flow according to policy criteria, there could be situations in which this is not adequate. For example, if there are downstream senior diverters without adequate minimum bypass flows, the project could be diverting when downstream flows are inadequate for spawning and passage, potentially exacerbating an existing low flow condition if the minimum bypass flow at the applicant's POD is not increased.

The first step in this evaluation involves checking the State Water Board's files and records to determine if there are any senior direct diversions or diversions to offstream storage between the POD and any POI that either do not have minimum bypass flow requirements or have minimum bypass flow requirements that do not conform to the policy's regional criteria. If there are no senior direct diversions or diversions to offstream storage that meet these conditions, then the applicant may proceed to section A.5.9, otherwise the analysis must continue with section A.5.7.

A.5.7 Can the minimum bypass flow for the proposed project be increased to prevent possible increase of diversions from flows needed for spawning and passage at downstream POIs?

If there are senior direct diversions or diversions to offstream storage downstream of the proposed project that have inadequate bypass flow requirements, the applicant may increase the minimum bypass flow at the proposed project to ensure that the proposed project does not result in increased senior diversions from flows needed to protect fish. If the applicant decides to increase the bypass flow to account for senior direct diversions, then the analysis should continue with section A.5.8. If the applicant does not want to increase the minimum bypass flow at the

proposed project, then the applicant shall conduct daily flow studies to evaluate whether the proposed project, in combination with senior diversions, may be causing flow reductions that result in conditions that are not protective of fish and fish habitat. The details of the daily flow studies are provided in section A.5.11.

A.5.8 Increase the Minimum Bypass Flow at the Proposed POD to Prevent Impacts to Flows Needed for Spawning and Passage at Downstream POIs

The suggested steps for calculating an increased minimum bypass flow for the proposed project to prevent potential impacts to the minimum flows required for spawning and passage at downstream POIs are as follows:

1. Calculate the impaired flow that occurs at each POI when the minimum bypass flow is being met at the POD using the following equation:

$$Q_y = MBF_{POD} * (DA_{POI} / DA_{POD}) * (P_{POI} / P_{POD}) - DIV$$

where:

Q_y = impaired flow at the POI when the minimum bypass flow is being met at the POD, in cubic feet per second;
MBF_{POD} = minimum bypass flow at the proposed POD based on the regional criteria, in cubic feet per second;
DA_{POI} = the drainage area at the POI, in square miles;
DA_{POD} = the drainage area at the POD, in square miles;
P_{POI} = the average annual precipitation of the POI, in inches;
P_{POD} = the average annual precipitation of the POD, in inches; and
DIV = the sum of the rates of diversion (direct diversion and collection to offstream storage) for all senior diversions that occur during the diversion season, that have inadequate minimum bypass flow terms, located between the POD and the POI, in cubic feet per second.

2. For each POI, calculate the quantity ($MBF_{POI} - Q_y$), where

MBF_{POI} = minimum bypass flow at the POI based on the regional criteria, in cubic feet per second; and
Q_y = impaired flow at the POI when the minimum bypass flow is being met at the POD, in cubic feet per second.

3. If the impaired flow, Q_y, at a POI is less than the necessary minimum bypass flow for the same POI, the minimum bypass flow at the applicant's proposed POD shall be increased according to the following equation:

$$MBF'_{POD} = MBF_{POD} + \text{the largest value of } (MBF_{POI} - Q_y)$$

where:

MBF'_{POD} = revised minimum bypass flow at the proposed POD, in cubic feet per second;
MBF_{POD} = minimum bypass flow at the proposed POD based on the regional criteria, in cubic feet per second;
MBF_{POI} = minimum bypass flow at the POI based on the regional criteria, in cubic feet per second; and
Q_y = impaired flow at the POI when the minimum bypass flow is being met at the POD, in cubic feet per second.

4. If the results of step 2 show that for all POIs, Q_y is greater than or equal to the minimum bypass flow at the POI calculated with the regional criteria, the minimum bypass flow at the proposed POD does not need to be increased.

A.5.9 Calculate the Sum of the Diversion Rates of Senior Diversions and the Proposed Project for the Watershed Upstream of Each POI

The maximum cumulative diversion is the criteria used for the protection of channel maintenance flows. It is the limit placed on the sum of the rates of diversion for all diversions in the watershed upstream of a POI. The value of the calculated criteria is used to evaluate whether (1) a proposed onstream dam requires a maximum rate of diversion as a permit term or condition, or (2) whether a proposed maximum rate of diversion for a direct diversion or diversion to offstream storage needs modification to ensure the maximum cumulative diversion criteria for the watershed is not exceeded.

Estimate the sum of the diversion rates of senior diverters and the proposed project in each POI's watershed according to the following steps:

1. Locate all senior diversions in the POI's watershed.

2. Obtain a rate of diversion for each of the senior diversions using the following guidelines:

   a. If the senior diversion is to onstream storage:

      (i) with a storage period determined in section A.5.4 to end before the start of the diversion season for the proposed project, use a rate of diversion of zero.

      (ii) with a maximum rate of diversion term on the water right permit, use the specified maximum rate of diversion;

   b. If the senior diversion is a direct diversion or diversion to offstream storage

(i) that does not divert water during the diversion season for the proposed project, use a rate of diversion of zero.

(ii) that does divert water during the diversion season for the proposed project, use the maximum rate of diversion specified on the water right permit or license. If a maximum rate of diversion is not specified, use the specified rate of diversion.

3. Obtain a maximum rate of diversion for the proposed project using the following guidelines:

    a. If the proposed project is to onstream storage:

    (i) with a requested maximum rate of diversion, use the specified maximum rate of diversion;

    (ii) with no requested maximum rate of diversion, the maximum diversion rate cannot be determined and a daily flow study is needed.

    b. If the proposed project is a direct diversion or diversion to offstream storage, use the maximum rate of diversion requested on the application.

4. Calculate the sum of the diversion rates in each POI's watershed by summing the rates of diversion for every senior diversion in the POI watershed and the proposed project.

A.5.10 Is the maximum cumulative diversion criteria exceeded at any POI?

Calculate the maximum cumulative diversion criteria for the watershed at each POI using the procedures described in section A.5.2.3. If the sum of the diversion rates calculated in section A.5.9 is smaller than the maximum cumulative diversion criteria for the corresponding POI, then there is enough water available for the proposed project. If there is any circumstance where the sum of the diversion rates calculated in section A.5.9 is larger than the maximum cumulative diversion criteria for the corresponding POI, a daily flow study is required to determine whether there is enough water available for the proposed project.

A.5.11 Daily Flow Study

The daily flow study shall assess the effects of the proposed project, in combination with senior diversions, to instream flows required for passage, spawning, and channel maintenance at each POI. The following steps are required:

1. Estimate time series of unimpaired daily flow at the POI during the proposed diversion season for each year in the period of record;

2. Estimate daily time series of impaired flow at each proposed POD, if the proposed POD is impaired by senior diversions, and the POI without the proposed project during the proposed diversion season for each year in the period of record;

3. Estimate the daily time series of impaired flow at each proposed POD and the POI with the proposed project during the proposed diversion season for each in year in the period of record;

4. Estimate effects to instream flows required for spawning and passage; and,

5. Estimate effects to instream flows needed for channel maintenance.

These steps are described in detail in sections A.5.11.1 through A.5.11.5.

The applicant shall submit a report that documents the daily flow study. The report shall provide a summary of the following:

(1) The estimated effects of the proposed project and senior diversions on instream flows needed for spawning and passage, including an evaluation of the number of days that instream flows meet or exceed the minimum bypass flow at each POI for the period of record for three flow conditions: unimpaired; impaired without the proposed project; and impaired with the proposed project.

(2) The estimated effects of the proposed project and senior diversions on channel maintenance flows, which consists of calculating the 1.5-year instantaneous peak flow for three flow conditions: unimpaired, impaired without the proposed project, and impaired with the proposed project, then comparing these values against the maximum cumulative diversion criteria; or comparing impaired conditions with and without the project.

A.5.11.1 Estimate time series of unimpaired daily flow at the POI

The unimpaired daily flow is the average daily rate of flow past a POI if no diversions (impairments) were taking place in the watershed above that point. The time series of unimpaired daily flow is a continuous record of unimpaired daily flows. The time series shall include at least ten complete water years*. Data must be

complete for the water years used but the water years do not have to be consecutive if the data is not available.

The time series of unimpaired daily flow past a POI shall be calculated using methods similar to those used to estimate the mean annual unimpaired flow in A.5.2.1. The methods used to estimate the time series required for the daily flow study differ slightly and are as follows:

A. Adjustment of streamflow records method

Collect the daily streamflow data records for the gage selected for analysis in method A of section A.1.1. Estimate the time series of daily flow at the POI by multiplying the daily flow at the gage by the ratio of the drainage area and precipitation using the methods described in method A of section A.1.1.

For the daily flow study, the gaged record may be assumed to represent unimpaired conditions.

B. Precipitation-based Streamflow Model

If a precipitation-based streamflow model was used in the earlier parts of the analysis to estimate the unimpaired mean annual flow, the time series of unimpaired daily flows that was generated shall be used for the daily flow study.

C. Another method acceptable to the State Water Board

If another method acceptable to the State Water Board was used in the earlier parts of the analysis to estimate the unimpaired mean annual flow, the time series of unimpaired daily flows that were generated shall be used for the daily flow study.

A.5.11.2 Impair the unimpaired daily flows at the POIs using senior diversions without the proposed project.

The time series of impaired daily flows at a POI is estimated by calculating how much flow is diverted at senior PODs in the POI's watershed and how much continues downstream.

To obtain the time series of impaired daily flows at the POI, subtract the sum of the daily diversion rates for individual senior PODs in the POI's watershed from the daily unimpaired flow time series at the POI. The daily diversion rate is the rate at which water is taken based on the amount of water available instream on that day. In the case of direct diversion, the daily diversion rate may be as high as the maximum rate of diversion in the permit or license. For onstream reservoirs, the daily diversion rate is equal to the flowrate available instream until the reservoir is full, unless a maximum rate of diversion is specified. Daily diversion rates shall

account for minimum bypass flow requirements contained in the permit or license. Daily diversion rates may need to be adjusted for multiple diversions in series.

Diversions from individual senior PODs are subtracted from the flow at the POI until the following conditions are reached:

1. For reservoirs add up the volume collected over time until the individual reservoir is full.

2. For direct diversions, convert the daily diversion rate to a daily volume of water collected. Add up the daily volumes until the maximum annual use is reached, or the end of the diversion season is reached if no maximum annual use is provided in the permit or license.

Applicants may refer to section A.2.1.4 for assumptions that may be used for this analysis.

A.5.11.3 Impair the unimpaired daily flows at the POIs using senior diversions and the proposed project.

Recalculate the impaired flows at the POIs by including the proposed project, using the guidance described in section A.5.11.2.

A.5.11.4 Evaluate whether the proposed project contributes to reductions in instream flows needed for spawning and passage

Any time instream flows meet or exceed the minimum bypass flow, conditions are conducive for spawning and passage. This analysis provides an estimate of whether the proposed project, in combination with senior diversions, may decrease the number of days that spawning and passage could occur.

At each POI, calculate the following:

(1) the minimum bypass flow using the regional criteria from methods described in section A.5.2.2, if not already calculated;

(2) the unimpaired flow time series, using the procedure described in section A.5.11.1;

(3) the number of days that the unimpaired flow meets or exceed the minimum bypass flow;

(4) the impaired flow time series without the proposed project, using the guidance provided in section A.5.11.2;

(5) the number of days that impaired flows without the proposed project meet or exceed the minimum bypass flow;

(6) the impaired flow time series with the proposed project, using the guidance provided in section A.5.11.3; and

(7) the number of days that the impaired flows with the proposed project meet or exceed the minimum bypass flow.

If the number of days counted in (7) is equal to the number of days counted in (5), the proposed project does not contribute to a significant reduction in the instream flows needed for spawning and passage.

A.5.11.5 Evaluate whether the proposed project contributes to reductions in instream flows needed for channel maintenance

1. Estimate the 1.5-year instantaneous peak flow using the methods described in section A.5.2.3 for each of the three time series generated in sections A.5.11.1 through A.5.11.3 for each POI. These are the time series for unimpaired conditions, impaired conditions without the proposed project, and impaired conditions with the proposed project.

2. Calculate the following quantities at each POI:

   a. $$1 - \frac{\text{1.5 year instantaneous peak flow for impaired conditions without the project}}{\text{1.5 year instantaneous peak flow for unimpaired conditions}}$$

   b. $$1 - \frac{\text{1.5 year instantaneous peak flow for impaired conditions with the project}}{\text{1.5 year instantaneous peak flow for unimpaired conditions}}$$

3. At each POI evaluate the following two conditions:

   a. Whether the value calculated in 2a is equal to the value calculated in 2b, meaning that the proposed project causes no change to the existing instream flow conditions; or

   b. Whether the value calculated in 2b is less than 0.05, meaning the proposed project, in combination with senior demands, causes less than a 5 percent change to the 1.5-year instantaneous peak flow from unimpaired conditions.

   One of these two conditions must be met at each POI in order to show that the proposed project does not cause a reduction in instream flows needed for channel maintenance.

A.5.12 Does the proposed project affect instream flows needed for fishery resources using the regional criteria?

If the daily flow studies show that the proposed project, in combination with senior diversions, affects the instream flow needs of fishery resources using the regional criteria, then there may not be enough water available for the project as proposed.

If the daily flow studies indicate the proposed project, in combination with senior diversions, complies with the regional criteria, then water is available for the proposed project.

A.5.13 Can the project be modified?

If the daily flow studies indicate the proposed project, in combination with senior diversions, does not comply with the regional criteria, the applicant may modify the proposed project so that it complies with the regional criteria, or do site-specific studies to obtain variances from the regional criteria.

There are numerous ways in which the applicant could modify the project. Examples of project modifications include: reductions in the amount of water collected to storage, reductions in the rate of direct diversion, placing a cap on the maximum rate of diversion, or raising the minimum bypass flow.

Depending on the modification to the project, the applicant may need to conduct additional daily flow studies to demonstrate the modified project is protective of the instream flow needs of fishery resources. If the modified project complies with the regional criteria, water is available for appropriation.

If the project cannot be modified, or if the modified project still does not comply with the regional criteria, then the applicant may conduct site-specific studies to evaluate whether variances may be obtained from the regional criteria for diversion season, minimum bypass flow, and/or maximum cumulative diversion.

A.6.0 Site-specific Study to Obtain Variances From the Regional Criteria for Diversion Season, Minimum Bypass Flow and/or Maximum Cumulative Diversion

The applicant may conduct site-specific studies to support a request for the State Water Board to consider granting a variance from the regional criteria that is protective of instream flows.

The site-specific studies shall be conducted by a qualified fisheries biologist. Fisheries biologist qualifications are described in section A.3.1. Prior to conducting the site-specific studies, the name(s) and qualifications of the individual(s) selected to perform the studies shall be provided to the State Water Board for review and

approval. The results of the site-specific study shall be submitted to the State Water Board for review and approval. If the State Water Board approves the proposed variances to the regional criteria, the site-specific criteria may be used to evaluate whether there is enough water available for the proposed project while providing protective instream flows for fish and their habitat.

The site-specific study shall consist of the following elements:

1. For proposed variances from the regional criteria, the geographic scope of the site-specific study shall extend to all POIs.

2. A description, supported by scientific evidence, of the historical and current presence of anadromous salmonids by fish species and life history stages from the POD to the ocean or to the confluence with a flow-regulated watercourse.

3. A determination of the upper limit of anadromy. Procedures for determining the upper limit of anadromy are described in section A.3.0

4. Description of the proposed variance(s) from the regional criteria for diversion season, minimum bypass flow, and/or maximum cumulative diversion.

5. A scientifically based analysis using site specific data and reproducible methods demonstrating that the proposed variance(s) will be protective of instream flows needed for anadromous salmonid habitat. The analysis shall consist of hydraulic analysis, geomorphologic analysis, and aquatic habitat analysis; and shall evaluate the stream flows needed at the POIs for ensuring adequate flows exist for protection of the following anadromous salmonid life history stages and habitat needs:

    a. upstream passage if a variance to the minimum bypass flow criteria is proposed;
    b. spawning and incubation habitat if a variance to the minimum bypass flow criteria is proposed;
    c. maintenance of channel and riparian habitat if a variance to the maximum cumulative diversion criteria is proposed; and/or
    d. the effects of water temperature on summer rearing habitat and upstream (adult) and downstream (juvenile) migration if a variance to the season of diversion criteria is proposed.

6. Daily flow analysis shall be performed with the site-specific criteria to evaluate whether the proposed project, in combination with senior diversions, may affect instream flows needed for the protection of fishery resources. The method in section A.5.11 may be used for a

daily flow analysis, or the applicant may propose a site-specific method of analysis for State Water Board review and approval.

The applicant shall submit technical reports documenting the site-specific studies and daily flow analysis to the State Water Board for review and approval.

A.6.1 Does the proposed project affect instream flows needed for fishery resources using the site-specific criteria?

If the daily flow studies show that the proposed project, in combination with senior diversions, affects the instream flow needs of fishery resources using the site-specific criteria, then the project as proposed does not leave enough water in the stream. Water may not be available for appropriation.

A.6.2 Can the proposed project be modified?

If the daily flow studies show that the proposed project affects the instream flow needs of fishery resources, the proposed project may be modified so that enough water remains instream. Depending on the modification to the project, the applicant may need to conduct additional daily flow studies to demonstrate the modified project is protective of instream flows. If the project cannot be modified, water may not be available for appropriation, and further environmental analysis should be undertaken to provide information to determine whether a water right permit may be issued for the proposed project.

A.6.3 Modify the Proposed Project so that Protective Instream Flows are Maintained

There are numerous ways in which the applicant could modify the project so that enough water remains in the stream for the protection of fishery resources. The end result of the modifications shall result in compliance with the site-specific criteria. Examples of project modifications include: reductions in the amount of water collected to storage, reductions in the rate of direct diversion, placing a cap on the maximum rate of diversion, or raising the minimum bypass flow.

A.7.0 Water is Available for the Proposed Project

Water is available for appropriation if the water availability analysis demonstrates the proposed project does not impact senior diverters and the proposed project, in combination with senior diversions, does not adversely affect instream flows needed for fishery resources.

Appendix 2. Glossary of Terms

Active bar — In a stream channel, regions of distinct deposits of sand, gravel, or cobble that are not yet colonized by riparian vegetation, and which may be mobilized during high flow; includes mid-channel island deposits and point bars.

Aquatic benthic macroinvertebrate — Aquatic animals without backbones that can be seen by the unaided eye and typically dwell on rocks, logs, sediment or plants. Include, but are not limited to, insects, mollusks, amphipods, and aquatic worms. Common aquatic insects include, but are not limited to, mayflies, stoneflies, caddisflies, true flies, water beetles, dragonflies, and damselflies.

Aquatic non-fish vertebrate — Include, but are not limited to, aquatic mammals, such as beavers, river otters, and muskrats; amphibians, such as frogs and salamanders; and reptiles, such as snakes and turtles.

Aquatic plants — Include obligate wetland plants and frequent or dense groupings of facultative wetland plants. For complete descriptions, see Reed, USFWS (1988).

Average, also called mean — The sum of measured values divided by the number of samples. The average of a set of measured values is calculated as follows:

$$\text{Average} = \frac{\Sigma x}{n}$$

where: Σx is the sum of the measured values, and

n is the number of samples.

Bankfull width — The width of the water surface across the stream channel at which the stream first overflows its natural banks.

Canopy — The overhead branches and leaves of streamside vegetation.

Channel maintenance flows — Peak stream flows needed for maintaining stream channel geometry, gravel and woody debris movement, and other habitat needs of anadromous salmonids.

Channel thalweg — The line connecting the lowest or deepest points along a stream channel.

Coarse sediment, coarse gravel — Stones of ¼ inch size or larger, including debris flow, that either contribute directly to spawning gravel, or comminute to a smaller usable size, or influences stream channel morphology by forming a substrate framework.

Ecological functions and values (of riparian habitat) — Functions are onsite and offsite natural riparian habitat processes. Values are the importance of the riparian habitat to society in terms of health and safety; historical or cultural significance;

education, research, or scientific significance; aesthetic significance; economic significance; or other reasons.

Ephemeral stream — A stream or part of a stream that flows only in direct response to precipitation; it receives little or no water from springs, melting snow, or other sources; its channel is at all times above the water table.

Exceedence probability —The probability that a specified stream flow magnitude will be exceeded. The exceedance probability is equal to one divided by the recurrence interval.

Face value demand — The maximum amount of water that is authorized to be diverted under a water right permit or license.

Facultative wetland plants — Plants that usually occur in wetlands. Include, but are not limited to, marsh and rough horsetail, most species of bulrush and flatsedge that are not obligate wetland plants, stream or smooth violet, milk maids, red-osier and brown dogwood, California Spikenard or Elk Clover, blueberry, blackberry (except Himilaya Blackberry), and water birch. For a more detailed list, see Reed, USFWS (1988).

Flow frequency analysis — a statistical technique used by hydrologists for estimating the average rate at which floods, droughts, storms, stores, rainfall events, etc., of a specified magnitude recur.

Flow path — The direction water flows along its stream course from the point of diversion to the Pacific ocean or a regulated mainstem river.

Habitat suitability criteria — Structural and hydraulic characteristics of a stream that are indicators of habitat suitability for different fish species and life stages.

Histogram — A graphical representation of a frequency distribution. The range of the variable is divided into class intervals for which the frequency of occurrence is represented by a rectangular column; the height of the column is proportional to the frequency of observations within the interval.

Hydraulic conductivity — A measure of the capacity for a rock or soil to transmit water; generally has the units of feet/day or cm/sec.

Hydric soils — A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layers. A guide for delineating hydric soils is provided in USDA, NRCS, US Army Corps of Engineers, 2006.

Hydrograph — A graph showing for a given point on a stream the stream flow, stage (depth), velocity, or other property of water with respect to time.

1.5-year instantaneous peak flow — The maximum instantaneous peak stream flow that occurs or is exceeded, on average over the long term, once every one and a half years.

Instream cover — Areas of shelter in a stream channel that provide aquatic organisms protection from predators or competitors and/or a place in which to rest and conserve energy due to a reduction in the force of the current.

Intermittent stream — Has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Large wood — Wood pieces greater than six feet in length, or greater than approximately half the mean channel width evaluated upstream, above the influence of the dam, whichever is larger (R2 Resource Consultants, 2007c).

Mean, also called average — The sum of measured values divided by the number of samples. The mean of a set of measured values is calculated as follows:

$$\text{Mean} = \frac{\Sigma x}{n}$$ where: Σx is the sum of the measured values, and

n is the number of samples.

Mean riffle width — The average width of the stream channel bottom at a riffle based on several measurements taken along the entire reach of the riffle.

Mean channel bankfull width — The average top width of the stream channel at bankfull flows; in incised channels or steep mountain channels without a floodplain, the average wetted top width at the mean annual flood is a reasonable approximation.

Mean channel longitudinal gradient — The average slope, in the downstream direction, of a defined segment of the stream channel based on measurements taken along the channel thalweg.

Minimum bypass flow — The minimum instantaneous flow rate of water at any location in a stream that is adequate for fish spawning and passage. In applying the minimum bypass flow to a diversion, it is the minimum instantaneous flow rate of water that must be moving past the point of diversion before water may be diverted under a permit.

Nature (of coarse sediment and large wood) — Characteristics other than size, such as type of rock, angularity, and roundness.

Obligate wetland plants — Plants that almost always occur in wetlands. Include, but are not limited to, Pacific foxtail, water hemlock, arrow-leaved groundsel, cattail, skunk cabbage, most monkeyflowers, many, but not all species of bulrush and flatsedge, most willows, and mountain alder. For a more detailed list, see Reed, USFWS (1988).

Permeability — The capability of soil or other geologic formations to transmit water. See hydraulic conductivity.

Period of record — The time period for which flow measurements have been recorded. The period of record may be continuous or interrupted by intervals during which no data were collected.

Perennial stream — A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Run-off from rainfall is a supplemental source of water for stream flow.

Pool — A deeper area of water in a stream channel; usually quiet and often with no visible flow.

Recurrence interval — The average time between occurrences of stream flows of a given or greater magnitude, sometimes referred to as the return period. The recurrence interval is equal to one divided by the exceedance probability.

Regulated mainstem river — A river or stream in which scheduled releases from storage are made to meet minimum instream flow requirements established by State Water Board Order or Decision.

Residual pool depth — The difference between the depth of a pool at its deepest point and at its outlet.

Riffle — A shallow area in which water flows rapidly over a rocky or gravelly stream bed.

Riffle crest — The highest point along the channel thalweg at a riffle.

Riparian habitat — Vegetation growing close to a watercourse, lake, swamp, or spring that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for streambank stability.

Season of diversion — the calendar period during which water may be diverted.

Skew — A measure of the degree of symmetry of a frequency distribution. Positive or negative skew indicate a bunching up of scores at one end of the scale and a smaller tail at the other end.

Standard deviation — A statistical term describing the measure of the variation of data around the mean of the data set, defined as the square root of the sum of squared differences between the average value and all observed values

Unimpaired flow — The stream flow that would naturally occur in a stream channel without any diversions or impoundments

Upper limit of anadromy — The upstream end of the range of anadromous fish that currently are or have been historically present year-round or seasonally, whichever extends the furthest upstream.

Watershed — The land area that drains into a stream. An area of land that contributes runoff to one specific delivery point; large watersheds may be composed of several smaller "subsheds", each of which contributes runoff to different locations that ultimately combine at a common delivery point. Often considered synonymous with a drainage basin or catchment. Watershed (drainage basin) boundaries follow topographic highs. The term watershed is also defined as the divide separating one drainage basin from another.

Water year — The time convention used by the USGS for compiling and reporting their streamflow data. The water year for the United States is from October 1st to September 30th. For example water year 2000 is from October 1, 1999 to September 30, 2000.

Appendix 3. References

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Appendix 4. Streams Within the Policy Area

The policy area includes the counties of Marin and Sonoma, and portions of Napa, Mendocino, and Humboldt counties. Information from the USGS National Hydrography Database was used to create the following list of named streams that are within the policy area. The policy applies to water diversions from these streams and to water diversions from unnamed streams and locally named streams that contribute flow to these streams.

Stream Names

Abalobadiah Creek
Ackerman Creek
Adams Creek
Adobe Creek
Alamere Creek
Albion River
Alder Creek
Allen Creek
Alpine Gulch
American Canyon Creek
Americano Creek
Americano, Estero
Anchor Creek
Anderson Creek
Anderson Gulch
Angel Creek
Anna Belcher Creek
Arroyo Seco
Arvola Gulch
Asbury Creek
Ash Creek
Atascadero Creek
Austin Creek
Avichi, Arroyo
Baechtel Creek
Bailey Creek
Baker Creek
Bakers Creek
Bald Hill Creek
Bale Slough
Barlow Gulch
Barnes Creek
Barrelli Creek
Barton Gulch
Beal Creek
Bear Canyon
Bear Creek
Bear Gulch
Bear Haven Creek
Bear Pen Creek
Bear Trap Creek
Bear Valley
Bear Wallow Creek
Bearpen Creek
Beartrap Creek
Beasley Creek
Bee Tree Creek
Beebe Creek
Beer Bottle Creek
Benmore Creek
Bevans Creek
Bidwell Creek
Big Carson Creek
Big Creek
Big Finley Creek
Big Flat Creek
Big Gulch
Big Oat Creek
Big Pepperwood Creek
Big River
Big Salmon Creek
Big Sulphur Creek
Biggs Gulch
Bill Williams Creek
Billings Creek
Biter Creek
Black Rock Creek
Blossom Creek
Blucher Creek
Blue Jay Creek
Blue Slide Creek
Bluegum Creek

Stream Names

Boardman Gulch
Boggs Creek
Bon Tempe Creek
Bonee Gulch
Booth Gulch
Bottom Creek
Boulder Creek
Boyd Creek
Boyer Creek
Boyes Creek
Brandon Gulch
Bridge Creek
Briggs Creek
Britain Creek
Broaddus Creek
Brooks Creek
Browns Creek
Brush Creek
Buck Creek
Buckeye Creek
Buckhorn Creek
Bull Team Gulch
Bullock Creek
Bunker Gulch
Burbeck Creek
Burns Creek
Burnt Ridge Creek
Burright Creek
Busch Creek
Bush Slough
Buzzard Creek
Canon Creek
Calabazas Creek
Camp Creek
Camp Sixteen Gulch
Campbell Creek
Cannon Gulch
Carneros Creek
Carriger Creek
Carson Creek
Cascade Creek
Caspar Creek
Cataract Creek
Cavanaugh Gulch
Cavanough Gulch
Cave Creek
Cedar Creek
Chadbourne Gulch
Chamberlain Creek
Champlin Creek
Chaparral Creek
Chapman Branch
Chemise Creek
Cheney Gulch
Cherry Creek
Chileno Creek
Chiles Creek
Chimney Rock Creek
China Creek
China Gulch
China Slough
Chinese Gulch
Churchman Creek
Clear Creek
Cloverdale Creek
Coast Creek
Cobb Creek
Cold Creek
Cold Springs Creek
Coleman Creek
Coleman Valley Creek
Colgan Creek Flood Control Channel
Con Creek
Conklin Creek
Conn Creek
Cook Creek
Cook Gulch
Coon Creek
Cooskie Creek
Copeland Creek
Copper Mine Gulch
Corral Creek
Corte Madera Creek
Corte Madera Del Presidio, Arroyo
Cottaneva Creek
Covington Gulch
Coyote Creek
Crane Creek
Crawford Creek
Crocker Creek
Cummiskey Creek
Curly Cow Creek
Cyrus Creek
Dago Creek

Stream Names

Danfield Creek
Dark Gulch
Davis Creek
Deadman Gulch
Deer Creek
Deer Park Creek
DeHaven Creek
Devil Creek
Devils Creek
Dooley Creek
Doolin Creek
Doty Creek
Dougherty Creek
Dowdall Creek
Doyle Creek
Dry Creek
Duck Pond Gulch
Ducker Creek
Duffy Gulch
Duncan Creek
Dunn Creek
Dutch Bill Creek
Dutch Charlie Creek
Dutch Henry Creek
Dutcher Creek
Duvoul Creek
East Austin Creek
East Branch
East Branch Little North Fork
East Branch N. Fork Big River
East Branch N. Fork Jackass Creek
East Branch N. Fork Mattole River
East Branch Russian Gulch
East End Creek
East Fork Cataract Creek
East Fork Honeydew Creek
East Fork Lagunitas Creek
East Fork Russian River
East Fork Swede George Creek
Ebabias Creek
Edwards Creek
Eldridge Creek (historical)
Elk Creek
Elkhead Creek
Elkhorn Creek
Elkins Creek
Eubank Creek
Devils Gulch Creek
Devils Slough
Dewarren Creek
Dietz Gulch
Digger Creek
Dinner Creek
Domingo Creek
Donahue Slough
Donelly Creek
Fairfax Creek
Fall Creek
Felder Creek
Feliz Creek
Felta Creek
Ferguson Gulch
Fern Creek
Fife Creek
Finley Creek
Fish Rock Gulch
Fisher Creek
Flat Ridge Creek
Flat Rock Creek
Fleming Creek
Floodgate Creek
Flume Gulch
Flynn Creek
Foote Creek
Forsythe Creek
Fort Ross Creek
Fourmile Creek
Fowler Creek
Fox Camp Creek
Franchini Creek
Franz Creek
Frasier Creek
Frazer Creek
Freathy Creek
Freezeout Creek
French Creek
Frink Canyon
Fuller Creek
Gallinas Creek
Galloway Creek
Garcia River
Garnett Creek
Gates Creek
George Young Creek

Stream Names

German Creek
Getchell Gulch
Gibson Creek
Gilham Creek
Gill Creek
Gilliam Creek
Gird Creek
Gitchell Creek
Glenbrook Creek
Glennen Gulch
Gossage Creek
Grab Creek
Granny Creek
Grape Creek
Grasshopper Creek
Graveyard Creek
Gray Creek
Green Gulch
Green Valley Creek
Greenwood Creek
Grindstone Creek
Groshong Gulch
Gschwend Creek
Gualala River
Gulch Creek
Gulch Eleven
Gulch Fifteen
Gulch One
Gulch Seven
Gulch Six
Gulch Thirtyone
Gulch Three
Gut Creek
Haggerty Gulch
Hale Creek
Hall Gulch
Halleck Creek
Haraszthy Creek
Hardy Creek
Hare Creek
Harmonica Creek
Harris Creek
Harrow Creek
Hathaway Creek
Haupt Creek
Hayfield Creek
Hayshed Gulch
Hayworth Creek
Hazel Gulch
Hensley Creek
High Valley Creek
Highland Creek
Hobson Creek
Hoil Creek
Hollister Creek
Home Ranch Creek
Hondo, Arroyo
Honey Creek
Honeydew Creek
Hooker Creek
Hoot Owl Creek
Horns Creek
Horse Creek
Horse Mountain Creek
Horsetail Gulch
Horsethief Creek
Hot Springs Creek
Hotel Gulch
House Creek
Howard Creek
Howell Creek
Huckleberry Creek
Hudeman Slough
Huichica Creek
Humboldt Creek
Humbug Creek
Hummingbird Creek
Hungry Hollow Creek
Icaria Creek
Indian Creek
Ingalls Creek
Inglenook Creek
Ingram Creek
Inman Creek
Irish Creek
Jack Peters Gulch
Jack Smith Creek
Jackass Creek
Jakes Creek
James Creek
Jan Jose, Arroyo
Jenner Gulch
Jewell Gulch
Jewett Creek

Stream Names

Jim Creek
Jimmy Creek
John Creek
John Gordon Creek
John Smith Creek
Johnson Creek
Johnson Gulch
Juan Creek
Jug Handle Creek
Julias Creek
Kaisen Gulch
Kass Creek
Kelley Creek
Kellogg Creek
Kelly Gulch
Kendall Gulch
Kent Creek
Ketty Gulch
Keys Creek
Kibesillah Creek
Kidwell Gulch
Kimball Gulch
Kinsey Creek
Kolmer Gulch
Kreuse Creek
Kroll Creek
Lagoon Creek
Laguna de Santa Rosa
Lagunitas Creek
Lake Gulch
Lancel Creek
Larkspur Creek
Larmour Creek
Laurel Gulch
Lawhead Creek
Lazy Creek
Lee Creek
Lewis Creek
Lichau Creek
Little Bear Creek
Little Bear Haven Creek
Little Briggs Creek
Little Creek
Little Finley Creek
Little Howard Creek
Little Jackass Creek
Little Juan Creek
Little N. Fork Gualala River
Little N. Fork Navarro River
Little N. Fork Noyo River
Little N. Fork Ten Mile River
Little Rancheria Creek
Little River
Little Salmon Creek
Little Strawberry Creek
Little Sulphur Creek
Little Valley Creek
Little Warm Springs Creek
Livereau Creek
Log Cabin Creek
Lone Tree Creek
Long Branch Creek
Long Ridge Creek
Lost Creek
Lovers Gulch Creek
Low Gap Creek
Lynch Creek
Lytton Creek
Maacama Creek
Mallo Pass Creek
Maple Creek
Marble Gulch
Mariposa Creek
Mark West Creek
Marsh Creek
Marsh Gulch
Marshall Creek
Marshall Gulch
Martin Creek
Matanzas Creek
Mattole Canyon
Mattole River
McCarvey Creek
McChristian Creek
McClellon Gulch
McClure Creek
McCormick Creek
McDonald Creek
McDonald Gulch
McDonnell Creek
McDowell Valley
McGann Gulch
McGinnis Creek
McKee Creek

Stream Names

McKenzie Creek
McKinnan Gulch
McMullen Creek
McNab Creek
McNutt Gulch
Mettick Creek
Mewhinney Creek
Meyer Gulch
Middle Creek
Middle Fork Cottaneva Creek
Middle Fork Feliz Creek
Middle Fork Hardy Creek
Middle Fork Lagunitas Creek
Middle Fork of North Fork Noyo River
Middle Fork Ten Mile River
Mill Creek
Miller Creek
Millerton Gulch
Milliken Creek
Mills Creek
Minnie Creek
Mira Slough
Mission Creek
Mitchell Creek
Moat Creek
Monahan Creek
Montgomery Creek
Moody Creek
Moore Creek
Morrison Creek
Morrison Gulch
Morses Gulch
Mud Hen Slough
Mud Slough
Mule Creek
Murphy Creek
Murray Gulch
Mustard Gulch
Napa Creek
Napa River
Napa Slough
Nash Creek
Nathanson Creek
Navarro River
Neefus Gulch
Nelson Creek
Newton Creek
Nicasio Creek
Niemela Gulch
Nolan Creek
Nooning Creek
Norden Gulch
North Branch
North Branch Little Sulphur Creek
North Branch North Fork Navarro River
North Branch Portfield Creek
North Fork Albion River
North Fork Alder Creek
North Fork Bear Creek
North Fork Big Flat Creek
North Fork Big River
North Fork Buckeye Creek
North Fork Cottaneva Creek
North Fork DeHaven Creek
North Fork Fuller Creek
North Fork Garcia River
North Fork Gualala River
North Fork Hardy Creek
North Fork Hayworth Creek
North Fork Indian Creek
North Fork Jackass Creek
North Fork James Creek
North Fork Juan Creek
North Fork Lancel Creek
North Fork Mattole River
North Fork Mill Creek
North Fork Navarro River
North Fork Noyo River
North Fork Redwood Creek
North Fork Schooner Gulch
North Fork South Fork Noyo River
North Fork Ten Mile River
North Fork Wages Creek
North Mill Creek
Novato Creek
Noyo River
Nye Creek
Oat Creek
Oat Valley Creek
O'Conner Gulch
Oil Creek
Old Mill Creek
Olds Creek
Olema Creek

Stream Names

Onion Patch Gulch
Ornbaun Creek
Osborne Creek
Orrs Creek
Osser Creek
Pacific Ocean
Painter Creek
Palmer Creek
Pardaloe Creek
Park Gulch
Parkinson Gulch
Parlin Creek
Parsons Creek
Patsy Creek
Pena Creek
Peaked Creek
Peat Pasture Gulch
Pechaco Creek
Pepperwood Creek
Perry Gulch
Petaluma River
Peter Gulch
Peterson Creek
Peterson Gulch
Phillips Gulch
Phoenix Creek
Pickle Canyon
Picnic Creek
Pieta Creek
Pigpen Gulch
Pike County Gulch
Pine Gulch Creek
Point Arena Creek
Pole Mountain Creek
Pool Creek
Porter Creek
Porterfield Creek
Poverty Gulch
Press Creek
Pritchard Creek
Pudding Creek
Purrington Creek
Quinlan Gulch
Quinliven Gulch
Rail Creek
Railroad Gulch
Railroad Slough
Rainbow Slough
Ramon Creek
Rancheria Creek
Randall Creek
Rattlesnake Creek
Ray Gulch
Rector Creek
Red Hill Gulch
Red Slide Creek
Redwood Creek
Redwood Log Creek
Rice Creek
Rider Creek
Rincon Creek
Ritchey Creek
Robinson Creek
Robinson Gulch
Rock Creek
Rockpile Creek
Rockport Creek
Rocky Creek
Rodgers Creek
Roller Gulch
Rolling Brook
Rose Creek
Roseman Creek
Ross Creek
Rough Creek
Roy Creek
Rue Gulch, La
Russ Gulch
Russell Brook
Russian Gulch
Russian Gulch Creek
Russian River
S. Branch North Fork Navarro River
Sage Creek
Saint Elmo Creek
Saint Marys Creek
Saint Orres Creek
Salmon Creek
Salt Creek
Salt Hollow Creek
Salt Spring Creek
San Anselmo Creek

Stream Names

San Antonio, Estero De
San Clemente Creek
San Francisco Bay
San Geronimo Creek
San Pablo Bay
San Rafael Creek
Santa Maria Creek
Santa Rosa Creek
Sarco Creek
Sartori Gulch
Saunders Creek
Sausal Creek
Sausal, Arroyo
Sawyer Creek
Schoolhouse Creek
Schooner Gulch
Scotty Creek
Sea Lion Gulch
Seaside Creek
Sebbas Creek
Second Napa Slough
Section Four Creek
Seven Oaks Creek
Seward Creek
Shearing Creek
Sheehy Creek
Sheephouse Creek
Sheldon Creek
Sherman Gulch
Sherwood Creek
Shingle Mill Creek
Shinglemill Gulch
Shipman Creek
Sholes Creek
Signal Creek
Signal Port Creek
Skunk Creek
Sled Creek
Sleepy Hollow Creek
Slick Rock Creek
Smith Creek
Smith Gulch
Snow Creek
Snuffins Creek
Soda Creek
Soda Fork
Soda Gulch
Soda Spring Creek
Soda Springs Creek
Soldier Creek
Sonoma Creek
South Branch Portfield Creek
South Branch Robinson Creek
South Fork Albion River
South Fork Bear Creek
South Fork Bear Haven Creek
South Fork Big River
South Fork Brush Creek
South Fork Cottaneva Creek
South Fork Dry Creek
South Fork Fuller Creek
South Fork Garcia River
South Fork Greenwood Creek
South Fork Gualala River
South Fork Hardy Creek
South Fork Hare Creek
South Fork Juan Creek
South Fork Matanzas Creek
South Fork Minnie Creek
South Fork Noyo River
South Fork Redwood Creek
South Fork Ten Mile River
South Fork Usal Creek
South Fork Wages Creek
South Slough
Spanish Creek
Spencer Creek
Spike Buck Creek
Spooner Creek
Spring Creek
Sproule Creek
Squaw Creek
Standley Creek
Stanley Creek
Stansberry Creek
Steamboat Slough
Stemple Creek
Stewart Creek
Stewarts Creek
Stinson Gulch
Stockhoff Creek
Strawberry Creek
Stuart Creek
Sugarloaf Creek

Stream Names

Sullivan Creek
Sulphur Creek
Sulphur Fork
Suscol Creek
Swartz Creek
Swede George Creek
Sweetwater Creek
Tamalpais Creek
Tank Four Gulch
Tannery Creek
Telegraph Creek
Ten Mile River
Thompson Creek
Three Springs Creek
Thurston Creek
Timber Cove Creek
Tin Can Creek
Tobacco Creek
Tolay Creek
Tom Bell Creek
Tomales Bay
Tombs Creek
Tramway Gulch
Triplett Gulch
Tule Slough
Tulucay Creek
Turner Canyon
Two Log Creek
Tyler Creek
Upper North Fork Honeydew Creek
Upper North Fork Mattole River
Usal Creek
Valentine Creek
Vallejo Gulch
Van Buren Creek
Van Wyck Creek
Vanauken Creek
Vasser Creek
Verde Canyon
Virgin Creek
Wages Creek
Waldron Creek
Walker Creek
Walker Gulch
Ward Creek
Warm Springs Creek
Warren Creek
Washoe Creek
Waterfall Gulch
Webb Creek
Weeks Creek
West Branch Fife Creek
West Branch Indian Creek
West Branch North Fork Indian Creek
West Branch Russian Gulch
West Fork Honeydew Creek
West Fork Lagunitas Creek
West Fork Sproul Creek
West Slough
Westlund Creek
Whale Gulch
Wheatfield Fork Gualala River
White Creek
White Gulch
Wild Cattle Creek
Wildcat Creek
Wildhorse Creek
Wilkins Gulch
Williams Creek
Willow Brook
Willow Creek
Willow Springs Creek
Wilson Creek
Windsor Creek
Wine Creek
Witherell Creek
Wolf Creek
Wolfey Gulch
Woloki Slough
Wood Creek
Woods Creek
Yale Creek
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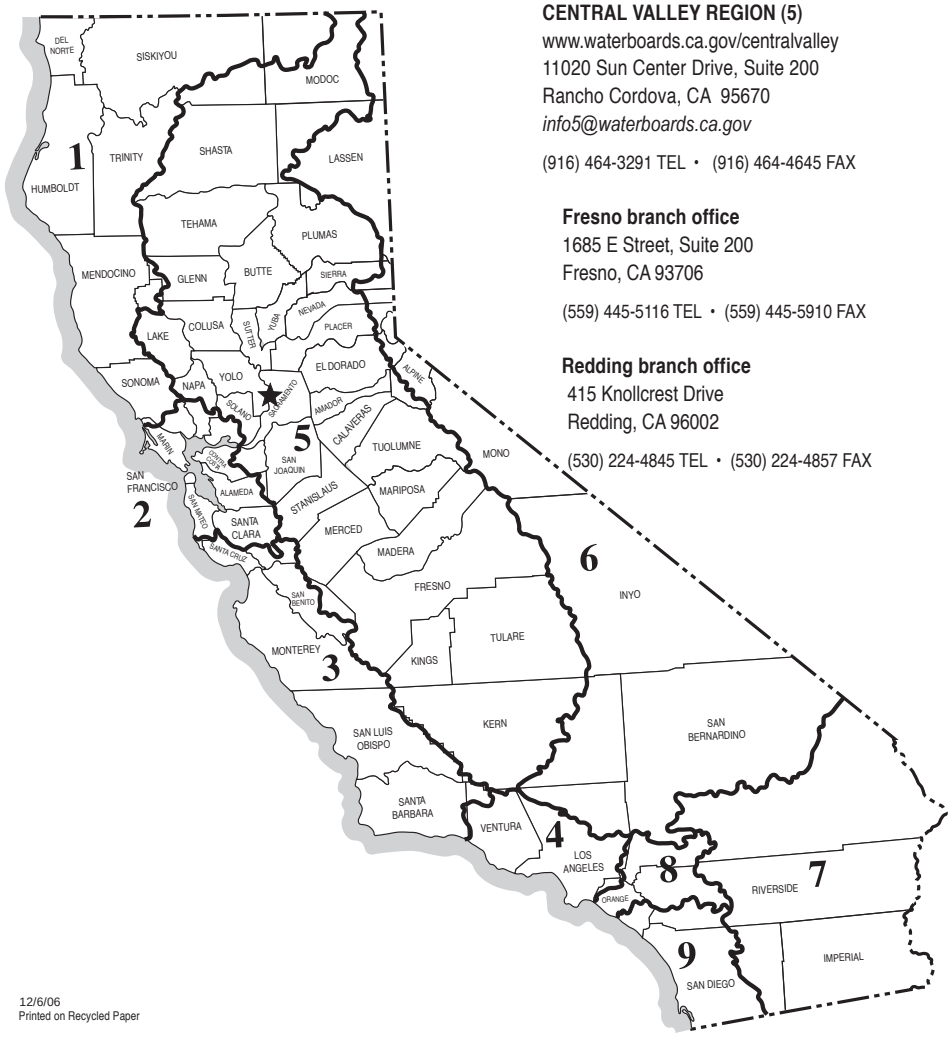

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